The Impact of Public Health Measures During the COVID-19 Pandemic on the Incidence and Characteristics of Pediatric Neck Abscesses

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SUMMARY

This retrospective study evaluated differences in the incidence, clinical characteristics, and management of pediatric neck abscesses requiring surgical intervention across the COVID-19 pre-pandemic, pandemic, and post-pandemic periods.

Data were collected from 54 pediatric patients surgically treated for neck abscesses at a tertiary center between 2016 and 2022. The patients were grouped by treatment period. Analyzed variables included age, abscess location, surgical approach, microbiological findings, and antibiotic use. Incidence rates were standardized per month.

No surgically treated peritonsillar abscesses were recorded during the pandemic, marking a significant decrease in incidence compared with the pre-pandemic period ($P = 0.0386$), which increased post-pandemic ($P = 0.0201$). During the pandemic, parapharyngeal and lateral cervical abscesses predominated, and mean patient age was markedly lower (1.95 years; $P = 0.0095$), with a significant shift toward a transcervical surgical approach ($P = 0.0336$; $P = 0.0109$). *Streptococcus pyogenes* isolation decreased during the pandemic, while *Staphylococcus aureus* isolation increased. Combination antibiotic therapy was used more frequently during the pandemic ($P = 0.0112$). Ceftriaxone — alone or combined with clindamycin — was the most used antibiotic.

The COVID-19 pandemic was associated with a lower patient age, increased reliance on conservative treatment, and changes in surgical approach.

KEYWORDS

Neck abscess; Pediatrics; COVID-19 pandemic; Incidence; Management

Introduction

The COVID-19 pandemic has significantly affected the immunology of the general population and the distribution of infectious diseases, largely due to widespread public health interventions, such as mandatory mask-wearing, social distancing, school and daycare closures, and the restructuring of healthcare services. Although essential for infection control, these measures also impacted the incidence, presentation, and management of pediatric neck infections[1,2].

Pediatric neck abscesses commonly arise as complications of upper respiratory tract infections and progress through suppurative lymphadenitis. These infections tend to follow a more rapid and aggressive course in children due to anatomical and immunological factors. If not promptly identified and treated, they can spread through cervical fascial planes into deep neck spaces, potentially leading to life-threatening complications, such as airway obstruction, mediastinitis, or sepsis[3,4].

The clinical presentation of pediatric deep neck infections depends on both the child's age and the anatomical location of the abscess. These infections typically occur following the symptoms of an upper respiratory tract infection, with or without fever, and are followed by localized signs, such as neck swelling, trismus, odynophagia, limited neck mobility, and lymphadenopathy[3,5]. In infants and younger children, diagnosis is particularly challenging due to their limited ability to express subjective symptoms, often resulting in misdiagnosis as a viral infection[3,6].

An accurate diagnosis of deep neck abscesses relies primarily on imaging, which enables both anatomical localization and differentiation from other soft tissue pathologies. Contrast-enhanced computed tomography (CECT) remains the gold standard due to its high sensitivity and ability to differentiate abscesses from surrounding soft tissue. Ultrasonography serves as a quick and non-invasive screening method[3,5], while magnetic resonance imaging (MRI) provides superior soft tissue contrast and is especially useful for distinguishing between abscesses, cellulitis, and lymphadenopathy, as well as for detecting complications[3].

Microbiological diagnosis is crucial for targeted antibiotic therapy. The most reliable specimens are obtained through surgical drainage or needle aspiration, since throat swabs and post-drainage samples are frequently contaminated by oral flora[3]. The most commonly reported pathogens include the *Streptococcus* species and *Staphylococcus aureus* (*S. aureus*). Anaerobic bacteria of oral origin, such as *Fusobacterium* spp. and *Peptostreptococcus* spp., have also been reported in the literature[3,7,8].

Surgical treatment typically involves incision and drainage. A transoral approach is standard for peritonsillar, retropharyngeal, and parapharyngeal abscesses. A transcervical approach is indicated when parapharyngeal abscesses are only partially visible in the pharynx, in complicated retropharyngeal abscesses, or when the infection involves more than two neck compartments. Lateral neck abscesses and submandibular abscesses require a transcervical approach[3,4].

