

Studying the Implications of Antibiotic Resistance in Dental Infections

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Background: Antibiotic resistance poses a growing challenge to the effective management of dental infections. Inappropriate prescribing practices and prior antimicrobial exposure contribute to the emergence of resistant microorganisms, complicating treatment outcomes. This study investigates the implications of antibiotic resistance in dental infections by evaluating bacterial resistance patterns, prescribing behaviors, and associated clinical outcomes.

Methods: A descriptive cross-sectional study was conducted involving 160 adult patients with diagnosed dental infections and 60 dental practitioners who prescribe antibiotics. Data were collected using structured questionnaires, clinical assessment forms, and microbiological laboratory reports. Clinical specimens from infected sites were cultured, and antibiotic susceptibility testing was performed against commonly prescribed dental antibiotics. Statistical analysis assessed associations between prior antibiotic use, resistance patterns, and clinical outcomes.

Results: Periapical abscesses (32.5%) were the most common infection. *Streptococcus viridans* (30.6%) and *Staphylococcus aureus* (23.1%) were the predominant isolates. Resistance rates were highest for penicillin (57.5%), amoxicillin (46.3%), and erythromycin (42.5%); the lowest resistance was observed for amoxicillin-clavulanic acid (11.9%). Amoxicillin was the most frequently prescribed antibiotic (40.0%). Prior antibiotic use within six months (64.4% of patients) was significantly associated with resistant isolates (76.7% vs. 36.8%, $p < 0.001$). Among resistant infections ($n=100$), delayed healing (41.0%) and recurrent infection (28.0%) were common, with 12.0% requiring hospital referral. While 91.7% of practitioners recognized resistance as a major concern, only 43.3% had received formal training on rational antibiotic use.

Conclusion: Antibiotic resistance is highly prevalent among

COPYRIGHT STATEMENT: microorganisms isolated from dental infections, particularly against

Copyright: © 2026 Authors. first-line agents like penicillin and amoxicillin. Prior antibiotic
Open access publication under exposure is a significant predictor of resistance. Gaps in
the terms and conditions antimicrobial stewardship training and inappropriate prescribing
of the Creative CommonsAttribution (CC practices contribute to adverse clinical outcomes, including delayed
BY) healing and treatment failure. Strengthening evidence-based
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education is urgently needed to preserve antibiotic effectiveness in
dental practice.

Background

Dental infections are among the most common conditions encountered in clinical dental practice and may range from localized carious lesions and periodontal diseases to severe odontogenic abscesses capable of spreading into facial spaces and systemic circulation. These infections are primarily caused by complex microbial communities consisting of aerobic and anaerobic bacteria that colonize the oral cavity. The management of dental infections has traditionally relied on operative dental treatment combined with the use of antibiotics when systemic involvement or spreading infection is present. However, the growing emergence of antibiotic-resistant microorganisms has become a major challenge for healthcare systems worldwide and has significantly affected the field of dentistry (Nizami et al., 2025).

Antibiotics have played a critical role in reducing complications associated with dental infections, particularly in cases involving cellulitis, acute apical abscesses, periodontal abscesses, and postoperative infections. Commonly prescribed antibiotics in dentistry include penicillin, amoxicillin, metronidazole, clindamycin, and macrolides. These medications are generally effective when used appropriately; however, excessive and inappropriate prescribing practices have contributed to the development of bacterial resistance. In many situations, antibiotics are prescribed unnecessarily for conditions that could be managed effectively through local dental interventions alone (Fischer et al., 2025).

Antibiotic resistance occurs when bacteria develop the ability to survive exposure to antimicrobial agents that would normally eliminate them or inhibit their growth. This phenomenon may result from genetic mutations

or the acquisition of resistance genes from other microorganisms. Resistant bacteria can persist within the oral cavity and spread among individuals and communities, making infections more difficult to treat. The misuse of antibiotics, including incorrect dosage, inadequate duration, self-medication, and overprescription, accelerates the development and dissemination of resistant strains (Haque et al., 2019).

