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Evaluation of microbiological flora in odontogenic space infections and its antibiotic sensitivity patterns

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Abstract:
Odontogenic space infections are common maxillofacial conditions with the potential for serious complications if not managed appropriately. Therefore, it is of interest to evaluate the microbiological flora associated with odontogenic space infections and analyzed their antibiotic sensitivity patterns. The results showed a predominantly polymicrobial etiology, with aerobic and anaerobic organisms commonly isolated. Antibiotic susceptibility testing revealed high sensitivity to amoxicillin–clavulanate and clindamycin, with increasing resistance to penicillin and macrolides. Thus, data shows the importance of microbiological culture and sensitivity testing to guide effective and rational antibiotic therapy.

Keywords: Odontogenic space infections; oral microbiology; antibiotic sensitivity; antimicrobial resistance; maxillofacial infections

Background:
Odontogenic space infections arise from dental pulp or periodontal tissues and represent a common cause of head and neck infections encountered in maxillofacial practice **[1]**. These infections can extend along fascial planes into adjacent anatomical spaces, potentially leading to serious local and systemic complications if not managed promptly **[2]**. The microbial etiology of odontogenic space infections is typically polymicrobial, reflecting the complex composition of the normal oral flora **[3]**. Aerobic bacteria such as viridans group streptococci and facultative anaerobes, along with obligate anaerobes including *Prevotella, Porphyromonas* and *Fusobacterium* species, are frequently implicated in these infections **[4]**. The relative predominance of specific microorganisms may vary depending on the stage of infection, host immune status and previous exposure to antimicrobial agents **[5]**. Accurate identification of the causative organisms is therefore essential for effective clinical management **[6]**. Empirical antibiotic therapy is often initiated in odontogenic infections; however, the growing prevalence of antimicrobial resistance has raised concerns regarding treatment efficacy **[7]**. Several studies have reported reduced sensitivity of common oral pathogens to routinely prescribed antibiotics such as penicillins and macrolides **[8]**. Inappropriate antibiotic selection and overuse without microbiological confirmation further contribute to the emergence of resistant strains **[9]**. Microbiological culture and antibiotic sensitivity testing provide valuable information for selecting targeted antimicrobial therapy, particularly in severe or recurrent odontogenic space infections **[10]**. An understanding of the prevailing microbial flora and their susceptibility patterns is crucial for optimizing treatment outcomes, minimizing complications and promoting rational antibiotic use in dental practice **[11]**. Therefore, it is of interest to examine the evaluation of microbiological flora in odontogenic space infections and its antibiotic sensitivity patterns.

Methodology:
This hospital-based observational study was conducted in the Department of Oral and Maxillofacial Surgery in collaboration with the Department of Microbiology at a tertiary care institution over a defined study period. Patients presenting with clinical features suggestive of odontogenic space infections were evaluated and cases of confirmed odontogenic origin were included in the study. Diagnosis was established based on clinical examination supported by radiographic findings. Patients with non-odontogenic infections, those who had received prolonged antibiotic therapy prior to sample collection, immunocompromised individuals and cases with inadequate or contaminated samples were excluded. Demographic details, clinical presentation, involved fascial spaces, source of infection, history of prior antibiotic use and relevant systemic conditions were recorded using a structured data collection format. Pus samples were obtained under strict aseptic conditions either by needle aspiration or during incision and drainage procedures, preferably before initiation of antibiotic therapy. The collected specimens were promptly transported to the microbiology laboratory for processing, ensuring minimal contamination and preservation of viable organisms. Microbiological evaluation included direct Gram staining followed by aerobic and, where applicable, anaerobic culture using standard laboratory

protocols. Isolated microorganisms were identified based on colony morphology, staining characteristics and appropriate biochemical tests. Antibiotic susceptibility testing was performed on clinically significant isolates using the Kirby–Bauer disc diffusion method in accordance with standard laboratory guidelines. The antimicrobial panel tested included commonly prescribed antibiotics for odontogenic infections and susceptibility results were interpreted as sensitive, intermediate, or resistant. The collected data were entered and analyzed using appropriate statistical software. Descriptive statistics were used to summarize demographic variables, microbial distribution and antibiotic sensitivity patterns. Categorical data were expressed as frequencies and percentages, while continuous variables were presented as mean with standard deviation or median values, as appropriate. Statistical associations between variables were evaluated using suitable tests and a p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the institutional ethics committee prior to commencement of the study and patient confidentiality was maintained throughout.