Empiric antibiotic therapy should cover both aerobic and anaerobic pathogens, typically combining penicillin with a β-lactamase inhibitor such as amoxicillin–clavulanate, or using β-lactamase–resistant antibiotics like cefoxitin or carbapenems. Clindamycin or metronidazole are added for anaerobic coverage, and clindamycin is the drug of choice in penicillin-allergic patients[3–5].

Materials and methods

Study design and setting

This retrospective cohort study was conducted at the Referral Center for Pediatric Otorhinolaryngology of the Ministry of Health of the Republic of Croatia: the Department of Otorhinolaryngology & Head and Neck Surgery, Sestre milosrdnice University Hospital Center, Zagreb, Croatia. The study period spanned from January 1, 2016 to December 31, 2022.

The pre-pandemic period was intentionally defined as a longer time frame to ensure an adequate number of cases for robust baseline incidence, allowing for meaningful comparisons with the shorter pandemic and post-pandemic periods. Incidence rates were standardized per month to account for differences in observation period length, and clinical characteristics were analyzed within these defined periods to reflect potential changes in patient profiles and management practices over time.

Patient selection

The study included pediatric patients aged 0 to 18 years who underwent surgical treatment for neck abscesses. Patients who were managed exclusively with conservative therapy were not included in the analysis. Based on the timing of their treatment, the patients were divided into three groups:

- **The pre-pandemic group**: treated before March 16, 2020;
- **The pandemic group**: treated between March 16, 2020 and May 1, 2021; and
- **The post-pandemic group**: treated after May 1, 2021.

These periods were defined according to the timing of national public health restrictions and their gradual relaxation, which influenced healthcare access, referral patterns, and clinical decision-making.

Ethics

This study was approved by the institutional ethics committee of Sestre milosrdnice University Hospital Center, Zagreb, Croatia (267th meeting, June 10, 2025).

Data collection

Clinical and demographic data were extracted from patient medical records. The collected variables included patient age, sex, abscess location, surgical approach (transoral or transcervical), microbiological findings, and antibiotic therapy. Abscess localization was determined based on clinical evaluation and imaging methods, including ultrasound, contrast-enhanced computed tomography (CECT), and magnetic resonance imaging (MRI).

Microbiological specimens were obtained intraoperatively from pus samples collected during drainage. Throat swabs were excluded from analysis due to a high risk of contamination.

Antibiotic regimens were classified based on treatment modality (monotherapy vs combination therapy) and the specific antibiotic that was administered.

Statistics

Because the periods differed in duration, incidence rates were standardized per month to enable comparison across abscess types (pre-pandemic, pandemic, and post-pandemic). This approach reflects the hospital workload and resource use, rather than population-based incidence. Each abscess was counted separately by site; therefore, some patients contributed more than one event per period. Rate differences and 95% confidence intervals were calculated in MedCalc using the test-based method described by Sahai & Khurshid (1996), with *P* values obtained using the χ^2 statistic. Descriptive

Table 1. Standardized incidence rates per month for each abscess type during the pre-pandemic, pandemic, and post-pandemic periods

Abscess type	Pre-pandemic period incidence rate (n)	Pandemic period incidence rate (n)	Post-pandemic period incidence rate (n)	Comparison	Rate difference	*P* value (95% CI)
All neck abscesses	0.63/month (32)	0.44/month (6)	0.80/month (16)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	0.19	0.4229 (–0.27 to 0.65)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	0.36	0.2129 (–0.20 to 0.92)
Peritonsillar	0.32/month (16)	0.00/month (0)	0.40/month (8)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	0.32	0.0386 (0.02 to 0.62)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	0.40	0.0201 (0.06 to 0.74)
Parapharyngeal	0.22/month (11)	0.22/month (3)	0.30/month (6)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	–0.004	0.9755 (–0.29 to 0.28)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	0.08	0.6701 (–0.28 to 0.44)
Retropharyngeal	0.14/month (7)	0.00/month (0)	0.20/month (4)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	0.14	0.1713 (–0.06 to 0.34)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	0.20	0.1003 (–0.04 to 0.44)
Submandibular	0.04/month (2)	0.07/month (1)	0.00/month (0)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	–0.03	0.6033 (–0.16 to 0.10)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	–0.07	0.2235 (–0.19 to 0.05)
Submental	0.02/month (1)	0.00/month (0)	0.00/month (0)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	0.02	0.6051 (–0.06 to 0.09)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	0.00	0 (0 to 0.27)
Lateral cervical	0.04/month (2)	0.15/month (2)	0.05/month (1)	Pre-pandemic (n = 32) vs pandemic period (n = 6)	–0.11	0.1565 (–0.26 to 0.04)
				Post-pandemic (n = 16) vs pandemic period (n = 6)	–0.10	0.3518 (–0.30 to 0.11)

