

Trends in Adenotonsillectomy and Myringotomy Before, During, and After the COVID-19 Pandemic

ORIGINAL ARTICLE
BALKAN ORL-HNS 2025;2(3):59-63

ABSTRACT

Background: Adenotonsillectomy and myringotomy are common otorhinolaryngological procedures, primarily performed in children and young adults. The COVID-19 pandemic disrupted healthcare systems worldwide, affecting the frequency and distribution of these surgeries.

Methods: To investigate trends in adenotonsillectomies, myringotomies, and ventilation tube insertions over a 5-year period, including the pre-pandemic, pandemic, and post-pandemic stages, at the University Hospital Center in Zagreb, Croatia. A retrospective cohort study reviewing the records of 1340 patients was conducted. Of these, 691 patients underwent relevant surgical procedures during 3 defined periods (pre-pandemic, pandemic, and post-pandemic) and were included in the final analysis. Descriptive and comparative statistical analysis was used to assess surgical volume, age, and gender distributions across periods.

Results: Pre-pandemic, 344 procedures were conducted, decreasing to 53 during the pandemic, and rebounding to 294 post-pandemic. The average patient age increased from 11.8 years pre-pandemic to 19.66 years during the pandemic ($P = .00017$), and decreased to 9.2 years post-pandemic ($P < .00001$). Gender ratios shifted slightly, becoming more balanced during and after the pandemic. Adenotonsillectomies and tonsillectomies were the most performed procedures pre- and post-pandemic, with a significant reduction during the pandemic. Myringotomies with ventilation tube insertions followed a similar trend but showed slower recovery post-pandemic.

Conclusion: The COVID-19 pandemic led to a reduction in otolaryngological surgeries in children and young adults, a temporary rise in patient age, and a shift in gender distribution. While surgical volumes have largely returned to pre-pandemic levels, some procedures remain below baseline. These findings underscore the pandemic's lasting impact on elective surgical care and the importance of planning in healthcare systems.

Keywords: Adenotonsillectomy, COVID, myringotomy, pandemic, tonsillectomy

Introduction

Adenotonsillectomy and adenoidectomy are among the most frequently performed otorhinolaryngological surgeries, particularly in children and young adults.¹ The prevalence of chronic and recurrent tonsillitis and adenotonsillitis serves as primary indications for tonsillectomy and adenotonsillectomy, which may be performed as standalone procedures or combined with other surgical interventions.² Studies have shown that adenotonsillectomy significantly reduces the frequency of upper respiratory infections and improves sleep quality in children with obstructive sleep apnea or chronic tonsillitis.^{3,4}

Nia Labaš¹ 

Ante Obrovac² 

Tomislav Baudoin³ 

¹Department of Otorhinolaryngology and Head and Neck Surgery, Sisters of Charity Hospital, Zagreb, Croatia

²General and Croatian Veterans Hospital Pakrac, Pakrac, Croatia

³Department of Otorhinolaryngology and Head and Neck Surgery, University Hospital Center Sestre Milosrdnice, Zagreb, Croatia

Corresponding author:

Nia Labaš

✉ nialabas1@gmail.com

Received: January 28, 2025

Revision Requested: July 2, 2025

Last Revision Received: July 31, 2025

Accepted: September 2, 2025

Publication Date: September 30, 2025

Cite this article as: Labaš N, Obrovac A, Baudoin T. Trends in adenotonsillectomy and myringotomy before, during, and after the COVID-19 pandemic. *Balkan ORL-HNS* 2025;2(3):59-63.

DOI: 10.5152/bohns.2025.25067



Copyright © Author(s) - Available online at <https://balkanorl-hns.org/EN>.
Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Myringotomy with tube insertion (also known as grommets) is a common procedure in children to treat persistent otitis media (OM) with effusion and recurrent ear infections. The procedure is often combined with adenoidectomy or adenotonsillectomy, and sometimes only 1 ear is affected. It involves making a small incision in the eardrum to drain fluid and inserting a tube to prevent further fluid buildup and improve hearing.⁵ This procedure is a widely used intervention for managing OM with effusion and recurrent ear infections, conditions that can lead to hearing loss and speech delays if untreated.⁶ The benefits of these procedures extend beyond physical health, contributing to better cognitive and social development in children.⁷

