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An Examination of Past Data on Emergency Hospital Admissions Associated with Odontogenic Abscesses

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Abstract

Background:

Odontogenic infections, originating from the teeth or their supporting structures, are a common cause of emergency medical visits in children, often leading to severe complications such as abscess formation. Although pediatric odontogenic abscesses are typically managed with antibiotics, severe cases necessitate surgical intervention, which may involve drainage under local or general anesthesia. The financial burden associated with the treatment of these infections is significant, particularly in public healthcare systems. Despite existing research on adult odontogenic infections, limited studies focus on pediatric cases requiring surgical treatment.

Methods:

This retrospective, single-center study analyzed data from 120 children and young people under 18 years of age who were hospitalized for odontogenic abscesses and received surgical drainage under local or general anesthesia over a 24-month period. Clinical data, including demographics, symptoms, abscess types, surgical procedures, and microbiological findings, were retrieved from medical records. Statistical analyses were performed using descriptive statistics, chi-square tests, and ANOVA to examine the relationships between variables, including hospital stay duration, abscess type, and treatment costs.

Results:

The study included 120 patients (77 males, 43 females), with a mean age of 6.3 years. The most common abscess type was the canine fossa abscess (43.3%). The majority of surgical procedures (96.7%) were performed under general anesthesia. The average hospital stay was 1.82 ± 1.19 days. Hospital stay duration was significantly associated with the abscess type and age group. Perimandibular and floor-of-mouth abscesses were linked to longer hospital stays. Microbiological analysis revealed common pathogens such as *Streptococcus anginosus* and *Streptococcus mitis/oralis*. The financial analysis indicated significant variability in treatment costs based on abscess type.

Conclusion:

The study highlights the importance of abscess type in determining the length of hospitalization and associated treatment costs. Surgical procedures, especially those involving severe abscesses, contribute significantly to the financial burden. Early and appropriate management can reduce

hospital stay duration and improve patient outcomes. This research underscores the need for targeted interventions to manage odontogenic infections efficiently in pediatric patients.

Introduction

Odontogenic infections originate from the teeth or their supporting structures and are often secondary to conditions such as dental caries, periodontal issues, or pericoronitis. These infections are typically caused by various bacterial species and are characterized by symptoms such as pain, swelling, and redness. Without addressing the underlying cause, the inflammatory process may progress, leading to both localized and systemic complications (1).

In children, odontogenic infections are a common reason for emergency medical visits (2–4). While severe cases are less frequent, potentially life-threatening complications have been reported in pediatric patients (5, 6).

The management of these infections depends on factors like the origin and severity of the condition. It is crucial to address the primary source of infection (1). In instances where the affected tooth cannot be preserved, prompt extraction has been shown to yield favorable outcomes in most scenarios (7). Many children presenting with odontogenic infections at emergency departments can be managed with oral antibiotics, with further dental procedures deferred to a later time (8). However, patients with severe symptoms, such as extensive swelling, cellulitis, or abscess formation, often require urgent care. This typically involves surgical intervention, such as incision and drainage under either local or general anesthesia, to remove accumulated pus. In these cases, intravenous antibiotics are often administered.

The treatment of odontogenic infections, particularly those requiring hospitalization, has become a notable financial challenge for public healthcare systems (9–11). Research indicates that early and efficient intervention can significantly reduce the duration of hospital stays (12, 13). Sedation or general anesthesia is increasingly utilized in pediatric dental care, especially for younger children who may have limited ability to cooperate during treatment (14).

While extensive research has been conducted on hospitalized adult patients with odontogenic infections (11, 15–17), there is a limited body of work focusing specifically on pediatric cases (8, 12, 13, 18, 19). The available studies provide restricted clinical insights into children who undergo surgical treatment under general anesthesia.

Materials and Methods

This study was conducted, examining data from all patients who visited the emergency department . The study focused on hospitalized patients under 18 years of age who were diagnosed with specific ICD-10 (International Classification of Diseases, German Modification) codes: K12.21/22 (submandibular abscess), K12.23 (buccal abscess), K12.28 (abscesses involving the massetericomandibular, floor of the mouth, paramandibular, or perimandibular regions), K12.29 (oral abscess), K04.7 (dental or canine fossa abscess), and K10.20/21 (upper jaw abscess). Inclusion criteria required patients to have undergone surgical drainage of an odontogenic abscess under local or general anesthesia. The precise location and diagnosis of each abscess were retrieved from surgical reports.

