



## Clinical evaluation of early and delayed post-operative complications following tonsillectomy. A prospective longitudinal observational study.

Dr. Sanjay Pathlavath<sup>1\*</sup>, Dr. Kavya S<sup>2</sup>, Dr. Lavuri Nagaraju<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Otorhinolaryngology, Government Medical College and General Hospital, Nalgonda, Telangana, India

<sup>2</sup>Senior Resident, Department of Otorhinolaryngology, Government Medical College and General Hospital, Nalgonda, Telangana, India

Page | 1

### Abstract

#### Background:

Tonsillectomy remains one of the most frequently performed ENT procedures, yet postoperative complications continue to influence recovery, patient safety, and resource utilization. Understanding the pattern of early and delayed complications helps refine perioperative practices and improve outcomes.

#### Aim:

To evaluate the early and delayed postoperative complications following tonsillectomy and determine their association with demographic and clinical variables.

#### Methods:

A prospective observational study was conducted among 50 patients aged 8–30 years undergoing tonsillectomy by the dissection and snare method. Baseline data, preoperative symptoms, tonsillar hypertrophy grade, early complications ( $\leq 24$  hours), and delayed complications (up to 6 months) were recorded. Statistical analysis was performed using the Chi-square test, with  $p < 0.05$  considered significant.

#### Results:

Most participants belonged to the 11–20-year group (74%), and females constituted 56%. Odynophagia (88%) and throat pain (84%) were the most common preoperative symptoms. Grade III tonsillar hypertrophy predominated (46%). Early complications were frequent, with oropharyngeal pain (82%), uvular edema (24%), and referred otalgia (22%) being the most common. Reactive hemorrhage occurred in 6%. Delayed complications included secondary hemorrhage (8%) and infection (6%), while no cases of tonsillar remnants or postoperative voice change were observed. Age showed a significant association with both early and delayed complications ( $p = 0.04$ ), with higher rates in younger patients. Gender and tonsillar grade showed no statistically significant correlation.

#### Conclusion:

Oropharyngeal pain and uvular edema were the predominant early postoperative events, while secondary hemorrhage represented the most frequent delayed complication. Younger age groups exhibited higher susceptibility to postoperative morbidity.

#### Recommendations:

Strengthening preoperative counselling for younger patients, standardising analgesic protocols, ensuring meticulous surgical technique, and implementing structured postoperative monitoring may reduce complication rates. Regular auditing of outcomes is recommended to enhance patient safety and refine clinical practice.

**Keywords:** Tonsillectomy; postoperative complications; reactionary hemorrhage; secondary hemorrhage; uvular edema; Ear Nose, and Throat surgery

**Submitted:** September 18, 2025 **Accepted:** November 15, 2025 **Published:** December 11, 2025

**Corresponding Author:** Dr. Sanjay Pathlavath

**Email:** [pathlavathsanjay@gmail.com](mailto:pathlavathsanjay@gmail.com)

Associate Professor, Department of Otorhinolaryngology, Government Medical College and General Hospital, Nalgonda, Telangana, India



## Introduction

Tonsillectomy remains one of the most frequently performed surgical procedures in otorhinolaryngology, widely indicated for recurrent tonsillitis, airway obstruction, and hypertrophic tonsillar disease. Despite steady advancements in anaesthesia, surgical instrumentation, and perioperative care, postoperative morbidity continues to pose a clinical challenge. Long-term studies have shown that tonsillectomy can lead to a spectrum of complications, underscoring the importance of continuous outcome monitoring and standardized care pathways [1]. Early postoperative events such as pain, uvular edema, nausea, and reactionary hemorrhage are well recognized during the immediate recovery period, particularly in pediatric cases, and directly influence the feasibility and safety of day-care tonsillectomy [2].

In children, the immediate postoperative phase is often characterized by variable pain intensity, airway discomfort, and recovery-related behavioural changes, emphasising the need for close observation and supportive care [3]. While these early events are usually self-limiting, certain complications, including bleeding, edema, and infection, require prompt medical intervention. Evidence from related surgical fields also underscores that procedures involving the upper airway can present early postoperative risks that demand vigilant perioperative assessment [4].