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), began in December 2019 in Wuhan, China, and quickly spread globally. On March 11, 2020, the World Health Organization declared the outbreak a global pandemic.⁸ In Croatia, the first confirmed case was reported on February 25, 2020. The country responded with a series of public health measures, including lockdowns, travel restrictions, and social distancing, aimed at controlling the spread of the virus.⁹

The pandemic significantly impacted healthcare systems worldwide, including in Croatia, leading to delays in elective surgeries, outpatient visits, and other non-urgent medical procedures. Throughout the pandemic, the healthcare system faced various challenges due to the need for resources to manage COVID-19 patients, while non-urgent medical care, including pediatric surgeries, was postponed or reduced.

The pandemic has had profound effects on both the timing and volume of medical procedures performed in various specialties, including pediatric otolaryngology.¹⁰

The study aimed to investigate the impact of the COVID-19 pandemic on the frequency of adenoid and tonsil surgeries, myringotomies, and ventilation tube insertions at the Clinic for Otorhinolaryngology and Head and Neck Surgery at the University Hospital Center "Sestre milosrdnice," one of the largest hospitals in Croatia, and the distribution by age and gender.

Material and Methods

This retrospective cohort study included a total of 1340 patient records at the Clinic for Otorhinolaryngology and Head and Neck

Surgery at one of the University Hospitals in Croatia over a 5-year period from 2018 to 2022. Among these, 691 patients underwent one or more relevant surgical procedures within the defined 3 study periods and were included in the final analysis.

Data was collected from the BIS hospitals information system (BIS; "Bolnički informatički sustav" in Croatian) by reviewing the surgical protocols and patient medical histories. This retrospective, non-interventional study was approved by the Ethics Committee of the University Hospital on March 11, 2025 (approval no.: EP-18437/23-10), and all collected data were anonymized. All patients undergoing surgical procedures had signed a general informed consent at hospital admission, which included consent for the use of anonymized medical data for research purposes. The study was compiled according to STROBE (Strengthening the Reporting of Observational Studies in Epidemiology guidelines) recommendations. Then, the 5-year period was divided into 3 stages: the pre-pandemic stage, the pandemic stage, and the post-pandemic stage, each with an equal duration of 11 months. Although data were available for the full 5-year period (January 2018 to December 2022), 3 11-month periods were selected for analysis to ensure temporal comparability across the pre-pandemic, pandemic, and post-pandemic stages. The remaining months were excluded from statistical comparison due to varying healthcare policy phases and seasonal variability. All patients of all age groups who underwent one or more of the predefined otorhinolaryngological procedures—adenoidectomy (V), tonsillectomy (T), and adenotonsillectomy (TV), tonsillotomy and adenoidectomy with or without CO₂ laser (Ttomy+V), tonsillotomy with or without CO₂ laser (Ttomy), revision of the operation (R), tonsillectomy a chaud (T a chaud), myringotomy (unilateral or bilateral) with or without the implantation of ventilation tubes—during the selected study periods were included in the analysis. Only surgeries performed at the Department of Otorhinolaryngology and Head and Neck Surgery during the 3 defined 11-month intervals representing the pre-pandemic, pandemic, and post-pandemic stages were considered eligible for inclusion.

Patients were excluded from the study if the procedure was performed outside these defined timeframes, if the surgery was conducted at another medical institution, or if relevant parts of the medical documentation—such as operative reports or patient history—were incomplete or missing.

Data were obtained from the BIS hospital information system using standardized surgical procedure codes. Each case was manually reviewed to confirm that it met the inclusion criteria before being entered into the study database.

The extracted data included the date of the procedure, procedure description, procedure duration, age, and gender. The surgical procedures for each patient were reviewed and categorized. Descriptive statistical analysis was used to compare subsets of patients from the pre-pandemic stage, the pandemic stage, and post-pandemic stage using Microsoft Excel (2020 Microsoft Corporation). Age distributions across the 3 study periods were compared using independent samples *t*-tests. Statistical significance was set at *P* < .05. Analyses were performed using Microsoft Excel. Mean values and SDs were calculated for each period to assess the observed differences.