statistics were used to summarize patient characteristics. The Kruskal–Wallis test was performed to compare age across groups, and categorical variables were analyzed using Fisher's exact test. A P value of < 0.05 was considered statistically significant. The incidence rate analysis was conducted in MedCalc (Version 23.2.8); the Kruskal–Wallis test was performed in Python (Version 3.13); and Fisher's exact test was conducted in GraphPad Prism (Version 10.4.2).

Results

A total of 54 pediatric patients underwent surgical treatment for neck abscesses between January 1, 2016 and December 31, 2022. The patients were categorized based on treatment period: pre-pandemic, pandemic, and post-pandemic.

Incidence of neck abscesses across time periods

Incidence rates were standardized per month due to unequal observation periods. Rate differences and confidence intervals were calculated using the test-based method, with P values obtained from the χ^2 statistic (Table 1).

Overall, the incidence of peritonsillar abscesses showed a significant decrease during the pandemic period compared to the pre-pandemic period ($P = 0.0386$), and an increase in the post-pandemic period ($P = 0.0201$). During the pandemic, parapharyngeal abscesses were most common, followed by lateral cervical abscesses.

The total cohort included 29 male (53.70%) and 25 female (46.30%) patients, as summarized in Table 2.

Table 2. Sex distribution across the study periods

Period (n)	Male (n)	Female (n)
Pre-pandemic (32)	62.50% (20)	37.50% (12)
Pandemic (6)	50.00% (3)	50.00% (3)
Post-pandemic (16)	37.50% (6)	62.50% (10)
Total (54)	53.70% (29)	46.30% (25)

Age distribution

Patient age varied significantly across the study periods. The median (1.69) and mean age (1.95) were lowest during the pandemic period (Table 3).

A Kruskal–Wallis test revealed a statistically significant difference in age distribution across the three groups ($H(2) = 9.30$, $P = 0.0095$). A post hoc analysis using Dunn's test with the Bonferroni correction confirmed that the pandemic group differed significantly from both the pre-pandemic (adjusted $P = 0.01$) and post-pandemic (adjusted $P = 0.01$) groups. No significant difference was found between the pre- and post-pandemic periods (adjusted $P = 1.00$).

These findings indicate that the COVID-19 pandemic period was associated with a distinct shift in the age distribution of pediatric patients undergoing surgical treatment for neck abscesses.

Table 3. Descriptive statistics of age by time period: pre-pandemic, pandemic, and post-pandemic

Period (n)	Median (range)	Mean ± SD
Pre-pandemic (32)	5.45 (0.4–17.98)	6.07 ± 3.66
Pandemic (6)	1.69 (0.58–4.13)	1.95 ± 1.31
Post-pandemic (16)	6.46 (0.89–17.94)	6.94 ± 4.56

Surgical approach

The distribution of surgical approaches varied significantly across the study periods (Table 4). During the pandemic period, the transcervical approach was used in 83.33% of cases, compared to 25.00% in the pre-pandemic and 18.75% in the post-pandemic period. The transoral approach, predominant before (68.75%) and after (81.25%) the pandemic, was used in only 16.67% of cases during the pandemic. A combined approach was observed only in the pre-pandemic group (6.25%).