Several studies have shown that the incidence, severity, and pattern of complications differ across age groups, surgical indications, and clinical environments. Younger patients are particularly vulnerable due to heightened inflammatory responses and lower physiological tolerance to postoperative discomfort [5]. Understanding these variations is essential for anticipating complications, enhancing patient counselling, and refining postoperative management.

With this background, the present prospective observational study evaluates the spectrum of early and delayed complications following tonsillectomy and examines their association with age, gender, and tonsillar hypertrophy. The findings aim to support safer surgical practice and contribute to evidence-based postoperative care.

## Methodology

### Study design

This was a prospective longitudinal observational study conducted to evaluate early and delayed postoperative complications following tonsillectomy.

## Study setting and study period

The study was conducted in the Department of Otorhinolaryngology at Mahatma Gandhi Memorial Hospital (MGMH), Warangal, Telangana, India, a government-run tertiary care teaching hospital attached to Kakatiya Medical College. The hospital provides comprehensive secondary and tertiary healthcare services, including otorhinolaryngology, general surgery, pediatrics, obstetrics and gynecology, anesthesiology, and emergency care, and receives referrals from urban and rural regions of Warangal district and surrounding districts of Telangana. The study was conducted from September 2022 to June 2024.

## Participants

All patients undergoing tonsillectomy during the study period and fulfilling the inclusion criteria were selected by consecutive sampling until the required sample size was achieved.

## Variables

The primary variables included demographic characteristics, indication for tonsillectomy, type of tonsillectomy performed, and early and delayed postoperative complications such as pain, hemorrhage, infection, and healing status.

## Data sources/measurements

Data were collected using a structured proforma through patient interviews, clinical examination, intraoperative records, and postoperative follow-up assessments conducted at predefined intervals.

## Bias

To minimize selection bias, consecutive eligible patients were enrolled. Information bias was reduced by using standardized data collection tools and uniform clinical criteria for defining postoperative complications. All patients were followed using the same postoperative protocol.

## Study size

The sample size was calculated using the formula:

$$n = Z^2 \times p \times q / d^2,$$

where  $Z = 1.96$  (95% confidence level),  $p = 0.5$ ,  $q = 0.5$ , and  $d = 0.14$ .



The calculated minimum sample size was 49, which was rounded off to 50 patients.

### Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS (Statistical Package for the Social Sciences), version 25.0. Categorical variables such as sex, indication for tonsillectomy, and early and delayed postoperative complications were summarized as frequencies and percentages. Continuous variables, including age, were expressed as mean  $\pm$  standard deviation. Associations between categorical variables were analyzed using the Chi-square test, and a p-value  $< 0.05$  was considered statistically significant.

### Ethical Considerations

This study was initiated only after receiving formal approval from the Institutional Ethics Committee of MGM Hospital, Warangal. Written informed consent was obtained from all participants or their guardians in the case of minors. Confidentiality of patient data was strictly maintained, and all procedures adhered to the principles outlined in the

Declaration of Helsinki. No interventions beyond standard clinical care were performed as part of the study.

## RESULTS

### Participants

During the study period, 58 patients undergoing tonsillectomy were initially assessed for eligibility. Of these, 5 patients did not meet the inclusion criteria, and 3 patients declined participation. A total of 50 patients were confirmed eligible, enrolled, and underwent tonsillectomy. All enrolled participants completed the scheduled postoperative follow-up, and all 50 patients were included in the final analysis, with no loss to follow-up.

A total of **50 patients** who underwent tonsillectomy were included in the analysis. The mean age of the study population was **15.28  $\pm$  4.86 years**. Most participants belonged to the **11–20-year age group (74%)**, and females formed **56%** of the population. Odynophagia (88%), throat pain (84%), and dysphagia (54%) were the predominant preoperative complaints. Grade III tonsillar hypertrophy was most common (46%). The baseline characteristics are summarized in **Table 1**.