Results

In these 3 periods, a total of 691 unique patients underwent surgical procedures. Specifically, 344 patients were operated on in

MAIN POINTS

- Otorhinolaryngological surgeries commonly performed in children and young adults decreased by 84.6% during the COVID-19 pandemic, reflecting a global decline in elective procedures.
- The average patient age rose from 11.8 to 19.66 years during the pandemic due to postponed surgeries in older individuals, then dropped to 9.2 years post pandemic.
- Adenotonsillectomy rates returned to near pre-pandemic levels post-COVID, while ventilation tube insertions recovered more slowly.
- These trends highlight the lasting impact of the pandemic on surgical care and the need to safeguard timely access to essential procedures.

the pre-pandemic period, 53 during the pandemic, and 294 in the post-pandemic period. Each patient underwent 1 surgical procedure within the observed interval. Before the COVID-19 pandemic (pre-COVID), the mean age was 11.85 years (SD=10.90). During the pandemic period, the mean age increased significantly to 19.99 years (SD=14.19; $P=.00017$ compared to pre-pandemic). After the pandemic (post-COVID), the mean age decreased again to 9.21 years (SD=9.79), which was significantly lower compared to the pandemic period ($P < .00001$) and also differed significantly from the pre-pandemic period ($P=.0013$).

The male-to-female ratio of patients undergoing the procedures showed some variation over the 3 periods studied. Before the COVID-19 pandemic (pre-COVID), the ratio was skewed towards males, with 56.7% male patients and 43.4% female patients. During the COVID-19 period, the distribution became more balanced, with males making up 51% and females 49%. After the COVID-19 period (post-COVID), the ratio remained almost equal, with 50.7% male and 49.3% female patients (Figure 1).

In the pre-COVID period, a total of 344 surgeries were performed. The majority of procedures consisted of 123 TV, and 110 T. Adenoidectomies were performed in 94 cases. Additionally, 12 tonsillotomies were conducted, some involving CO₂ laser. There were also 5 revision surgeries (Revisio) (see Figure 2). In terms of myringotomies, 61 procedures were performed, with 39 bilateral and 14 unilateral cases involving the placement of ventilation tubes, while the 8 cases were simple myringotomies without tubes. In the COVID period, a total of 53 surgeries were performed. Tonsillectomies were the most frequent procedure, followed by 11 adenoidectomies. Adenotonsillectomies were performed in 9 cases. Tonsillotomies and revision surgeries (Revisio) were not performed during the COVID period. For myringotomies, there were 4 bilateral and only 1 unilateral case with ventilation tube insertion, while the simple myringotomies without tube insertion weren't performed. During the post-COVID period, a total of 294 surgeries were carried out. The predominant procedures included 103 adenotonsillectomies, and 106 adenoidectomies. Tonsillectomies were performed in 56 cases. Furthermore, 11 tonsillotomies were performed, some involving CO₂ laser. There was also 1 revision surgery (Revisio). Regarding myringotomies, a total

of 42 procedures were carried out, with 26 bilateral and 7 unilateral placements of ventilation tubes, while the rest were simple myringotomies without tube insertion (Figures 1 and 3).

Discussion

This study analyzed trends in pediatric otolaryngological surgeries during the pre-pandemic, pandemic, and post-pandemic periods, highlighting how the COVID-19 pandemic significantly influenced surgical practice. These findings are consistent with global trends and add to the growing body of literature examining the pandemic's impact on healthcare services.

The dramatic decrease in surgical volume during the COVID-19 period observed in this study aligns with findings by Heward et al¹¹ (2020), who noted that concerns about COVID-19 transmission led to hesitancy among parents in seeking surgical interventions for their children. In this cohort, surgeries decreased by 84.6% during the pandemic, reflecting similar global reductions in elective surgical procedures due to restrictions, resource reallocation, and parental reluctance.¹¹

Windfuhr and Günster (2022) reported a substantial decrease in all types of tonsil surgeries during Germany's first COVID-19 lockdown, with cases dropping from 556 to 111 per week. This reduction was accompanied by a 33.4% decrease in outpatient visits for sore throat complaints, indicating fewer consultations for conditions typically leading to surgery. The sustained lower surgical activity post-lockdown highlights the impact of pandemic-related restrictions on healthcare delivery. These findings align with the current study, reinforcing the global trend of reduced elective surgeries during the pandemic.¹²

