ANTIBIOTIC PRESCRIPTION PATTERNS FOR ODONTOGENIC INFECTIONS: ARE WE CONTRIBUTING TO RESISTANCE?

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ORIGINAL ARTICLE

ABSTRACT

OBJECTIVE: This study aimed to analyze antibiotic prescription patterns for odontogenic infections and assess their potential role in fostering antimicrobial resistance.

METHODOLOGY: A cross-sectional study involving 215 patients presenting with odontogenic infections was conducted at the Civil Hospital Dental OPD (outpatient department), LUMHS (Liaquat University of Medical & Health Sciences) Hyderabad. Data on patient demographics, infection characteristics, antibiotic prescriptions, prescriber profiles, and culture sensitivity results (in a subset of 80 cases) were collected using a structured proforma. Prescription appropriateness and adherence to stewardship guidelines were evaluated.

RESULTS: The mean patient age was 34.5 years; 55.8% were male. Periapical abscess (51%) was the most frequently diagnosed infection. Amoxicillin was the most prescribed antibiotic (56%), followed by amoxicillin/clavulanic acid (23%). Most prescriptions (77%) adhered to guideline dosages; however, 35% exceeded recommended course durations. Culture sensitivity revealed 25% resistance to amoxicillin and 12.5% resistance to clindamycin. General dentists accounted for 70% of prescriptions, with 65% aware of antibiotic stewardship guidelines. Clinical resolution occurred in 88% of cases, while 12% required treatment modification. Adverse effects were minimal.

CONCLUSION: Effective management of odontogenic infections demands rational antibiotic use to mitigate the rise of antimicrobial resistance. This study highlights promising trends alongside areas needing attention, notably duration of therapy and empirical prescribing. Coordinated stewardship efforts, prescriber education, and robust surveillance are essential to preserve antibiotic efficacy and safeguard patient outcomes

KEYWORDS: Odontogenic infections, Antimicrobial resistance, Dental prescribing practices, Empirical antibiotic use, Antibiotic stewardship, Public and private dental settings.

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INTRODUCTION: Odontogenic infections remain the most common bacterial orofacial diseases come across in the dental outpatient department, count for up to 90% of head-and-neck infections [1]. Despite being polymicrobial and largely responsive to minor surgical interventions. Antibiotics continue to be freely prescribed often practically and for durations exceeding international recommendations. [2,3] Such careless use exerts selective pressure on the resident oral flora, accelerating the emergence of antimicrobial resistance (AMR) that now compromises the efficacy of first-line agents such as amoxicillin.

Globally, approximately 25-30 % of oral streptococci demonstrate reduced susceptibility to penicillin, while a recent review from Pakistan reported 28 % resistance to amoxicillin in odontogenic pus isolates. Surveys among dental practitioners repeatedly document prolonged antibiotic courses (> 5 days), preference for broad-spectrum agents, and absence of culture guidance, reflecting major stewardship gaps. [4-6]

Using antibiotics wisely, guided by local monitoring and stewardship principles, is vital to achieve drug effectiveness, reduce treatment failures, and advance Pakistan's national AMR strategy. [7, 8]

Our study aimed to access antibiotic prescribing patterns for odontogenic infections among dental practitioners at Civil Hospital Hyderabad LUMHS, evaluate microbial resistance patterns from culture data, and evaluate prescriber awareness of stewardship principles. Such evidence is essential to develop targeted strategies to optimize antibiotic use and curb the rise of resistance in this common yet clinically significant infection.

METHODOLOGY: A descriptive cross-sectional study carried out in between March 2025 and May 2025 at Civil Hospital Dental OPD, Hyderabad, LUMHS, Eligible participants were adult's ≥18 years with a clinical diagnosis of odontogenic infection (periapical abscess, cellulitis, or periodontal abscess).

Exclusion criteria: immunocompromised patients, pregnancy, lactation, or prior antibiotic therapy exceeding 24 hours.

Data were collected using a pre-tested structured proforma capturing:

Patient demographics (age, gender, relevant history)

Infection characteristics (type, severity, location)

Antibiotic prescriptions (drug, dosage, duration, prescriber)

Prescriber profiles (qualification, experience, clinical setting)

Microbiological Assessment

Pus/swab samples from consenting participants were cultured aerobically and anaerobically within two hours of collection. Antimicrobial susceptibility was tested using the CLSI disc-diffusion method.

Patients were followed up seven days post-prescription to assess clinical resolution.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics 31

Descriptive statistics (mean ± SD, proportions) summarized the data.

Chi-square tests and Fisher's exact test evaluated associations between categorical variables.

Multivariate logistic regression identified predictors of guideline non-compliance.

Significance was set at $p < 0.05$.