**Table 1. Baseline Characteristics of the Study Population (N = 50)**

Variable	Category	n (%)
Age group (years)	$\leq 10$	6 (12)
	11–20	37 (74)
	21–30	7 (14)
Gender	Male	22 (44)
	Female	28 (56)
Preoperative symptoms	Odynophagia	44 (88)
	Throat pain	42 (84)
	Dysphagia	27 (54)
Tonsillar hypertrophy	Grade II	16 (32)
	Grade III	23 (46)
	Grade IV	11 (22)

### Early Post-operative Complications

Early complications occurred in the majority of patients. Oropharyngeal pain was the most frequent early event,

affecting 82%, followed by uvular edema (24%), referred otalgia (22%), fever (20%), nausea/vomiting (18%), TMJ pain (8%), and reactionary hemorrhage (6%). Detailed distribution is provided in Table 2.

**Table 2. Early Post-operative Complications**

Complication	n (%)
Oropharyngeal pain	41 (82)
Uvular edema	12 (24)
Referred otalgia	11 (22)



Fever	10 (20)
Nausea/vomiting	9 (18)
TMJ pain	4 (8)
Reactionary hemorrhage	3 (6)

A statistically significant association was observed between younger age and the occurrence of early complications ( $p = 0.04$ ). Children  $\leq 10$  years experienced the highest frequency of early adverse events. Gender and tonsillar grade did not show any statistically significant associations (Table 4).

Delayed complications were documented in 8% of patients. Secondary hemorrhage (8%) and postoperative infection (6%) were the only delayed events noted. No cases of tonsillar remnants or postoperative voice change were identified. The complete profile of delayed complications is presented in Table 3.

### Delayed Post-operative Complications

**Table 3. Delayed Post-operative Complications and Hemorrhage**

Complication	n (%)
Secondary hemorrhage	4 (8)
Infection	3 (6)
Tonsillar remnants	0
Change in voice	0
Total hemorrhage	7 (14)
Reactionary hemorrhage	3 (6)
Secondary hemorrhage	4 (8)

Delayed complications also showed a significant association with age ( $p = 0.04$ ), with the highest rates occurring in the  $\leq 10$ -year group, as shown in Table 4. No significant relationship was identified between gender or tonsillar grade and delayed complications.

Overall, hemorrhage was recorded in 14% of the study population, with reactionary hemorrhage in 6% and secondary hemorrhage in 8%. Hemorrhage distribution is detailed in Table 3. Although hemorrhage was numerically higher in patients with Grade III tonsillar hypertrophy, this trend was not statistically significant (Table 4).

### Post-Tonsillectomy Hemorrhage

**Table 4. Significant Associations with Post-operative Complications**

Variable	Comparison	Finding	p-value
Age vs early complications	Higher complications in $\leq 10$ yrs; lowest in 21–30 yrs	Significant	0.04
Age vs delayed complications	Delayed complications are highest in $\leq 10$ yrs	Significant	0.04
Gender vs complications	No meaningful difference	Not significant	0.68 / 0.81
Tonsillar grade vs complications	Higher grades showed an increasing trend, but not significant	Not significant	$>0.25$

The association between selected demographic and clinical variables and the occurrence of postoperative complications was analyzed using the Chi-square test. No statistically

significant association was observed between age group and postoperative complications ( $\chi^2 = 1.84, p = 0.39$ ). Similarly, the association between sex and postoperative



complications was not statistically significant ( $\chi^2 = 0.62$ ,  $p = 0.43$ ). The occurrence of early and delayed complications was comparable across the studied subgroups, indicating no significant influence of these variables on postoperative outcomes.

Page | 5

## Discussion

This prospective observational study evaluated early and delayed postoperative complications following tonsillectomy and explored their association with age, sex, and tonsillar hypertrophy. The findings highlight that postoperative morbidity continues to be a relevant clinical concern despite advances in surgical techniques and perioperative management.

Oropharyngeal pain emerged as the most frequent early postoperative complication. This observation is consistent with previous reports indicating that post-tonsillectomy pain is primarily driven by mucosal disruption, local inflammation, and exposure of nerve endings, particularly in pediatric patients [6]. The occurrence of uvular edema and referred otalgia in the present study also mirrors earlier evidence attributing these symptoms to intraoperative tissue handling, suction-related trauma, and irritation of the glossopharyngeal nerve. Prior adult-focused studies have further demonstrated variability in pain severity and pattern depending on the indication for surgery, reflecting the heterogeneous nature of postoperative recovery [7].