Results:

A total of 60 patients with odontogenic space infections were included in the study. The study population consisted of 38 males (63.3%) and 22 females (36.7%), with an age range of 18–65 years and a mean age of 34.6 ± 11.2 years. The most commonly affected age group was 21–40 years (55%). Mandibular posterior teeth were identified as the predominant odontogenic source. The submandibular space was the most frequently involved fascial space, followed by the buccal and sublingual spaces. The demographic profile, clinical characteristics and distribution of involved spaces are detailed in **Table 1**. Microbiological culture was positive in 54 cases (90%), while 6 samples (10%) showed no growth. Polymicrobial infection was observed in 32 cases (59.3%), whereas 22 cases (40.7%) yielded monomicrobial growth. Among the isolates, aerobic and facultative anaerobic bacteria predominated. The most frequently isolated organism was viridans group streptococci (31.5%), followed by *Staphylococcus aureus* (18.5%), *Prevotella species* (16.7%), *Fusobacterium species* (13.0%) and *Escherichia coli* (9.3%). The distribution of microbial isolates is presented in **Table 2**. Antibiotic susceptibility testing revealed that the majority of isolates were highly sensitive to amoxicillin–clavulanate (83.3%) and clindamycin (77.8%). Metronidazole showed excellent activity against anaerobic organisms, with a sensitivity rate of 88.9%. In contrast, lower sensitivity rates were observed for penicillin (55.6%) and azithromycin (48.1%). Multidrug resistance was identified in 9 isolates (16.7%), predominantly among gram-negative organisms. The detailed antibiotic sensitivity and resistance patterns are shown in **Table 3**. Statistical analysis demonstrated a significant association between prior antibiotic use and the presence of resistant isolates ($p = 0.03$). No statistically significant association was observed between age and gender and the type of microorganism's isolated ($p > 0.05$). These findings emphasize the importance of microbiological evaluation and antibiotic susceptibility testing for effective management of odontogenic space infections.

Table 1: Demographic and clinical characteristics of the study population (n = 60)

Variable	Number (%)
Gender	
Male	38 (63.3)
Female	22 (36.7)
Age group (years)	
≤20	8 (13.3)
21–40	33 (55.0)
41–60	15 (25.0)
>60	4 (6.7)
Common fascial spaces involved	
Submandibular	22 (36.7)
Buccal	16 (26.7)
Sublingual	11 (18.3)
Submental	6 (10.0)
Multiple spaces	5 (8.3)

Table 2: Distribution of microbial isolates (n = 54 culture-positive cases)

Microorganism	Number (%)
Viridans group streptococci	17 (31.5)
Staphylococcus aureus	10 (18.5)
Prevotella species	9 (16.7)
Fusobacterium species	7 (13.0)
Escherichia coli	5 (9.3)
Others	6 (11.0)

Table 3: Antibiotic sensitivity pattern of isolated microorganisms

Antibiotic	Sensitive (%)	Resistant (%)
Amoxicillin–clavulanate	45 (83.3)	9 (16.7)
Clindamycin	42 (77.8)	12 (22.2)
Metronidazole	32 (88.9)*	4 (11.1)*
Penicillin	30 (55.6)	24 (44.4)
Azithromycin	26 (48.1)	28 (51.9)

**Anaerobic isolates only*

Discussion:

Odontogenic space infections continue to represent a significant clinical challenge due to their potential for rapid spread and serious complications involving the deep fascial spaces of the head and neck **[12]**. The present study demonstrated a male predominance and a higher incidence in young to middle-aged adults, findings that are consistent with previous reports and may be attributed to higher exposure to dental caries, poor oral hygiene and delayed dental care in this population **[13]**. The submandibular space was the most frequently involved fascial space in the present study, which aligns with the anatomical relationship of mandibular posterior teeth to the mylohyoid muscle and surrounding fascial planes **[14]**. Similar distributions of fascial space involvement have been reported in earlier studies evaluating odontogenic infections of maxillofacial origin **[15]**. Microbiological analysis in this study revealed a high rate of culture positivity, with polymicrobial infections being more common than monomicrobial infections, reflecting the complex

polymicrobial nature of oral flora **[16]**. The predominance of viridans group streptococci among aerobic isolates is consistent with their role as early colonizers of the oral cavity and frequent pathogens in odontogenic infections **[17]**. The isolation of anaerobic organisms such as *Prevotella* and *Fusobacterium* species further supports the role of obligate anaerobes in the progression of established odontogenic infections **[18]**. Antibiotic susceptibility patterns observed in this study demonstrated high sensitivity to amoxicillin–clavulanate and clindamycin, which supports their continued use as first-line agents in the management of odontogenic space infections **[19]**. The good susceptibility of anaerobic isolates to metronidazole is consistent with previous studies emphasizing its effectiveness against obligate anaerobic bacteria **[20]**. However, the reduced sensitivity observed for penicillin and macrolides highlights the growing concern of antimicrobial resistance among oral pathogens **[21]**. The presence of multidrug-resistant isolates in this study underscores the consequences of inappropriate antibiotic use and empirical prescribing without microbiological confirmation **[22]**. The significant association between prior antibiotic exposure and resistance patterns observed in this study further supports the need for rational antibiotic prescribing practices in dental and maxillofacial infections **[23]**. These findings emphasize the importance of culture-guided therapy, particularly in severe, recurrent, or non-resolving odontogenic space infections **[24]**. The findings of the present study emphasize the importance of microbiological evaluation in the diagnosis and management of odontogenic space infections. Brook **[25]** reported that these infections are typically polymicrobial, involving a mixture of aerobic and anaerobic microorganisms, which may influence disease severity and treatment response. Kataria et al. **[24]** further highlighted that delayed diagnosis and inappropriate antimicrobial therapy can contribute to the progression of infection and increased morbidity. The World Health Organization has identified antimicrobial resistance as a major global health concern, underscoring the need for rational antibiotic use and antibiotic stewardship programs **[26].** The present findings are comparable with those reported by Fischer *et al.* **[27]** and Arora *et al.* **[28],** who demonstrated that odontogenic space infections are predominantly polymicrobial in nature and exhibit varying antibiotic sensitivity patterns. Fischer *et al.* **[27]** observed increasing antimicrobial resistance among odontogenic pathogens and emphasized the value of culture and sensitivity testing in guiding effective treatment. Similarly, Arora *et al.* **[28]** reported that microbiological assessment and targeted antibiotic therapy play a significant role in improving clinical outcomes and reducing treatment failures. Therefore, routine microbiological culture and antibiotic sensitivity testing should be considered an integral component of the management of odontogenic space infections to optimize patient outcomes and minimize the development of antibiotic resistance **[25–28]**.