The oral cavity contains a highly diverse microbiome that plays an important role in maintaining oral and systemic health. Disturbances in the balance of oral microorganisms may contribute to the progression of infectious diseases and the emergence of resistant bacterial populations. Repeated exposure to antibiotics can alter the normal oral flora, encouraging the survival of resistant organisms while eliminating susceptible bacteria. This selective pressure creates an environment where resistant pathogens may dominate and increase the risk of persistent or recurrent infections (Schmid et al., 2026).

Dentists are responsible for a significant proportion of antibiotic prescriptions in outpatient healthcare settings. In recent years, concerns have increased regarding inappropriate prescribing habits in dentistry, including prescribing antibiotics for irreversible pulpitis, uncomplicated toothache, or routine dental procedures without clear indications. Fear of litigation, diagnostic uncertainty, time constraints, and patient expectations are among the factors influencing unnecessary antibiotic use. Such practices contribute not only to antibiotic resistance but also to adverse drug reactions and increased healthcare costs (Agarwal et al., 2026).

Antibiotic-resistant dental infections may lead to serious clinical consequences, including delayed healing, treatment failure, prolonged pain, and the spread of infection into deeper anatomical spaces. Severe odontogenic infections can progress rapidly and may become life-threatening if resistant organisms limit the effectiveness of first-line antimicrobial therapy. In addition,

resistant infections often require the use of broader-spectrum or more potent antibiotics, which may increase the risk of toxicity, secondary infections, and further resistance development (Domínguez-Domínguez et al., 2024).

The global rise of antimicrobial resistance has prompted healthcare organizations and public health authorities to emphasize antimicrobial stewardship in all medical disciplines, including dentistry. Antimicrobial stewardship involves the responsible use of antibiotics to optimize patient outcomes while minimizing the development of resistance. In dentistry, this includes accurate diagnosis, evidence-based prescribing, appropriate selection of antibiotics, and patient education regarding adherence to prescribed regimens. The implementation of stewardship programs is considered essential for preserving the effectiveness of existing antimicrobial agents (Ardila & Bedoya-García, 2022).

The implications of antibiotic resistance extend beyond oral health and may influence overall systemic health. Oral infections caused by resistant bacteria can contribute to systemic inflammatory responses and may increase the risk of complications in medically compromised patients. Individuals with diabetes, cardiovascular disease, immunosuppression, or other chronic conditions may be particularly vulnerable to the effects of resistant odontogenic infections. Furthermore, resistant oral microorganisms may act as reservoirs of resistance genes that can be transferred to other pathogenic bacteria within the body (Becker et al., 2024).

Research into antibiotic resistance in dentistry has gained increasing importance due to the growing prevalence of resistant organisms and the limited development of new antimicrobial agents. Investigations have focused on patterns of antibiotic prescribing, bacterial susceptibility profiles, mechanisms of resistance, and strategies to reduce unnecessary antibiotic use. Understanding the relationship between dental infections and antimicrobial resistance is essential for improving clinical practice, guiding treatment

protocols, and enhancing patient safety (Kulis et al., 2025).

Studying the implications of antibiotic resistance in dental infections is therefore essential for addressing one of the most significant public health challenges facing modern healthcare. Greater awareness among dental professionals, improved prescribing practices, and continued research are necessary to control the spread of resistant microorganisms and ensure effective management of dental infections. By promoting rational antibiotic use and strengthening infection control measures, dentistry can play an important role in combating antimicrobial resistance and protecting both oral and systemic health (Danadneh et al., 2025).

Methodology

Study Design

This study was conducted using a descriptive cross-sectional research design to evaluate the implications of antibiotic resistance in dental infections and to assess the patterns, contributing factors, and clinical outcomes associated with antimicrobial resistance in dental practice. The study aimed to investigate the prevalence of antibiotic-resistant dental infections, the prescribing behavior of dental practitioners, and the awareness of antibiotic stewardship principles among healthcare providers involved in dental care. The design was selected because it allowed for the collection and analysis of data from a defined population within a specific study period.