Reactive hemorrhage was uncommon in this cohort, aligning with complication rates reported in contemporary literature. In contrast, secondary hemorrhage constituted the majority of delayed complications, a pattern well documented in previous studies. This has been attributed to sloughing of the tonsillar bed eschar during the healing phase and to behavioral factors such as premature resumption of normal diet or physical activity [9]. The low incidence of postoperative infection observed in this study is comparable to findings from studies emphasizing meticulous surgical technique and appropriate perioperative antibiotic use as key preventive measures.

An important finding was the significant association between younger age and postoperative complication rates. Similar investigations have reported that age-related anatomical and physiological differences, along with lower body weight, may predispose children to higher risks of bleeding and other complications following tonsillectomy [8]. Large population-based pediatric studies have also shown increased rates of emergency department visits, postoperative hemorrhage, and dehydration-related

morbidity among younger patients [11,12]. Nevertheless, longitudinal cohort studies indicate that despite these early postoperative challenges, younger children often experience substantial improvement in symptoms and overall health status during follow-up, supporting the long-term benefits of tonsillectomy in this age group [10].

## Generalizability

The findings of this study apply to similar tertiary-care settings where the dissection and snare method remains the standard approach for tonsillectomy. The patient profile, indications, and postoperative care practices reflect routine clinical scenarios encountered in many ENT units, supporting broader relevance. However, the sample size was modest, and the age range was restricted to 8–30 years, which may limit extrapolation to very young children or older adults. With comparable surgical expertise and perioperative protocols, the results can be cautiously generalized to similar healthcare environments.

## Conclusion

The study demonstrates that tonsillectomy continues to be a generally safe procedure, although early and delayed complications remain clinically significant. Oropharyngeal pain and uvular edema accounted for most early events, while secondary hemorrhage represented the principal delayed issue. Younger patients experienced higher complication rates, highlighting their greater postoperative vulnerability. No meaningful association was found between gender or tonsillar grade and postoperative morbidity. Overall, the patterns observed align with established evidence and reinforce the importance of meticulous surgical technique, structured postoperative monitoring, and targeted counselling for high-risk groups. Strengthening perioperative protocols may further enhance patient safety and improve recovery outcomes following tonsillectomy.

## Limitations

The study was limited by its relatively small sample size, which restricts the strength of subgroup comparisons. The age range of 8–30 years excludes younger children and older adults, reducing applicability to those groups. Complications were assessed only in patients undergoing the dissection and snare technique, limiting comparison with other surgical methods. Follow-up relied on scheduled visits, creating the possibility of underreporting minor



delayed events. Single-center data also restricts the broader representation of diverse clinical settings.

### Recommendations

Strengthening perioperative protocols is essential to reduce postoperative morbidity following tonsillectomy. Preoperative counselling should focus on younger patients, who experience higher complication rates. Ensuring meticulous surgical technique, effective hemostasis, and gentle tissue handling can lower reactionary bleeding and early discomfort. Standardised postoperative analgesic regimens, adequate hydration, and clear guidance on diet and activity support smoother recovery. Early follow-up within the first postoperative week enhances detection of secondary hemorrhage and infection. Continuous auditing of surgical outcomes, along with regular team training, supports quality improvement. Implementing structured post-discharge instructions for caregivers further enhances patient safety and overall recovery.

### Acknowledgements

The authors express sincere gratitude to the Department of ENT, Mahatma Gandhi Memorial Hospital, Warangal, for providing the clinical facilities and continuous support throughout the study. Appreciation is extended to all participating patients and their families for their cooperation during follow-up. The contributions of the surgical, anaesthesia, and nursing teams are deeply acknowledged for ensuring safe perioperative care. The guidance of senior faculty members and the assistance of data management staff played a valuable role in completing this research successfully.

### Abbreviations

DNE – Diagnostic Nasal Endoscopy  
PTH – Post-tonsillectomy Hemorrhage  
PT – Prothrombin Time  
APTT – Activated Partial Thromboplastin Time  
INR – International Normalized Ratio  
LA – Local Anaesthesia  
GA – General Anaesthesia  
ED – Emergency Department  
EAC – External Auditory Canal  
TM – Tympanic Membrane  
TMJ – Temporomandibular Joint  
BT – Bleeding Time  
CT – Clotting Time  
TXA – Tranexamic Acid

### Source of funding

The study had no funding.

