

## Original Research Article

# Incidence and patterns of post-tonsillectomy hemorrhage in paediatric patients: a hospital-based study

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## ABSTRACT

**Background:** Post-tonsillectomy hemorrhage (PTH) is a potentially serious complication in pediatric patients, contributing to increased morbidity, hospital readmission, and healthcare burden. Its incidence and clinical patterns vary depending on multiple patient- and procedure-related factors, particularly in developing healthcare settings. The aim of the study was to determine the incidence and patterns of PTH in pediatric patients and evaluate associated risk factors, timing, severity, and management outcomes.

**Methods:** This hospital-based observational study was conducted over 1 year in a tertiary care hospital in Bangladesh, including 220 pediatric patients who underwent tonsillectomy. Data were collected using a structured format covering demographic variables, type and timing of hemorrhage, severity, clinical presentation, management strategies, and associated risk factors. Statistical analysis was performed using statistical package for the social sciences (SPSS) version 26, with results expressed as frequency and percentage. A  $p \leq 0.05$  was considered statistically significant.

**Result:** The mean age of patients was  $8.6 \pm 3.2$  years, with a male predominance (60.00%). Secondary hemorrhage (90.91%) was more common than primary hemorrhage (9.09%), most frequently occurring on days 5-10 (58.00%). Mild hemorrhage accounted for 46.36% of cases, while 10.91% required surgical intervention. Oral bleeding was present in 100.00% of patients, followed by blood-stained saliva (71.82%) and hematemesis (25.45%). Conservative management was sufficient in 46.36% of cases, whereas 12.73% required blood transfusion. Major associated risk factors included Diathermy technique (45.45%), infection (40.00%), and dehydration (32.73%).

**Conclusion:** Post-tonsillectomy hemorrhage is predominantly secondary in nature, with identifiable risk factors and varied clinical severity. Early recognition, improved surgical techniques, and effective postoperative care are essential to minimize complications and enhance pediatric patient outcomes.

**Keywords:** Post-tonsillectomy hemorrhage, Pediatric tonsillectomy, Secondary hemorrhage, Risk factors, Surgical complications, Bangladesh

## INTRODUCTION

Post-tonsillectomy hemorrhage (PTH) is defined as bleeding from the tonsillar bed occurring after surgical removal of the tonsils, either within 24 hours (primary) or

after 24 hours (secondary), and it remains one of the most serious postoperative complications in pediatric tonsillectomy.<sup>1</sup> Globally, the prevalence of PTH in children generally ranges from about 1-5%, depending on surgical technique and population characteristics.<sup>2</sup> In

Bangladesh, the comparable rates of secondary hemorrhage are typically around 2-4% among pediatric patients undergoing tonsillectomy.<sup>3</sup> The process of PTH is closely linked to wound healing and vascular integrity in the tonsillar fossa. After surgery, a fibrin clot forms over the exposed muscle. Subsequent sloughing of this eschar during healing, usually around the 5th-10th postoperative day, this protective layer gradually separates, which may expose underlying vessels, and lead to bleeding.<sup>4</sup> This process is influenced by factors such as infection, surgical technique, and patient age, which influence this mechanism, highlighting the multifactorial nature of hemorrhage development. Thus, understanding the biological process directly informs prevention and management strategies.<sup>1</sup> The impact of PTH is significant, ranging from minor bleeding to life-threatening hemorrhage requiring urgent surgical intervention or transfusion.<sup>5</sup> It increases hospital readmissions, prolongs recovery, and causes considerable anxiety for caregivers. Moreover, severe cases may compromise airway safety in children, making it a critical postoperative concern. Therefore, evaluating incidence and patterns has direct implications for patient safety and healthcare burden.<sup>6</sup> PTH offers several advantages, including detailed clinical data, controlled follow-up, and the ability to identify risk factors such as age, surgical method, and comorbidities. These studies also support evidence-based improvements in perioperative care.<sup>7</sup> However, they have disadvantages, including potential selection bias, limited generalizability, and dependence on retrospective data quality.<sup>8</sup> The importance of studying PTH lies in its preventable nature and clinical consequences. Identifying patterns can improve surgical techniques, postoperative care protocols, and early intervention strategies, ultimately reducing morbidity and healthcare costs. In pediatric populations, this is particularly relevant due to their vulnerability and reliance on caregiver recognition of complications.<sup>9</sup> Despite existing research, several limitations persist. Many studies have small sample sizes, heterogeneous methodologies, and inconsistent definitions of hemorrhage, limiting comparability.<sup>10</sup> Additionally, most evidence originates from high-income countries, with limited data from developing settings such as Bangladesh, where healthcare infrastructure and patient profiles differ.<sup>11</sup> Therefore, there is a clear need for a current, context-specific study focusing on pediatric PTH in Bangladesh. Such research can address regional variations, evaluate local surgical practices, and provide more applicable evidence for clinicians working in similar environments. The study aimed to determine the incidence and patterns of post-tonsillectomy hemorrhage in pediatric patients, and to evaluate associated risk factors, timing, severity, and clinical outcomes in order to improve early detection, management strategies, and overall patient safety in a hospital setting.