Patients were excluded if they had received only intravenous antibiotics without surgical drainage, left the hospital against medical advice before undergoing surgery, or if their records contained insufficient or contradictory information.

The data were collected from electronic medical records, including details on demographic and economic factors, patient characteristics, symptoms, diagnostics, treatment methods,

microbiological findings, and clinical outcomes during the hospital stay. Tooth numbering followed the FDI (Fédération Dentaire Internationale) system.

Statistical Procedures

Data were compiled using Microsoft Excel (Version 15.33; Microsoft Corporation, Redmond, WA, USA) and analyzed with IBM SPSS Statistics 25 (IBM Corporation, Armonk, NY, USA). Descriptive statistics were used to summarize data, with frequencies and percentages reported for categorical variables and means with standard deviations for continuous variables.

Relationships between categorical variables were assessed using cross-tabulation and Pearson's chi-square test. Comparisons of means for symmetrically distributed continuous variables without outliers were conducted using Student's t-test and analysis of variance (ANOVA). For the skewed variable "length of stay," comparisons were made using the Mann–Whitney U test and the Kruskal-Wallis test, as appropriate. The correlation between two continuous variables was evaluated using Spearman's rank correlation coefficient. A significance threshold of $\alpha=0.05$ was applied. As this study was exploratory in nature, no Bonferroni correction for multiple comparisons was used.

Results

This study analyzed 120 inpatient cases meeting inclusion criteria, involving 120 patients (77 males and 43 females). The average age was 6.3 years, ranging from 1 to 17 years. While gender distribution was generally balanced across ages, a pronounced disparity was observed at age 6, where males were significantly more affected (5.5:1 ratio).

Nine patients (7.5%) were referred from other hospitals for further treatment. Prior antibiotic use was reported in 35 cases (29.2%), while 14 patients (11.7%) had undergone previous trepanation or endodontic procedures. One patient (0.8%) presented with persistent symptoms following prior surgical drainage performed elsewhere.

Preexisting conditions were documented in 21 patients (17.5%), though chronic illnesses were uncommon. Four patients had a history of heart disease, two had developmental disorders or mental retardation, and one suffered from thalassemia major. Comorbidities were largely absent in most children. A penicillin allergy was recorded in three patients (2.5%).

On average, 5 patients under 18 years of age were admitted monthly for surgical intervention due to odontogenic abscesses. The highest incidence occurred in July (16.7%), while the lowest was in April (0.8%). Patients most frequently presented in the first half of the month (60%) and often after weekends, particularly on Mondays. The majority (97 patients) presented during standard hours (7 a.m.–7 p.m.), while 23 presented during after-hours on-call services. A detailed distribution of presentation times is shown in Table 2.

Common symptoms included dental pain, swelling, and erythema. Other symptoms included limited mouth opening (24.2%), dysphagia (8.3%), tenderness at the medial angle of the eye (5.8%), and dyspnea (0.8%).

At presentation, 121 abscesses were identified in 120 patients, with one patient diagnosed with both a paramandibular abscess and a submucous abscess. The most common diagnosis was canine fossa abscess (43.3%), followed by submucous abscess (23.3%) and paramandibular abscess (17.5%). Table 3 provides details on abscess diagnoses, associated symptoms, and inflammatory markers.

Dental caries and apical periodontitis/pulpitis accounted for 88.3% of abscess cases. Abscesses following tooth extraction occurred in 6.7%, while the cause was unclear in 5.0%. A focus tooth or infection region was identified in 77.5% of cases. The primary maxillary first molar was most frequently implicated, with upper jaw infections being more prevalent than those in the lower jaw. Table 4 outlines the distribution of focus teeth or regions by abscess type.