Fisher's exact test indicated a significant difference in approach distribution across periods ($P = 0.0299$). Pairwise comparisons showed that the pandemic period differed significantly from both the pre-pandemic ($P = 0.0336$) and post-pandemic ($P = 0.0109$) periods, while no difference was found between the pre- and post-pandemic periods.

The observed differences suggest a temporary shift in surgical strategy during the pandemic period.

Table 4. Distribution of surgical approaches by time period: pre-pandemic, pandemic, and post-pandemic

Surgical approach	Pre-pandemic period (n = 32)	Pandemic period (n = 6)	Post-pandemic period (n = 16)
Transoral	68.75% (n = 22)	16.67% (n = 1)	81.25% (n = 13)
Transcervical	25.00% (n = 8)	83.33% (n = 5)	18.75% (n = 3)
Combined	6.25% (n = 2)	-	-

Table 5. Distribution of microorganisms isolated from abscess swabs across the study periods

	Pre-pandemic period	Pandemic period	Post-pandemic period
Data collected from abscess swabs	75.00% (n = 24)	83.33% (n = 5)	75.00% (n = 12)
Isolated microorganisms	75.00% (n = 18)	100.00% (n = 5)	58.33% (n = 7)
One microorganism isolated	55.56% (n = 10)	80.00% (n = 4)	85.71% (n = 6)
More than one microorganism isolated	44.44% (n = 8)	20.00% (n = 1)	14.29% (n = 1)
Streptococcus pyogenes	50,00% (n = 9)	20.00% (n = 1)	57.14% (n = 4)
Staphylococcus aureus	5.56% (n = 1)	80.00% (n = 4)	-
Streptococcus viridans	22.22% (n = 4)	-	42.86% (n = 3)
Haemophilus influenzae	5.56% (n = 1)	-	14.29% (n = 1)
Peptostreptococcus	27.78% (n = 5)	-	-
Gram-negative anaerobic bacilli	16.67% (n = 3)	-	14.29% (n = 1)
Gram-positive anaerobic bacilli	-	20.00% (n = 1)	14.29% (n = 1)
β-hemolytic *streptococcus* type C	5.56% (n = 1)	-	14.29% (n = 1)
Enterococcus	5.56% (n = 1)	-	-

Microbiological findings

A comparison of the distribution of *S. aureus* and *Streptococcus pyogenes* (*S. pyogenes*) across the three study periods revealed a statistically significant difference (Fisher's exact test, $P = 0.0108$). *Staphylococcus aureus* was isolated more frequently during the pandemic period, while *S. pyogenes* predominated in the pre-pandemic and post-pandemic periods (Table 5).

In the pre-pandemic period, anaerobic bacteria were more frequently identified at the species level, including *Fusobacterium* spp. and *Bacteroides* spp. During the pandemic and post-pandemic periods, gram-positive and gram-negative bacilli were reported without further species-level identification, while other microorganisms were identified as presented in Table 5.

During the pandemic period, combination therapy predominated, while monotherapy remained the standard approach in the pre- and post-pandemic periods.

The use of monotherapy and combination antibiotic therapy differed significantly across the three periods (Table 6; Fisher's exact test, $P = 0.0211$). Only the pre-pandemic vs pandemic comparison remained significant after the Bonferroni correction ($P = 0.0112$; $\alpha = 0.0167$). The pandemic vs post-pandemic comparison showed a non-significant trend ($P = 0.0464$), while no difference was found between the pre- and post-pandemic periods ($P > 0.999$). Antibiotic therapy was predominantly administered intravenously, except for one patient in the pre-pandemic period and two in the post-pandemic period, who received oral antibiotics.

The use of ceftriaxone combined with clindamycin increased significantly during the pandemic period compared to the pre-pandemic period (Table 7; $P = 0.031$). This may indicate a greater reliance on this specific regimen in response to evolving clinical concerns and institutional protocols.