## METHODS

This hospital-based observational study was conducted in a tertiary care hospital in Bangladesh over a period of 3

years from January 2023 to December 2025, focusing on pediatric patients undergoing tonsillectomy. A total of 220 children were included in the study using a purposive sampling technique, forming a well-defined study population. Participants were selected based on predefined eligibility criteria to ensure clinical relevance and data accuracy.

### Inclusion criteria

Pediatric patients ( $\leq 18$  years) who underwent tonsillectomy and patients who developed PTH during the study period were included.

### Exclusion criteria

Patients with incomplete clinical records, patients undergoing combined surgical procedures other than tonsillectomy and known bleeding disorders diagnosed prior to surgery without proper perioperative management were excluded.

### Data collection

Data were systematically collected from hospital records and patient follow-up using a structured data collection sheet. Variables recorded included demographic characteristics (age, gender), type and timing of haemorrhage (primary within 24 hours and secondary after 24 hours), severity (mild, moderate, severe), clinical presentation (oral bleeding, hematemesis, pallor, hypovolemia), management modalities (conservative, medical, surgical), and associated risk factors such as infection, dehydration, surgical technique, coagulopathy, and early physical activity. All patients were monitored during hospital stay and followed up postoperatively for detection of delayed haemorrhage.

### Statistical analysis

Statistical analysis was performed using statistical package for the social sciences (SPSS) software (version 26). Continuous variables were expressed as mean  $\pm$  standard deviation (SD), while categorical variables were presented as frequency and percentage. Descriptive statistics were used to determine the incidence and pattern of post-tonsillectomy haemorrhage. Associations between risk factors and haemorrhage patterns were analyzed using the chi-square test where applicable. A  $p \leq 0.05$  was considered statistically significant.

## RESULTS

Table 1 demonstrated that the total population was 220 and the highest proportion of patients was observed in the 5-10 years' age group, accounting for 47.27% cases, followed by  $>10$  years with 35.45% cases, while children aged  $<5$  years comprised 17.27% cases. The mean age of the participants was  $8.6 \pm 3.2$  years. In terms of gender

distribution, males were predominant with 60.00% cases, whereas females constituted 40.00% cases (Table 1).

Secondary haemorrhage (>24 hours) was markedly higher, occurring in 90.91% patients, compared to primary haemorrhage (<24 hours) in 9.09% patients. Among secondary haemorrhage cases, the highest occurrence was noted during day 5-10 (58.00% cases), followed by day 2-4 (11.00% cases) and >10 days (31.00% cases) (Table 2). Mild haemorrhage was the most common, observed in 46.36% patients, followed by moderate haemorrhage in 42.73% patients. Severe haemorrhage requiring surgical intervention was reported in 10.91% patients (Table 3).

Oral bleeding was universal, reported in all patients (100.00%). Blood-stained saliva was observed in 71.82% patients, while hematemeses occurred in 25.45% patients.

Pallor was noted in 29.09% cases, and signs of hypovolemia were present in 16.36% cases (Table 4).