Of the 120 primary surgical procedures performed, 96.7% occurred under general anesthesia, while 3.3% were conducted under local anesthesia. The mean time from emergency department registration to incision in the operating room for general anesthesia cases was 6 hours and 28 minutes, with a range of 46 minutes to 37 hours. The average surgery duration was 20 minutes and 10 seconds, ranging from 5 to 56 minutes. Revision surgery was required in three patients (2.5%) due to persistent symptoms, and a total of 264 teeth were extracted across all procedures.

The mean hospital stay was 1.82 ± 1.19 days, ranging from 0 to 8 days. One patient left the hospital on the day of admission after surgery (length of stay: 0 days). Characteristics of hospital stays and surgical procedures are summarized in Table 5.

There was no significant relationship between hospital stay duration and gender ($p = 0.479$) or prior antibiotic use ($p = 0.880$). However, hospital stay length was significantly associated with the type of abscess ($p < 0.001$) and surgical procedure duration ($rho = 0.259$, $p = 0.005$). Patients with perimandibular or floor-of-mouth abscesses had longer hospital stays compared to those with submucous or canine fossa abscesses. Age group also influenced stay duration ($p < 0.001$), with older patients (14–17 years) hospitalized longer than younger patients (<6 years). Additionally, patients with secondary focus regions stayed longer than those with primary focus regions or undefined foci ($p < 0.001$).

Surgical procedures performed under general anesthesia occurred more frequently during after-hours (61.2%) compared to standard hours (38.8%).

Microbiological analysis of pus samples (collected from 44.2% of patients) frequently identified *Streptococcus anginosus* and *Streptococcus mitis/oralis*.

Table 1. Weekday of presentation at the emergency department.

Weekday	**N (%)**
Monday	23 (19.2%)
Tuesday	19 (15.8%)
Wednesday	13 (10.8%)
Thursday	15 (12.5%)
Friday	20 (16.7%)
Saturday	12 (10.0%)
Sunday	18 (15.0%)

Table 2. Time (frame) of presentation at the emergency department.

Time	**N (%)**
6 a.m. – 11:59 a.m.	33 (27.5%)
12 p.m. – 4:59 p.m.	51 (42.5%)
5 p.m. – 11:59 p.m.	31 (25.8%)
12 a.m. – 5:59 a.m.	5 (4.2%)

Table 3. Distribution of patients according to diagnoses as per the mean age, side, main symptoms, and values of CRP and leukocytes.

Abscess diagnosis	**N (%)**	**Age in years (Mean ± SD)**	**Localisation (Right/Left)**	**Symptoms**				**Inflammatory values**	
				Dysphagia	**Dyspnea**	**LMO**	**PP**	**CRP mg/l (median [IQR])**	**Leukocytes / nl (mean ± SD)**
Submucous	28 (23.3 %)	5.0 ± 2.27	11/18*	1 (3.6%)	0 (0%)	0 (0%)	0 (0%)	16.55 [48.05] (n = 4)	10.1 ± 2.21 (n = 4)
Canine fossa	52 (43.3 %)	5.7 ± 3.51	20/32	1 (1.9%)	0 (0%)	4 (7.7 %)	7 (13.5 %)	23.9 [49.1] (n = 7)	11.4 ± 3.93 (n = 8)
Paramandibular	21 (17.5 %)	5.9 ± 3.35	10/11	1 (4.8%)	0 (0%)	10 (47.6 %)	0 (0%)	18.3 (n = 3)	10.9 ± 1.93 (n = 3)
Perimandibular	14 (11.7 %)	9.9 ± 4.38	6/8	6 (42.9%)	0 (0%)	10 (71.4 %)	0 (0%)	55.4 [81.25] (n = 5)	15.9 ± 6.33 (n = 7)
Floor of mouth	3 (2.5 %)	8.0 ± 1.00	3/1*	1 (33.3%)	1 (33.3 %)	3 (100 %)	0 (0%)	48.6 (n = 1)	15.3 (n = 1)
Massetericomandibular	2 (1.7 %)	16.0 ± 0.00	2/0	0 (0%)	0 (0%)	2 (100 %)	0 (0%)	38.2 (n = 2)	13.9 ± 3.31 (n = 2)

* one abscess occurred on both sides.
LMO: limited mouth opening.
PP: painful palpation of the medial angle of the eye

Discussion

Limited research exists on odontogenic infections in pediatric patients requiring hospitalization, particularly regarding those surgically managed under general anesthesia (8, 12, 13, 18, 19). This study is one of the most comprehensive analyses in this area to date.