Table 6. Distribution of intravenous monotherapy and combination therapy across the pre-pandemic, pandemic, and post-pandemic period

Period	Monotherapy (n)	Combination therapy (n)
Pre-pandemic	76.92% (20)	23.08% (6)
Pandemic	16.67% (1)	83.33% (5)
Post-pandemic	73.33% (11)	26.67% (4)

Table 7. Antibiotic regimens administered during hospitalization across the study periods

Antibiotic/regimen Available data (n/N)	Pre-pandemic period 87.50% (28/32)	Pandemic period 100.00% (6/6)	Post-pandemic period 93.75% (15/16)
Ceftriaxone (monotherapy)	39.29% (n = 11)	16.67% (n = 1)	46.67% (n = 7)
Ceftriaxone + clindamycin	17.86% (n = 5)	66.67% (n = 4)	20.00% (n = 3)
Co-amoxiclav (monotherapy)	25.00% (n = 7)	-	20.00% (n = 3)
Clindamycin (monotherapy)	3.57% (n = 1)	-	6.67% (n = 1)
Cefazolin + clindamycin	3.57% (n = 1)	16.67% (n = 1)	6.67% (n = 1)
Cefazolin (monotherapy)	-	-	-
Penicillin G (monotherapy)	3.57% (n = 1)	-	-
Unspecified intravenous antibiotic	7.14% (n = 2)	-	-

Discussion

To enable a valid comparison across time periods of unequal duration, incidence rates in this study were standardized per month. The pre-pandemic period was intentionally defined as a longer interval to ensure a sufficiently robust baseline for trend analysis. Clinical, microbiological, and management characteristics were interpreted within the context of these defined periods, allowing for a more accurate assessment of the pandemic's impact on pediatric neck abscesses. The results demonstrated significant temporal variation in the incidence and presentation of pediatric neck abscesses, reflecting the impact of COVID-19 public health measures on infectious disease patterns and surgical decision-making.

After adjusting for study period duration, the event-based incidence of peritonsillar abscesses was higher in both the pre-pandemic (0.32/month) and post-pandemic (0.40/month) periods, while no cases were recorded during the pandemic. The incidence of other abscess types remained relatively stable across all three periods.

In comparison, a study conducted at the same clinic approximately 25 years ago reported a slightly lower adjusted monthly incidence of peritonsillar abscesses (0.24/month). Notably, the rate of parapharyngeal abscesses in the current cohort was consistently higher in the pre-pandemic (0.22/month), pandemic (0.22/month), and post-pandemic (0.30/month) periods compared to an earlier cohort (0.07/month)[9].

Neck abscesses are a common complication of tonsillitis, pharyngitis, and other upper respiratory infections, often resulting in cervical lymphadenitis[10]. In the paediatric population, educational institutions and childcare facilities represent a significant source of transmission[11].

The implementation of public health measures, including the use of masks, social distancing, and isolation, has been a crucial strategy in reducing viral and bacterial exposure, resulting in a notable decline in cases of tonsillitis[1] and pharyngitis. Quraishi and colleagues examined the correlation between physical interventions and adult hospital admissions for ENT infections during the SARS-CoV-2 pandemic and revealed a statistically significant reduction in the number of cases of tonsillitis (64.4%; $P < 0.001$) and peritonsillar abscess (60.68%; $P < 0.001$)[2].

The absence of surgically treated peritonsillar abscesses during the pandemic period may reflect significant changes in clinical practice. Surgical intervention was often postponed in favor of conservative antibiotic therapy, with longer observation periods allowing sufficient time for clinical improvement without the need for surgery. Many children were successfully managed with outpatient antibiotics or treated in infectious disease or pediatric departments at other hospitals. The increased use of conservative treatment and hesitance to perform surgical procedures, particularly those involving the oral cavity due to the heightened risk of viral transmission, contributed to a reduction in surgical interventions for peritonsillar abscesses during the pandemic. Furthermore, incision and drainage procedures were more frequently performed in outpatient emergency departments to reduce hospital admissions and surgical workload. These findings suggest that, with appropriate patient selection, conservative management including prolonged intravenous or oral antibiotic therapy and careful monitoring may represent a safe alternative to immediate surgical intervention[12].