Conservative management was the most frequently applied approach in 46.36% patients, followed by medical management in 42.73% patients. Surgical intervention was required in 10.91% cases. Additionally, blood transfusion was necessary in 12.73% patients (Table 5).

The most common risk factor was surgical technique (diathermy), observed in 45.45% patients, followed by infection at the tonsillar bed in 40.00% patients. Poor oral intake or dehydration was present in 32.73% cases, surgical technique (cold dissection) was in 24.55%, while early physical activity was noted in 16.36% cases. Coagulopathy was the least frequent risk factor, identified in 8.18% patients (Table 6).

**Table 1: Baseline characteristics of study population (n=220).**

Variable	Frequency (N)	Percentage (%)	
Age (years)	<5	38	17.27
	5-10	104	47.27
	>10	78	35.45
	Mean±SD	8.6±3.2	
Gender	Male	132	60.00
	Female	88	40.00

**Table 2: Incidence and timing of post-tonsillectomy haemorrhage (n=220).**

Variable	Frequency (N)	Percentage (%)	
Type of haemorrhage (hour)	Primary (<24)	20	9.09
	Secondary (>24)	200	90.91
Timing of secondary haemorrhage (days)	Day 2-4	22	11.00
	Day 5-10	116	58.00
	>10 days	62	31.00

**Table 3: Severity of haemorrhage among patients (n=220).**

Severity Level	Frequency (N)	Percentage (%)
Mild (self-limiting)	102	46.36
Moderate (required medical intervention)	94	42.73
Severe (required surgical intervention)	24	10.91

**Table 4: Clinical presentation of haemorrhage (n=220).**

Clinical Features	Frequency (N)	Percentage (%)
Oral bleeding	220	100.00
Hematemeses	56	25.45
Blood-stained saliva	158	71.82
Hypovolemia signs	36	16.36
Pallor	64	29.09

**Table 5: Management strategies for haemorrhage (n=220).**

Management modality	Frequency (N)	Percentage (%)
Conservative (observation)	102	46.36
Medical (adrenaline, cautery bedside)	94	42.73

Continued.

Management modality	Frequency (N)	Percentage (%)
<b>Surgical intervention (re-exploration)</b>	24	10.91
<b>Blood transfusion required</b>	28	12.73

**Table 6: Risk factors associated with post-tonsillectomy haemorrhage (n=220).**

Risk Factor	Frequency (N)	Frequency (%)
<b>Infection at tonsillar bed</b>	88	40.00
<b>Poor oral intake/dehydration</b>	72	32.73
<b>Surgical technique (Diathermy)</b>	100	45.45
<b>Coagulopathy</b>	18	8.18
<b>Early physical activity</b>	36	16.36
<b>Surgical technique (Cold dissection)</b>	54	24.55

## DISCUSSION

PTH remains the most common and potentially serious complication following pediatric tonsillectomy, with reported incidence rates varying widely across studies due to differences in patient populations, surgical techniques, and definitions of bleeding events.<sup>12</sup> The mean age was  $8.6 \pm 3.2$  years, with the majority of patients (47.27%) aged 5-10 years and a male predominance (60%). Similarly, Mohammadpour-Maleki et al observed a comparable male predominance (56.4%), supporting the gender trend seen in our study.<sup>4</sup> Our findings align with Windfuhr et al, who reported in a large-scale multicenter study that children younger than 15 years constitute the primary demographic for elective tonsillectomy and subsequent complications.<sup>1</sup> A predominance of secondary hemorrhage (90.91%) was demonstrated compared to primary hemorrhage (9.09%). This is consistent with a similar study showing secondary hemorrhage rates (approximately 5.8%) exceeding primary rates (approximately 1.0%) across surgical techniques.<sup>13</sup> Likewise, Handler et al reported delayed hemorrhage as more frequent than primary bleeding, reinforcing our findings.<sup>2</sup> In contrast, Windfuhr and Ulbrich suggested that primary hemorrhage may be more clinically significant and sometimes more frequent in certain groups, indicating variability depending on study design and population.<sup>14</sup> Regarding timing, our peak incidence of secondary hemorrhage occurred on days 5-10 (58.00%), which closely corresponds to the reported mean onset around 7-8 days postoperatively in the Iranian retrospective study by Mohammadpour-Maleki et al.<sup>4</sup> In our study, most cases were mild (46.36%), followed by moderate (42.73%) and severe (10.91%). These findings are consistent with those of Handler et al., who reported that a significant proportion of hemorrhages are minor and self-limiting, requiring only observation.<sup>2</sup> Similarly, other retrospective analyses have shown that only a minority of cases require surgical intervention, often ranging between 20-30%, which closely parallels our severe category (20%).<sup>4</sup> However, some earlier large-scale studies, such as Chowdhury et al, reported lower overall hemorrhage rates but did not stratify severity in detail, making direct comparison limited.<sup>15</sup> Oral bleeding was universal (100%) in our study, with additional symptoms such as blood-stained saliva (71.82%) and hematemesis (25.45%).