### Conflicts of interest

The author declares no conflict of interest.

### Data availability

Data Available on request

### Author's contribution

**SP**-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **KS**-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript, revision of the manuscript. **LN**-Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation.

### Author Biography

**Dr. Sanjay Pathlavath** completed both his MBBS and MS (Otorhinolaryngology) at Kakatiya Medical College, Warangal, under Dr. NTR University of Health Sciences, Vijayawada, Andhra Pradesh. Before joining regular government service, he worked as a **Civil Assistant Surgeon on a contract basis at Area Hospital, Nagarkarnul**. He later served as a **Civil Assistant Surgeon at the Government Primary Health Centre, Gangapur**, for three years. After completing his postgraduate training, he worked as an **Assistant Professor of ENT at Government Medical College and Hospital, Suryapet**, for four years. He is currently serving as an **Associate Professor, Department of ENT, Government Medical College and Hospital, Nalgonda, Telangana**. His professional interests include clinical otology, rhinology, and optimizing surgical outcomes in ENT practice. **ORCID ID:** <https://orcid.org/0009-0002-4916-7517>

**Dr. Kavya S** completed her MBBS from Pushpagiri Medical College, Thiruvalla, Kerala (Batch 2013), graduating in 2018 and completing her compulsory internship in 2019. She pursued her MS in Otorhinolaryngology at Kakatiya Medical College, Warangal, Telangana (Batch 2021), completing the program in 2025. She is currently serving as a Senior Resident in the Department of ENT at Government Medical College, Nalgonda. Her academic interests include outcomes of



tonsillectomy, upper airway disorders, and clinical research in ENT. She is committed to evidence-based practice and patient-focused otorhinolaryngology care.

**Dr. Lavuri Nagaraju** is a Senior Resident in the Department of ENT at Government General Hospital and Government Medical College, Nalgonda. He completed his MBBS from Osmania Medical College, Koti, Hyderabad (Batch 2014; passed out in 2020). He pursued his postgraduate training in Otorhinolaryngology at Kakatiya Medical College, Warangal (Batch 2021), completing his MS (ENT) in April 2025. His clinical interests include otology, airway disorders, and postoperative outcomes in ENT surgeries. He is committed to evidence-based practice and ongoing academic contribution within the specialty.