A study by Stansfield et al. demonstrated a shift toward the conservative management of peritonsillar abscesses during the COVID-19 pandemic. Prior to the pandemic, all patients underwent surgical drainage; however, during the pandemic, only one patient required surgical intervention. All others were managed successfully with antibiotics, showing full clinical recovery without the need for additional procedures[13].

In their study, Fadel et al. found no surgically treated cases of peritonsillar abscess during the pandemic period. This observation was likely

influenced by the typical age range of the affected patients (4.75–12.07 years)[14], who belonged to a group subject to consistent mask use and public health restrictions. Additional contributing factors included a higher rate of outpatient antibiotic treatment, and the fact that abscess drainage was more frequently performed in emergency departments during the pandemic[15].

Our study found a statistically significant decrease in the mean age of pediatric patients undergoing surgical treatment for deep neck infections during the pandemic, compared to both the pre- and post-pandemic periods. Previous studies reported pre-pandemic mean ages of 4.6[6] and 4.75 years[16]; our pre-pandemic cohort was slightly older (mean 6.07 years), while the pandemic group had a mean age of just 1.95 years. Similar findings were reported by Fadel et al., who observed a decrease from 5.05 ± 5.03 in the period of 2015–2019 to 2.24 ± 1.91 years in 2020 ($P = 0.064$)[15].

This shift in age distribution has been partially attributed to public health guidelines implemented during the pandemic. Centers for Disease Control and Prevention advised against mask use in children under 2 years of age due to the risk of suffocation and their limited ability to remove masks independently[15,17].

These findings suggest that pandemic-related containment strategies and public health guidelines may have reduced exposure to common pathogens among older children due to school and daycare center closures, limited peer interaction, and widespread mask use.

In contrast, younger children, particularly those under 2 years of age, who were not subject to mask mandates and remained in close contact with household members, may have experienced greater exposure. The observed reduction in mean age during the pandemic period may therefore reflect a temporary shift in disease burden toward a more vulnerable pediatric subgroup.

During the pandemic period, a notable reduction in *S. pyogenes* isolation was observed. This pattern is consistent with the established role of *S. pyogenes* as a pathogen associated with person-to-person transmission, which may have been reduced by public health interventions. In contrast, *S. pyogenes* remained the predominant isolate in both the pre- and post-pandemic periods, reaffirming its role in the etiology of pediatric neck abscesses.

In our cohort, *S. aureus* was the most frequently isolated pathogen in pediatric patients who underwent surgical treatment during the pandemic period. Unlike *S. pyogenes*, *S. aureus* is a well-recognized component of the endogenous nasal and oral flora.

Supporting evidence is provided by Corte et al., who reported *S. pyogenes* as the leading causative agent of pediatric deep neck infections prior to the pandemic, isolated in approximately 40% of cases, while *S. aureus* was identified less frequently[7]. In contrast with the previously mentioned findings, other studies conducted prior to the pandemic identified *S. aureus* as the primary causative agent[8,18].

A study by Klug and colleagues reported a notable decline in both the absolute number and proportion of peritonsillar abscesses caused by *S. pyogenes* following the implementation of lockdown measures, corresponding to a 56% reduction compared with the pre-lockdown period. In contrast, the number of cases positive for *Fusobacterium necrophorum* and *S. aureus* showed no significant change. These findings are consistent with the association between *S. pyogenes* infection and person-to-person transmission[19].

A study by Oguzkaya-Artan et al. reported a nasal carriage rate of 18% for *S. aureus* in healthy preschool children aged 5 to 7 years[20]. This may support the hypothesis that, during the pandemic, a greater proportion of deep neck infections originated from endogenous flora rather than external sources.

According to previous literature, the recommended antibiotics for starting empiric treatment are amoxicillin with clavulanic acid or antibiotics resistant to β-lactamase. Additionally, it is recommended to use clindamycin or metronidazole in

conjunction with these antibiotics to cover anaerobic bacteria[3–5].