Recent studies have investigated the impact of the COVID-19 pandemic on the incidence of pediatric OM and related surgical interventions. Allen et al¹³ (2022) conducted a study revealing a significant decrease in OM diagnoses and myringotomy tube placements during the pandemic. This decline was attributed to reduced transmission of respiratory pathogens due to public health measures such as social distancing and mask-wearing.¹³

Similarly, Hullegie et al¹⁴ (2021) reported a substantial reduction in OM cases among children in the Netherlands during the pandemic, with

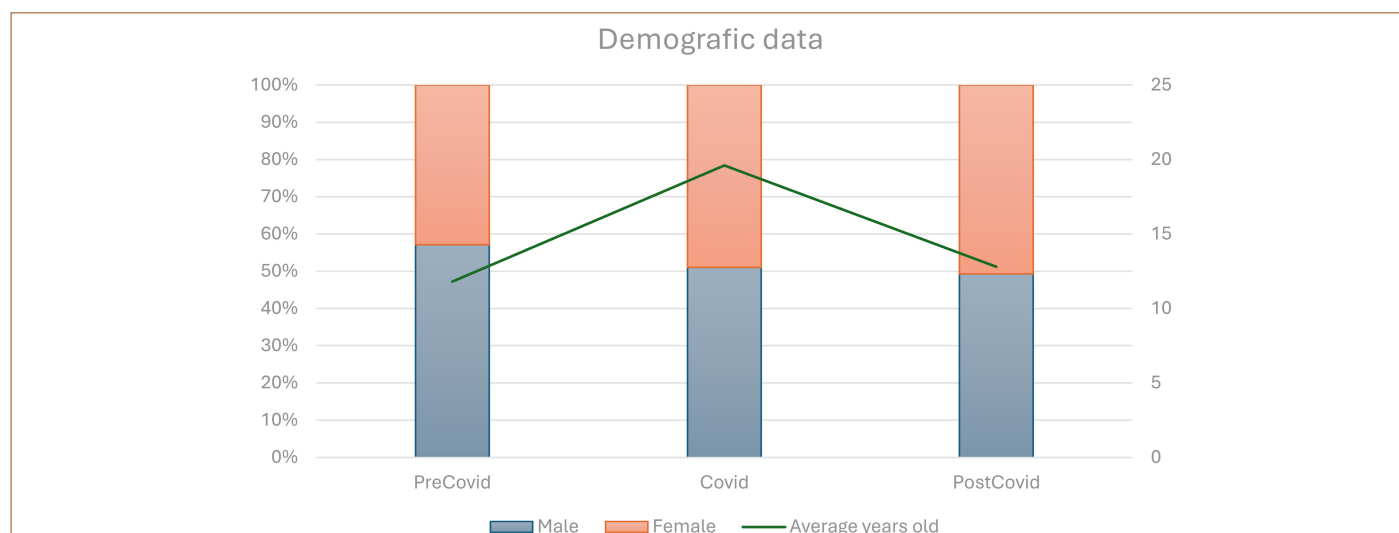
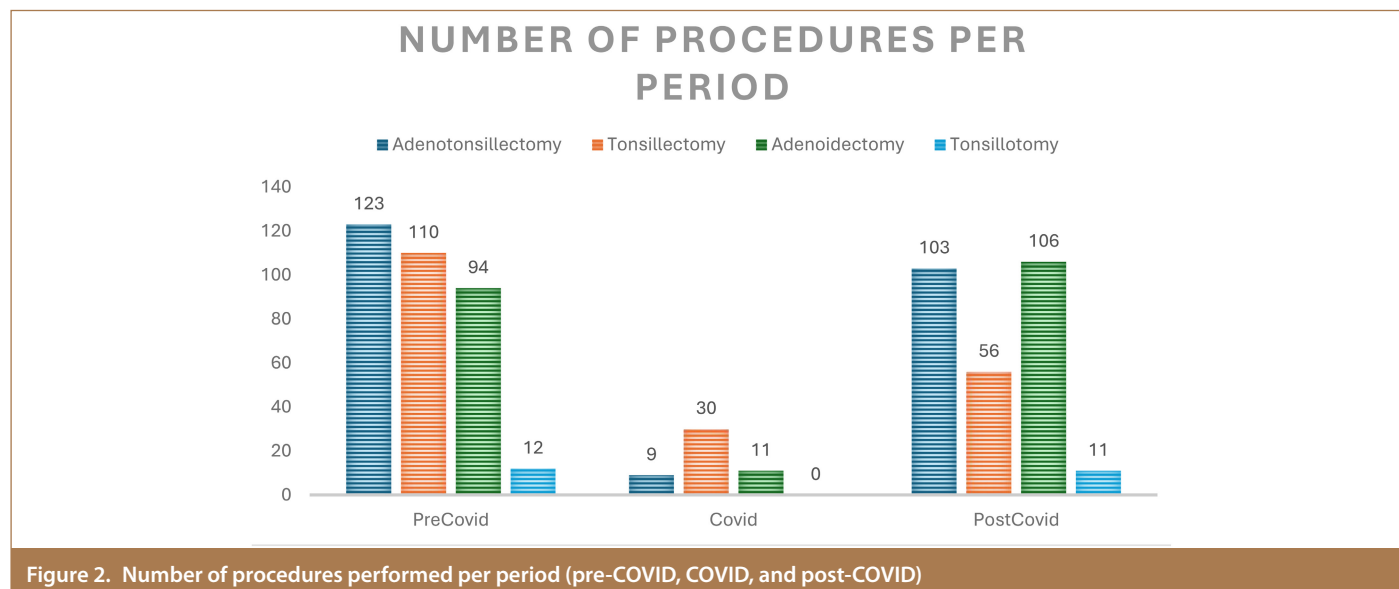