RESULTS: A total of 215 patients with odontogenic infections participated in the study, with a mean age of 34.5 years and a slightly higher proportion of males (55.8%). The most common infections were periapical abscesses (51%) and cellulitis (26%), with nearly half classified as mild in severity. Amoxicillin was the most frequently prescribed antibiotic (56%), followed by the combination of amoxicillin and clavulanic acid (23%). The majority of prescriptions (77%) adhered to guideline-recommended dosages, with 65% of courses lasting five days or less. Culture data from 80 cases revealed that 75% of isolates were sensitive to amoxicillin, although 25% showed resistance, and notable resistance was also found against clindamycin (12.5%). General dentists made most prescriptions (70%), and 65% of prescribers reported awareness of antibiotic stewardship guidelines. Clinically, 88% of patients showed resolution of infection after treatment, while 12% experienced treatment failure requiring further intervention. Adverse reactions were limited and mostly mild. These findings highlight the current prescribing trends and underscore the importance of ongoing stewardship to prevent further antimicrobial resistance in odontogenic infections.

TABLE I: PARTICIPANT DEMOGRAPHICS AND INFECTION CHARACTERISTICS

Characteristic	Number (n=215)	Percentage (%)
Age (Mean ± SD)	34.5 ± 12.3	-
Gender		
- Male	120	55.8
- Female	95	44.2
Medical History		
- Diabetes/Immunocompromised	30	14
- None	185	86
Type of Infection		
- Periapical abscess	110	51
- Cellulitis	55	26
- Periodontal abscess	30	14
- Other	20	9
Severity of Infection		
- Mild	100	46.5
- Moderate	80	37
- Severe	35	16.5

TABLE II: ANTIBIOTIC PRESCRIPTION PATTERNS

Antibiotic Prescribed	Number (n=215)	Percentage (%)
Amoxicillin	120	56
Amoxicillin + Clavulanic Acid	50	23
Metronidazole	30	14
Clindamycin	10	5
Other (e.g., Ciprofloxacin)	5	2
Duration of Antibiotic Course	Number	Percentage (%)
≤ 5 days	140	65
> 5 days	75	35

FIGURE I: ANTIBIOTIC SENSITIVITY PATTERNS OF ORGANISMS (N=80 CULTURES)

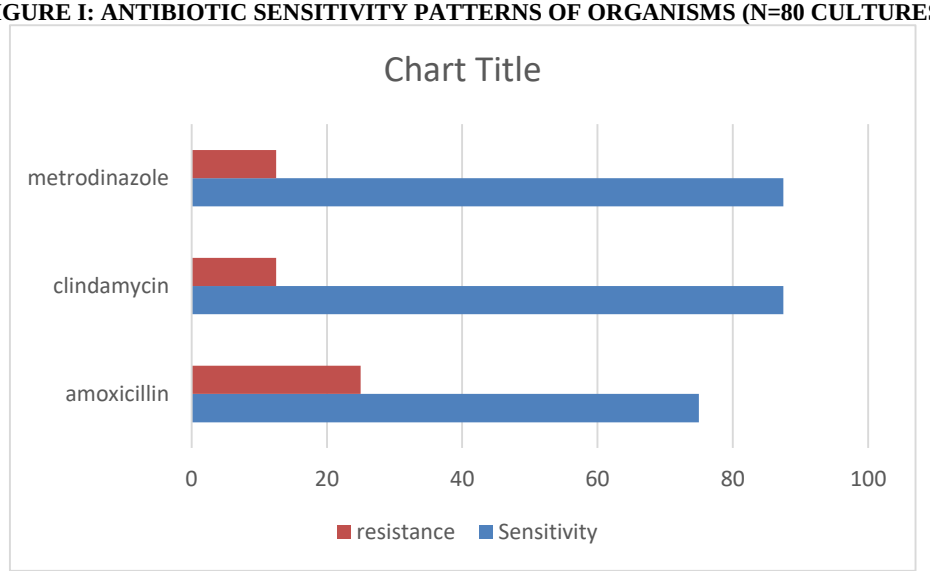
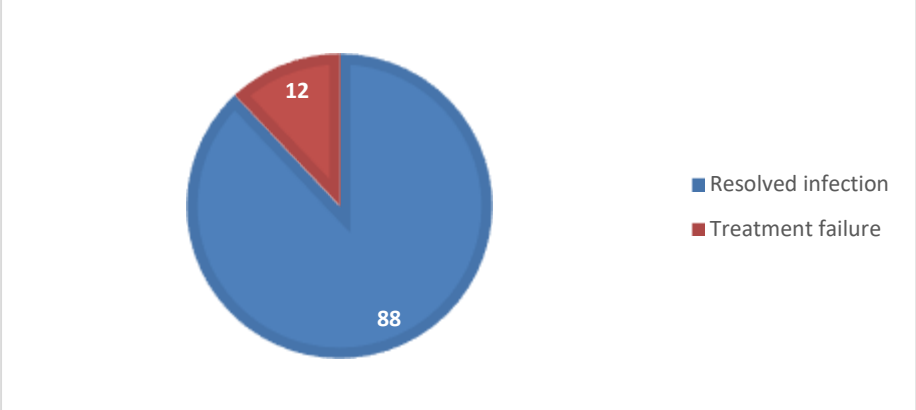


TABLE III: PRESCRIBER PROFILE AND AWARENESS

Prescriber Type	Number (n=215)	Percentage (%)
General dentists	150	70
Specialists	40	19
Undergraduate dental students	25	11
Awareness of Antibiotic Stewardship	Number	Percentage (%)
Aware	140	65
Not aware	75	35

FIGURE II: PATIENT OUTCOMES AFTER TREATMENT



The study population included 215 patients (mean age 34.5 ± 12.3 years); males constituted 55.8%. Periapical abscess was the predominant diagnosis (51%), followed by cellulitis (26%). Severity varied, with 46.5% classified as mild.