Sousa Menezes et al. emphasized the use of amoxicillin-clavulanate combined with clindamycin as standard empiric treatment, and reported that some patients were treated with ceftriaxone and clindamycin[14]. In our cohort, ceftriaxone was the most frequently administered antibiotic during hospitalization, either alone or combined with clindamycin, reflecting the need to cover anaerobic and resistant bacteria. Co-amoxiclav was also used, mainly in the pre- and post-pandemic periods, consistent with guidelines for broad-spectrum empiric therapy. During the pandemic period, combination therapy predominated, while monotherapy remained the standard approach in the pre- and post-pandemic periods. These changes should be interpreted with caution, as they may reflect evolving institutional protocols and pandemic-related infection control measures rather than intrinsic changes in disease characteristics.

Surgical treatment is indicated in patients with deep neck abscesses presenting with airway compromise, septicemia, abscess rupture or extension, and a lack of clinical improvement after 48 hours of intravenous antibiotic therapy[3].

The transcervical approach is required for abscesses located in the submandibular, carotid, or prevertebral spaces. For parapharyngeal and retropharyngeal abscesses, the transoral approach is typically preferred. A transcervical approach may be used when the transoral route is unsafe or insufficient for complete drainage.

The timing of surgical interventions for deep neck abscesses and the role of conservative treatment remain topics of ongoing discussion in the literature. In a systematic review, Carbone et al. reported a success rate of 0.517 for conservative management without the need for surgery[21]. However, each of the articles from this systematic review suggested that conservative treatment may be sufficient in certain cases. Wong et al. conducted a case-control study to determine patient characteristics that could predict the outcome of conservative treatment. The study concluded that conservative treatment is a viable option for children with an abscess size of less than 25 mm on computed tomography and that children with smaller, isolated abscesses should initially be treated with intravenous antibiotics[16].

Cheng et al. identified younger age (≤ 51 months) and abscess size greater than 22 mm as risk factors for the failure of conservative treatment[22].

In our cohort, all patients received broad-spectrum antibiotics and underwent surgery. The transoral approach was most frequently used before and after the pandemic, consistent with the predominance of peritonsillar and parapharyngeal abscesses.

The SARS-CoV-2 virus pandemic has precipitated a shift in medical practice, with the aim of protecting patients and physicians, and mobilizing human resources to acute specialties engaged in battling the outbreak. Given the nature of their work, otorhinolaryngology physicians were at an elevated risk of infection due to the contact with saliva and respiratory droplets; the first global death of a physician resulting from SARS-CoV-2 infection was that of an otorhinolaryngology specialist[23].

Chan et al. observed a reduction in elective clinics and operations, with the objective of mobilizing manpower to acute specialties and maximizing the number of hospital beds. The ongoing impact of the COVID-19 pandemic contributed to a prevailing fear of visiting hospitals among the public. This resulted in a more than 50% reduction in the daily number of patients attending the otorhinolaryngology specialist clinic[23].

Additionally, during the pandemic, fewer patients presented to emergency departments requiring urgent surgical care. Those who did often sought treatment at a more advanced stage, resulting in more severe clinical presentations[24].

This aligns with our findings, where the transcervical approach was the most commonly used

procedure during the pandemic period, likely attributable to more severe cases.

Our findings align with previous reports indicating that the COVID-19 pandemic temporarily altered the epidemiology and clinical presentation of pediatric deep neck infections. Reduced social contact, school closures, and limited access to primary care likely contributed to the lower incidence observed during the pandemic. The subsequent rise in post-pandemic cases may reflect a rebound in exposure and delayed treatment of minor infections.

Despite these trends, the causal relationship between the pandemic and observed clinical changes may be multifactorial. Future multicenter studies with larger cohorts and standardized data collection are needed to validate these findings and to clarify the long-term impact of the pandemic on pediatric head and neck infections.

Limitations

The study's retrospective, single-center design and relatively small sample size may have limited the strength of statistical inferences, particularly after the subdivision into three time periods. The standardization of observation periods was necessary to enable the comparison of incidence rates across periods. This approach reflected hospital workload rather than population-based incidence. The relatively small number of cases during the pandemic period may have further reduced statistical power, but likely reflected real-world clinical practice, characterized by reduced hospital admissions and an increased reliance on conservative management. In addition, the inclusion of only surgically treated neck abscesses introduced selection bias, as changes in admission criteria and surgical decision-making during the COVID-19 pandemic may have influenced which patients underwent operative management. Finally, microbiological data were partially unavailable, because several patients were initially treated at external institutions, and corresponding culture results were not consistently accessible for analysis.