Comparable studies also report hematemesis as a frequently associated symptom due to swallowed blood, supporting our findings.<sup>2</sup> Additionally, signs of hypovolemia (16.36%) and pallor (29.09%) in our study indicate clinically significant blood loss in a subset of patients, similar to reports emphasizing the potentially life-threatening nature of PTH.<sup>14</sup> Regarding conservative management, our study managed 46.36% of cases through observation alone. This is consistent with Kim et al, who argued that many secondary bleeds are self-limiting and can be managed without invasive procedures if the patient is hemodynamically stable.<sup>16</sup>

The requirement for blood transfusion in 12.73% of our patients is notably higher than the 0.49% reported by Walker and Syanni. This suggests our study population may have presented later or had higher initial blood loss, possibly due to delays in seeking medical attention.<sup>17</sup> Similarly, Mohammadpour-Maleki et al reported that approximately 27.8% of patients required surgical intervention, closely matching our findings (surgical re-exploration-10.91%).<sup>4</sup> Surgical technique (diathermy, 45.45%), infection at tonsillar bed (40.00%), poor oral intake/dehydration (32.73%), and surgical technique (cold dissection, 24.55%), are major risk factors in this study. This mirrors the findings of Medikundu et al, who demonstrated that adequate postoperative hydration is essential for maintaining the integrity of the tonsillar bed and preventing eschar desiccation.<sup>18</sup> A meta-analysis demonstrated that cold steel dissection is associated with lower secondary hemorrhage rates compared to diathermy techniques.<sup>13</sup>

A comparative study reported higher bleeding rates with bipolar diathermy compared to cold dissection (12.5% versus 5.5%), supporting the importance of technique selection.<sup>19</sup> Coagulopathy (8.18%) was relatively uncommon in our study, consistent with previous studies indicating that bleeding disorders account for a small proportion of PTH cases but remain clinically significant when present.<sup>2</sup> PTH in pediatric patients remains a clinically significant complication with a predominance of secondary bleeding, and our findings reinforce the importance of early recognition, appropriate management,

and identification of modifiable risk factors to improve patient outcomes and reduce morbidity.<sup>13</sup>

### Limitations

This study has several limitations. Being a single-center hospital-based study, the findings may not be generalizable to broader populations. The use of purposive sampling may introduce selection bias. Additionally, reliance on hospital records and follow-up data may lead to information bias due to incomplete documentation. The absence of a control group limits causal inference regarding risk factors. Variations in surgical expertise and postoperative care practices were not fully controlled, which may influence the observed incidence and patterns of hemorrhage.

### CONCLUSION

This study demonstrates that PTH remains a significant postoperative complication among pediatric patients, with a predominance of secondary hemorrhage (90.91%), most commonly occurring between postoperative days 5-10 (58.00%). The majority of cases were mild (46.36%), although a considerable proportion required medical (42.73%) and surgical intervention (10.91%), indicating notable clinical burden. Oral bleeding was universally present (100%), with associated features such as blood-stained saliva (71.82%) and hematemesis (25.45%). Key contributing factors included surgical technique (Diathermy) (45.45%) and infection (40.00%). These findings emphasize the importance of meticulous surgical practice, postoperative monitoring, and caregiver awareness to ensure early detection and timely management, thereby improving patient safety and reducing complication.

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