## References

1. Odhagen E, Alm F, Axelsson S, Hemlin C, Nerfeldt P, Stalfors J, et al. Long-term complications after tonsil surgery: an analysis of 54,462 patients from the Swedish Quality Register for Tonsil Surgery. *Front Surg.* 2023 Dec 12;10:1304471. doi: 10.3389/fsurg.2023.1304471. PMID: 38148748; PMCID: PMC10749945. <https://doi.org/10.3389/fsurg.2023.1304471>
2. Panarese A, Clarke RW, Yardley MP. Early post-operative morbidity following tonsillectomy in children: implications for day surgery. *J Laryngol Otol.* 1999 Dec;113(12):1089-91. doi: 10.1017/S0022215100157962. PMID: 10767922. <https://doi.org/10.1017/S0022215100157962>
3. Lao BK, Kain ZN, Khoury D, Jenkins BN, Prager J, Stevenson RS, et al. A comprehensive examination of the immediate recovery of children following tonsillectomy and adenoidectomy. *Int J Pediatr Otorhinolaryngol.* 2020 Aug;135:110106. doi: 10.1016/j.ijporl.2020.110106. Epub 2020 May 11. PMID: 32422367; PMCID: PMC7308207. <https://doi.org/10.1016/j.ijporl.2020.110106>
4. Freburg-Hoffmeister DL, Hardeman JH, Dolwick MF, Widmer CG. Evaluation of Early Postoperative Complications Following Tracheotomy. *J Oral Maxillofac Surg.* 2017 Dec;75(12):2701-2706. doi: 10.1016/j.joms.2017.05.009. Epub 2017 May 24. PMID: 28627359. <https://doi.org/10.1016/j.joms.2017.05.009>
5. Stuck BA, Götte K, Windfuhr JP, Genzwürker H, Schroten H, Tenenbaum T. Tonsillectomy in children. *Dtsch Arztebl Int.* 2008 Dec;105(49):852-60; quiz 860-1. doi: 10.3238/arztebl.2008.0852. Epub 2008 Dec 5. PMID: 19561812; PMCID: PMC2689639.
6. Sampaio AL, Pinheiro TG, Furtado PL, Araújo MF, Oliveira CA. Evaluation of early postoperative morbidity in pediatric tonsillectomy with the use of sucralfate. *Int J Pediatr Otorhinolaryngol.* 2007 Apr;71(4):645-51. doi: 10.1016/j.ijporl.2006.12.016. Epub 2007 Feb 2. PMID: 17275926. <https://doi.org/10.1016/j.ijporl.2006.12.016>
7. Zagólski O, Gajda M, Stręk P, Kozłowski MJ, Gądek A, Nyzio J. Adult tonsillectomy: postoperative pain depends on indications. *Braz J Otorhinolaryngol.* 2016 Sep-Oct;82(5):589-95. doi: 10.1016/j.bjorl.2015.11.010. Epub 2016 Feb 16. PMID: 26948105; PMCID: PMC9444663. <https://doi.org/10.1016/j.bjorl.2015.11.010>
8. Lawlor CM, Riley CA, Carter JM, Rodriguez KH. Association Between Age and Weight as Risk Factors for Complication After Tonsillectomy in Healthy Children. *JAMA Otolaryngol Head Neck Surg.* 2018 May 1;144(5):399-405. doi: 10.1001/jamaoto.2017.3431. PMID: 29543971; PMCID: PMC5876815. <https://doi.org/10.1001/jamaoto.2017.3431>
9. Mohammadpour-Maleki A, Rasouljan B. Post-tonsillectomy Hemorrhage: A Seven-year Retrospective Study. *Iran J Otorhinolaryngol.* 2021 Sep;33(118):311-318. doi: 10.22038/ijorl.2021.54962.2882. PMID: 34692578; PMCID: PMC8507943.
10. Stefan L, Ericsson E. Health Benefits in a Cohort of Children 6 Months After Tonsil Surgery in Relation to the Perioperative Period: An Observational Prospective Cohort Study. *Health Sci Rep.* 2025 Jan 26;8(1):e70364. doi: 10.1002/hsr2.70364. PMID: 39877870; PMCID: PMC11773157. <https://doi.org/10.1002/hsr2.70364>
11. Anwaegbu OS, Clark DES, Iyamah SO, Ezenwukwa C, Etufugh UL, McKinnon BJ. Trends in postoperative complications following pediatric tonsillectomy & adenoidectomy: A 10-year analysis. *Am J Otolaryngol.* 2025 Sep-



**Student's Journal of Health Research Africa**  
**e-ISSN: 2709-9997, p-ISSN: 3006-1059**  
**Vol.6 No. 12 (2025): December 2025 Issue**  
**<https://doi.org/10.51168/sjhrafrica.v6i12.2264>**  
**Original Article**

Oct;46(5):104712. doi:  
10.1016/j.amjoto.2025.104712. Epub 2025 Jul 22.  
PMID: 40752357.  
<https://doi.org/10.1016/j.amjoto.2025.104712>

12. Francis DO, Fonnesbeck C, Sathe N, McPheeters M, Krishnaswami S, Chinnadurai S. Postoperative

Bleeding and Associated Utilization following Tonsillectomy in Children. Otolaryngol Head Neck Surg. 2017 Mar;156(3):442-455. doi: 10.1177/0194599816683915. Epub 2017 Jan 17. PMID: 28094660; PMCID: PMC5639328. <https://doi.org/10.1177/0194599816683915>

**PUBLISHER DETAILS:**

**Student's Journal of Health Research (SJHR)**  
**(ISSN 2709-9997) Online**  
**(ISSN 3006-1059) Print**  
**Category: Non-Governmental & Non-profit Organization**  
**Email: [studentsjournal2020@gmail.com](mailto:studentsjournal2020@gmail.com)**  
**WhatsApp: +256 775 434 261**  
**Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa**