Conclusion

This study described temporal changes in the clinical presentation, microbiology, and management of pediatric neck infections during the COVID-19 pandemic. A shift toward younger patients was observed, likely reflecting mask exemptions for children under 2 years of age and ongoing exposure within household and daycare environments. Public health measures, changes in clinical decision-making, and increased reliance on conservative management appear to have contributed to the temporary reduction in surgically treated peritonsillar abscesses. Conversely, delayed presentation may have led to more severe cases requiring combination antibiotic therapy and transcervical drainage.

The observed changes in pathogen distribution, with an increased isolation of *S. aureus* and a decrease in *S. pyogenes* during the pandemic, may reflect altered patterns of interpersonal transmission. These findings highlight how pandemic-related restrictions can indirectly influence disease epidemiology and clinical management. Larger, multicenter studies are needed to confirm these observations and to guide future management strategies for pediatric neck infections in post-pandemic settings.

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ETHICS APPROVAL This study was approved by the institutional ethics committee of Sestre milosrdnice University Hospital Center, Zagreb, Croatia (267th meeting, June 10, 2025; Approval No.: 251-29-11/3-25-13).

AUTHOR CONTRIBUTIONS MK collected and curated the clinical data, performed the formal analysis, and wrote the original draft of the manuscript. GG facilitated access to institutional resources, provided clinical supervision, and participated in the critical review of the manuscript. EKM contributed to the critical review and editing of the manuscript.

TB conceptualized and designed the study, supervised the research process, contributed to data interpretation, and critically reviewed and edited the manuscript, providing overall project oversight and intellectual guidance throughout the study. All authors read and approved the final version of the manuscript. ■

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SAŽETAK

Utjecaj javnozdravstvenih mjera tijekom pandemije COVID-19 na incidenciju i klinička obilježja vratnih apscesa u djece

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Ova retrospektivna studija procijenila je razlike u incidenciji, kliničkim obilježjima i liječenju djece s apscesima vrata koji su zahtijevali kiruršku intervenciju prije, tijekom i nakon pandemije virusa COVID-19.

U studiju su bila uključena 54 pedijatrijska bolesnika kirurški liječena u tercijarnom centru od 2016. do 2022. godine. Bolesnici su podijeljeni prema razdoblju liječenja. Analizirane varijable uključivale su dob, lokalizaciju apscesa, kirurški pristup, mikrobiološke nalaze i primjenu antibiotika. Stope incidencije standardizirane su po mjesecu.

Tijekom pandemije nije zabilježen nijedan kirurški liječeni peritonzilarni apsces, što predstavlja značajno smanjenje incidencije u odnosu na predpandemijsko razdoblje ($P = 0,0386$), uz porast u postpandemijskom razdoblju ($P = 0,0201$). Tijekom pandemije parafaringealni i lateralni cervikalni apscesi bili su najčešći. Srednja dob bolesnika bila je značajno niža tijekom pandemije (1,95 godina; $P = 0,0095$), uz značajan pomak prema transcervikalnom kirurškom pristupu ($P = 0,0336$; $P = 0,0109$). Zabilježen je pad učestalosti izolacije *Streptococcus pyogenes* te porast izolacije *Staphylococcus aureus*. Kombinirana antibiotska terapija bila je češće primjenjivana tijekom pandemije ($P = 0,0112$). Najčešće korišteni antibiotik bio je ceftriakson: sam ili u kombinaciji s klindamicinom.

Liječenje apscesa vrata u doba pandemije COVID-19 bilo je povezano s mlađom dobi bolesnika, većim oslanjanjem na konzervativno liječenje i promjenama u kirurškom pristupu.

KLJUČNE RIJEČI

Apsces vrata; *Pedijatrija*; *Pandemija COVID-19*; *Incidencija*; *Liječenje*