Figure 1. Demographic distribution of patients by sex and age across pre-COVID, COVID, and post-COVID periods.

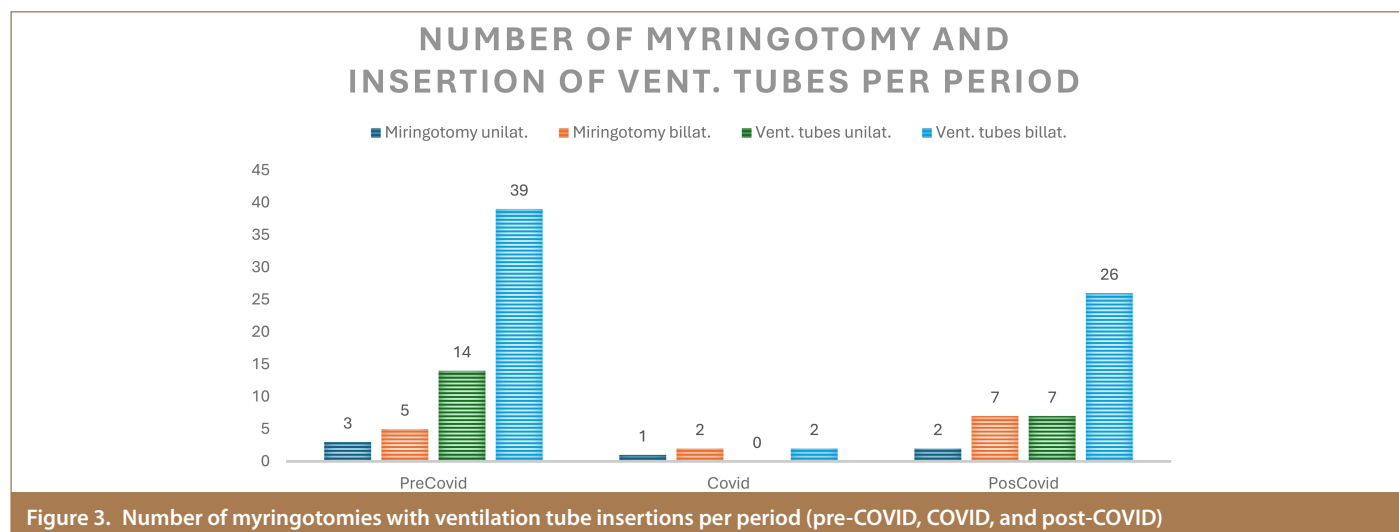


a corresponding decrease in antibiotic prescriptions. They suggested that the decline in upper respiratory tract infections, resulting from COVID-19 mitigation strategies, contributed to this trend.¹⁴ These findings align with the current study's observation of decreased surgical procedures for OM during the pandemic period. The reduction in OM incidence likely led to fewer cases requiring surgical intervention, such as myringotomy with ventilation tube insertion. In addition to access limitations and postponed elective procedures, the decrease in surgical volume during the pandemic may also be attributed to a genuine reduction in otorhinolaryngology (ENT) morbidity. Several population-level studies have shown that public health measures implemented to limit the spread of COVID-19—such as mask-wearing, social distancing, school closures, and improved hygiene—led to a significant decline in upper respiratory tract infections among children. These factors likely contributed to a reduced number of referrals for surgical intervention. For example, Weinberger et al¹⁵ (2022) reported a marked reduction in pediatric ENT visits and respiratory illness incidence during lockdown periods, while Hullege et al¹⁴ (2021) observed a nationwide drop in ENT-related infections and antibiotic prescriptions in the Netherlands.

The current data showed a statistically significant increase in the mean patient age during the COVID-19 period (from 11.85 to 19.99 years; $P=.00017$), followed by a significant decrease in the post-pandemic period to 9.21 years ($P<.00001$). A significant difference was also observed between the pre- and post-pandemic periods ($P=.0013$).

This trend likely reflects postponed interventions in adolescents and young adults during the pandemic, when elective procedures were limited and priority was given to urgent cases. Once restrictions were lifted, the surgical focus returned to conditions predominantly affecting younger children, such as adenoid hypertrophy and recurrent OM.

Unlike studies such as the 1 conducted in Taiwan, which reported no statistically significant changes in the average age of pediatric surgical patients during the pandemic (Front Pediatr. 2024), the current study likely observed this difference because the cohort included both pediatric and adult patients.¹⁶ The inclusion of adult patients, who may have experienced delayed care due to resource reallocation during the pandemic, contributed to the temporary increase in the