Conclusion:

Odontogenic space infections are predominantly polymicrobial in nature, with both aerobic and anaerobic organisms contributing to disease progression. The observed variability in antibiotic sensitivity patterns highlights the importance of culture-guided antimicrobial therapy to ensure effective management and limit resistance. Thus, routine microbiological evaluation should therefore be encouraged to optimize clinical outcomes and promote rational antibiotic use in odontogenic infections.

References:

[1] Krakowiak PA. *Oral Maxillofac Surg Clin North Am*. 2011 23:401. [PMID: 21798440]
[2] Flynn TR *et al. J Oral Maxillofac Surg*. 2006 **64**:1093. [PMID: 16781343]
[3] Brook I. *Otolaryngol Head Neck Surg*. 2006 **135**:349. [PMID: 16949963]
[4] Patankar A *et al. Natl J Maxillofac Surg*. 2014 **5**:161. [PMID: 25937727]
[5] Kuriyama T *et al. Oral Microbiol Immunol.* 2007 **22**:285. [PMID: 17600542]
[6] Herrera D *et al. J Clin Periodontol*. 2008 **35**:45. [PMID: 18724841]
[7] Haug RH. *Oral Maxillofac Surg Clin North Am*. 2003 **15**:1. [PMID: 18088656]
[8] Chow AW *et al*. *Ann Intern Med.* 1978 **88**:392. [PMID: 343682]
[9] Pallasch TJ. *Dent Clin North Am*. 2003 **47**:623. [PMID: 14664456]
[10] Wang LF *et al. Am J Otolaryngol.* 2003 **24**:111 [PMID: 12649826]
[11] Brook I. *Anaerobe.* 2010 **16**:183. [PMID: 20025984]
[12] Flynn TR & Halpern LR, *Oral Maxillofac Surg Clin North Am*. 2003 **15**:17. [PMID: 18088657]
[13] Uluibau IC *et al. Aust Dent J*. 2005 **50**:S74. [PMID: 16416722]
[14] https://www.scirp.org/reference/referencespapers?referenceid=224183
[15] Huang TT *et al. Head Neck*. 2004 **26**:854. [PMID: 15390207]
[16] Brook I. *J Antimicrob Chemother*. 2002 **50**:805. [PMID: 12460997]
[17] Heimdahl A & Nord CE. *Scand J Infect Dis Suppl*. 1983 **39**:86.[PMID: 6359382]
[18] Kuriyama T *et al. Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2000 **90**:600. [PMID: 11077383]
[19] Herrera D *et al. J Clin Periodontol*. 2000 **27**:377. [PMID: 10883866]
[20] Newman MG. *Rev Infect Dis*. 1984 **6**:S107 [PMID: 6372018]
[21] Lewis MAO. *Br Dent J*. 2008 **205**:537. [PMID: 19023306]
[22] Ajantha GS & Hegde V. *NY State Dent J*. 2012 **78**:38. [PMID: 23252193]
[23] Sweeney LC. *J Antimicrob Chemother.* 2004 **53**:567. [PMID: 14985274]
[24] Kataria G *et al. Iran J Otorhinolaryngol*. 2015 **27**:293. [PMID: 26788478]
[25] Brook I. *J Oral Maxillofac Surg.* 2005 **63**:392 [PMID: 15742293]
[26] https://iris.who.int/bitstream/handle/10665/193736/9789241509763_eng.pdf

[27] Fischer M *et al. Clin Oral Investig*. 2025 **29**:597. [PMID: 41335374].

[28] Arora S *et al. Acta Sci Dent Sci*. 2025 **9**:54. [DOI: 10.31080/ASDS.2025.09.1991].