Amoxicillin was prescribed in 56% of cases, followed by amoxicillin/clavulanic acid (23%) and metronidazole (14%). Clindamycin and other antibiotics were less commonly prescribed. Approximately 77% of prescriptions were guideline-concordant in dosage; however, 35% exceeded recommended treatment durations (>5 days). The majority (84%) were empirical rather than culture-guided prescriptions.

Among 80 cultured cases, Streptococcus viridians and anaerobic species dominated. Sensitivity to amoxicillin was noted in 75% of isolates, with 25% showing resistance. Clindamycin resistance was present in 12.5%, and Metronidazole resistance was also 12.5% underscoring the emerging challenge.
General dentists accounted for 70% of prescriptions, with specialists and dental students representing the remainder. Awareness of antibiotic stewardship guidelines was reported by 65%.
Clinical resolution was achieved in 88% of patients. Treatment failures (12%) necessitated antibiotic modification or referral. Adverse effects were infrequent and generally mild

DISCUSSION: This research delves into the prescribing habits of antibiotics for odontogenic infections and their connection to antimicrobial resistance (AMR), an escalating global health issue in medical and dental fields. Amoxicillin is frequently used for these infections due to its efficacy against common oral bacteria and its positive safety record. The combination of amoxicillin with clavulanic acid and the use of metronidazole are strategies to address the mix of aerobic and anaerobic bacteria often found in odontogenic abscesses. [9]
Contrary to guidelines advocating brief antibiotic regimens, the study found that over a third of prescriptions surpassed the recommended 5-day period. Evidence supports shorter treatment durations, which are effective when paired with proper surgical care and help minimize the selective pressure leading to resistance. Unnecessary prolongation of antibiotic therapy can promote resistance and heighten the risk of adverse effects.
Microbiological testing via culture and sensitivity is not commonly used in dental practice, leading to most prescriptions being empirical. The study's microbiological data showed a 25% resistance rate to amoxicillin and approximately 12.5% resistance to clindamycin, echoing global trends of rising resistance in oral pathogens like Staphylococcus aureus and Prevotella species. This resistance can compromise treatment effectiveness and lead to persistent infections or complications. [10]
General dentists were responsible for the majority of prescriptions. While 65% acknowledged awareness of antibiotic stewardship concepts, there are clear gaps in applying this knowledge in practice, particularly in determining the appropriate duration of treatment and reducing empirical prescribing. This points to the urgent need for focused stewardship programs in dental training and ongoing professional development. Better surveillance and the use of regional antibiograms could enhance the precision and evidence-based nature of antibiotic selection. [11]
Most cases had positive clinical outcomes, with 88% of infections resolving successfully. However, the 12% failure rate highlights the impact of resistance and the problems caused by improper antibiotic use. The low rate of adverse events suggests that safety concerns are not a major barrier, emphasizing the need to focus on improving prescribing practices rather than restricting antibiotic use overall

CONCLUSION: Prudent antibiotic prescribing is essential to combat antimicrobial resistance in managing odontogenic infections. While the study highlights promising trends, challenges persist in optimizing treatment durations and reducing empirical prescribing. Tackling these issues through stewardship initiatives, prescriber education, and robust resistance surveillance is critical to preserving antibiotic efficacy and improving patient outcomes.

RECOMMENDATION: Boost antibiotic stewardship education for dental practitioners. Workshops with real-life case studies can change prescribing habits, showing how shorter courses can be as effective as longer ones. Promote guideline-based prescribing with narrow-spectrum antibiotics and shorter durations. For a mild periapical abscess, a 5-day amoxicillin course is often enough, reducing unnecessary microbiome disruption. Reserve clindamycin for confirmed penicillin allergies. Overuse has led to a 12.5% resistance rate, making it crucial to save clindamycin for when it's truly needed. Encourage microbiological sampling in moderate to severe infections. Even sending samples to a central lab can guide therapy and improve outcomes. Establish regular surveillance of resistance patterns. Regional antibiograms can provide actionable insights, helping dentists make informed choices and reducing empirical prescribing.

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Author Contributions:

Asad Ali: Concept and study idea, topic selection, study design, manuscript drafting, and all computer-based work except statistical analysis.

Maya Bhojwani: Drafted and refined the Methodology section and contributed to manuscript writing.

Muhammad Arslan: Performed statistical analysis using SPSS and analyzed results.

Vikant Kumar: Assisted in data collection and documentation.

Sarfaraz Chandio: Assisted in data collection and preliminary record management.

Dr. Ram Pershad: Provided overall supervision, critical revision of the manuscript, and final approval of the version to be submitted.