average age during the COVID period. The post-pandemic decrease suggests a return to addressing conditions predominantly affecting younger children, such as adenoid hypertrophy and recurrent OM.

In the post-pandemic period, adenotonsillectomy rates nearly returned to pre-pandemic levels, mirroring the resurgence of upper respiratory infections as public health restrictions were lifted. However, the slower recovery of ventilation tube insertions may indicate a shift in treatment paradigms or a residual backlog of cases.

This study has several limitations. First, the retrospective design and reliance on data from a single institution may limit the generalizability. Second, while we categorized surgical procedures were categorized and their trends were analyzed over the 3 periods, detailed data was not collected on the exact symptomatology that led patients to surgery. This prevents from assessing whether the clinical indications or presenting symptoms for surgical intervention changed during the pre-pandemic, pandemic, and post-pandemic periods. Finally, the absence of long-term follow-up data restricts the ability to evaluate the outcomes of delayed surgical interventions.

The COVID-19 pandemic disrupted the number and types of otolaryngological surgeries, with a significant decrease in procedures and a temporary rise in the average age of patients during the pandemic. Post-pandemic data show a return to treating younger children, but some procedures have not yet reached pre-pandemic levels. These results highlight the lasting effects of the pandemic and the need to ensure access to essential surgical care in future crises.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Artificial Intelligence (AI) Use Declaration: The authors declared that no artificial intelligence (AI) tools were used in the generation, writing, or editing of this manuscript, and all content was produced solely by the authors.

Ethics Committee Approval: This study was approved by the Ethics Committee of University Hospital (Approval No.: EP-18437/23-10; Date: March 11 2025).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Acknowledgments: The authors would like to thank all medical staff and administrative personnel who assisted in the retrieval and anonymization of patient data.

Author Contributions: Concept – N.L., A.O., T.B.; Design – N.L., A.O., T.B.; Supervision – N.L., A.O., T.B.; Resources – N.L., A.O., T.B.; Materials – N.L., A.O., T.B.; Data Collection and/or Processing – N.L., A.O., T.B.; Analysis and/or Interpretation – N.L., A.O., T.B.; Literature Search – N.L., A.O., T.B.; Writing Manuscript – N.L., A.O., T.B.; Critical Review – N.L., A.O., T.B.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support.