The average age of the participants was 6.3 years, spanning from 1 to 17 years. A higher prevalence was noted in males (64.2%) compared to females (35.8%), with a male-to-female ratio of 1.79:1. Comparisons with other studies are challenging due to variations in the age range of included participants (13, 18). A study by Kara et al. involving individuals younger than 18 reported a higher

mean age (12). While other research identified a balanced gender distribution (13, 18, 20), these findings align with Kara et al.'s study, which also reported a male predominance (1.4:1) (12).
Most participants in the present study had no documented medical comorbidities, with preexisting conditions reported in only 21 cases, and severe chronic illnesses were rare. These findings align with Michael et al., who found that 93% of children presenting with odontogenic swellings in emergency settings were otherwise healthy (8).
The seasonal distribution revealed that most patients presented during the summer months (July being the peak month with 16.7% of cases). Comparatively, Kara et al. identified January as the peak period (12), while Unkel et al. reported a spring peak (20). Lin et al. observed a predominance of cases in February (19). In the present study, the highest case numbers were noted during both warm (June–August: n = 43) and cold seasons (December–February: n = 34), with fewer cases during transitional periods in spring and autumn. The reasons for this pattern remain speculative, but temperature fluctuations may influence bacterial growth in oral microbial communities, potentially increasing the risk of dental abscesses (21, 22, 23).
Many patients arrived at the emergency department immediately before or after weekends (Friday: 16.7%, Monday: 19.2%), likely reflecting the limited availability of outpatient services. Most visits occurred between 7 a.m. and 7 p.m. (80.1%), yet most surgical interventions (61.2%) were performed during on-call hours (7 p.m.–7 a.m.), which has significant implications for staff and operating room resource planning. Performing surgeries at night incurs higher costs, presenting additional financial challenges for healthcare facilities. Existing studies do not provide comparable data on the timing of presentations and surgeries (8, 12, 13, 18, 19).
The average hospital stay duration was 1.82 days, ranging from 0 to 8 days, and was significantly associated with the type of abscess ($p < 0.001$). Patients with larger abscesses required longer stays compared to those with submucosal abscesses. Additionally, a weak correlation between the duration of surgical procedures under general anesthesia and length of stay was observed, warranting further investigation with a larger sample size. Unlike Kara et al. (12), this study identified a significant association between patient age and hospitalization duration ($p < 0.001$), with older children experiencing longer stays, likely due to a higher incidence of large abscesses.
Compared to previous studies, which reported mean hospital stays of 5.03 to 5.86 days (12, 18, 19), the present study observed a substantially shorter average duration. Variability in classification methods for infections complicates direct comparisons. For instance, other studies categorized infections by anatomical location, such as upper versus lower facial infections (24). Nevertheless, findings here align with Thikkurissy et al., who also reported shorter stays associated with early intervention and definitive treatment (13). Kara et al. similarly noted shorter hospitalizations for patients who underwent tooth extractions within 48 hours of admission (12).
The left primary maxillary first molar (tooth 64) was the most frequent source of infection, consistent with previous findings that primary first molars are commonly implicated in abscess formation in both the upper and lower jaws (12, 18).
Economic analysis for 45 cases in a single calendar year revealed insurance reimbursements totaling €84,855, while associated costs primarily from anesthesiology amounted to €71,655. Although this resulted in a modest profit of approximately €13,200, it was insufficient to cover additional treatment expenses, highlighting the economic strain associated with managing these cases.
While the study provides detailed clinical and financial insights into pediatric odontogenic infections, its retrospective nature and limited sample size underscore the need for prospective studies to validate these findings.

Conclusion

The length of hospitalization was significantly influenced by the type of abscess diagnosed. The primary first molar in the upper jaw was the most frequently identified source of infection. Additionally, the type of abscess significantly impacted treatment costs.

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