References

1. Murto KTT, Katz SL, McIsaac DI, Bromwich MA, Vaillancourt R, van Walraven C. Pediatric tonsillectomy is a resource-intensive procedure: a study of Canadian health administrative data. *Can J Anaesth*. 2017;64(7):724-735. [\[CrossRef\]](#)
2. Alzahrani ES, Aseeri IA, Alzahrani WJ, Alharthi MS, Qattan FM, Khan M. The indications of tonsillectomy among pediatric patients: our nine-year retrospective review. *Cureus*. 2023;15(12):e50638. [\[CrossRef\]](#)
3. Mitchell RB, Archer SM, Ishman SL, et al. Clinical practice guideline: tonsillectomy in children (update)—executive summary. *Otolaryngol Head Neck Surg*. 2019;160(2):187-205. [\[CrossRef\]](#)
4. Baugh RF, Archer SM, Mitchell RB, et al. Clinical practice guideline: tonsillectomy in children. *Otolaryngol Head Neck Surg*. 2011;144(1)(suppl):S1-S30. [\[CrossRef\]](#)
5. Rosenfeld RM, Culpepper L, Doyle KJ, et al. Clinical practice guideline: otitis media with effusion. *Otolaryngol Head Neck Surg*. 2004;130(5)(suppl):S95-S118. [\[CrossRef\]](#)
6. Rosenfeld RM, Schwartz SR, Pynnonen MA, et al. Clinical practice guideline: tympanostomy tubes in children. *Otolaryngol Head Neck Surg*. 2013;149(1)(suppl):S1-S35. [\[CrossRef\]](#)
7. Alenezi EMA, Robinson M, McKinnon EJ, et al. Impact of ventilation tube insertion on long-term language outcomes at 6 and 10 years of age: a prospective pregnancy cohort study. *Clin Otolaryngol*. 2024;49(2):191-198. [\[CrossRef\]](#)
8. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727-733. [\[CrossRef\]](#)
9. Government of the Republic of Croatia. Croatia braces for COVID-19 as first case is confirmed; Published 2020. Available at: <https://vlada.gov.hr/news/croatia-braces-for-covid-19-as-first-case-is-confirmed/28860>. Accessed June 13, 2025.
10. Bašković M, Čizmić A, Bastić M, Župančić B. The impact of the COVID-19 pandemic on the most common diagnoses in pediatric surgery: abdominal pain, acute scrotum, upper and lower extremity injuries—tertiary center experience. *Turk Arch Pediatr*. 2022;57(1):38-45. [\[CrossRef\]](#)
11. Heward E, Rocke J, Kumar N, Izzat S. Recurrent tonsillitis and parental perceptions of tonsillectomy during the COVID-19 pandemic. *Int J Pediatr Otorhinolaryngol*. 2020;139:110463. [\[CrossRef\]](#)
12. Windfuhr JP, Günster C. Impact of the COVID-pandemic on the incidence of tonsil surgery and sore throat in Germany. *Eur Arch Otorhinolaryngol*. 2022;279(8):4157-4166. [\[CrossRef\]](#)
13. Allen DZ, Challapalli S, McKee S, et al. Impact of COVID-19 on nationwide pediatric otolaryngology: otitis media and myringotomy tube trends. *Am J Otolaryngol*. 2022;43(2):103369. [\[CrossRef\]](#)
14. Hulleger S, Schilder AGM, Marchisio P, et al. A strong decline in the incidence of childhood otitis media during the COVID-19 pandemic in the Netherlands. *Front Cell Infect Microbiol*. 2021;11:768377. [\[CrossRef\]](#)
15. Weinberger JM, Hayes KL, Tumin D, King L, Simon HK. Pediatric otitis media in the COVID-19 era. *Pediatrics*. 2022;149(3):e2021052197. [\[CrossRef\]](#)
16. Huang SY, Chou CM, Chen HC. Impact of COVID-19 on pediatric surgical practice in Taiwan: a comprehensive analysis. *Front Pediatr*. 2024;12:1354576. [\[CrossRef\]](#)