Study Setting

The study was carried out in dental healthcare facilities that provided diagnostic and therapeutic services for patients presenting with dental infections. These facilities included outpatient dental clinics, university-affiliated dental centers, and private dental practices. The selected settings offered a wide range of dental services, including restorative dentistry, oral surgery, periodontics, and emergency dental care, enabling the inclusion of patients with various forms and severities of odontogenic infections.

Study Population

The study population consisted of adult patients diagnosed with dental infections and dental practitioners involved in prescribing antibiotics for oral and maxillofacial conditions. Patients included individuals presenting with conditions such as periapical abscesses, periodontal abscesses, cellulitis, pericoronitis, and other odontogenic infections requiring clinical evaluation. Dental practitioners included general dentists and dental specialists who routinely managed infectious dental conditions and prescribed antimicrobial medications as part of patient treatment.

Sample Size and Sampling Technique

A calculated sample size was determined to achieve statistically reliable results based on the estimated prevalence of antibiotic resistance in dental infections and the confidence interval required for analysis. Participants were selected using a convenience sampling technique. Eligible patients attending the participating dental facilities during the study period were invited to participate. Similarly, dental practitioners available during data collection and willing to participate were included in the study. The sample size was considered adequate to provide representative findings regarding antibiotic resistance patterns and prescribing practices.

Inclusion and Exclusion Criteria

Patients were included if they were adults diagnosed clinically with an active dental infection and had either received antibiotic therapy or required antibiotic treatment as part of their management. Dental practitioners were included if they had experience in prescribing antibiotics for dental conditions. Patients who had severe systemic illnesses unrelated to dental infections, those who were unable to provide informed consent, or individuals currently participating in another clinical study were excluded. Dental practitioners who did not routinely prescribe antibiotics or declined participation were also excluded from the study.

Data Collection Tools

Data were collected using structured questionnaires, clinical assessment forms, and microbiological laboratory reports. Separate questionnaires were designed for patients and dental practitioners. The patient questionnaire collected demographic information, medical and dental history, previous antibiotic use, symptoms related to dental infection, and history of recurrent infections. The practitioner questionnaire assessed prescribing habits, knowledge regarding antibiotic resistance, preferred antimicrobial agents, and awareness of antibiotic stewardship guidelines.

Clinical assessment forms were used to document the type, severity, and location of dental infections. Laboratory reports included bacterial culture and antibiotic sensitivity testing results obtained from collected clinical specimens. The data collection tools were reviewed for clarity, relevance, and completeness before the initiation of the study.

Clinical Examination and Diagnosis

All participating patients underwent comprehensive dental examinations performed by qualified dental professionals. The examination included assessment of pain, swelling, pus discharge, tooth mobility, periodontal involvement, and facial space infection when present. Diagnostic procedures included intraoral and extraoral examinations as well as radiographic investigations when indicated. The diagnosis of dental infections was established based on clinical findings supported by radiographic evidence and patient history.

Specimen Collection and Microbiological Analysis

Samples from infected sites were collected under aseptic conditions using sterile aspiration syringes, paper points, or swabs depending on the nature and location of the infection. The collected specimens were transported promptly to the microbiology laboratory for culture and sensitivity testing. Bacterial isolates were

identified using standard microbiological techniques, including gram staining, colony morphology assessment, and biochemical testing.

Antibiotic susceptibility testing was performed using standardized antimicrobial sensitivity methods to determine bacterial resistance patterns against commonly prescribed dental antibiotics. The antibiotics tested included penicillin, amoxicillin, amoxicillin-clavulanic acid, metronidazole, clindamycin, erythromycin, and other relevant antimicrobial agents used in dental practice. Results were interpreted according to accepted laboratory guidelines.

Data Collection Procedure

Data collection was conducted over a defined study period. Eligible participants were informed about the purpose and procedures of the study before obtaining informed consent. Patients completed the questionnaires with assistance when necessary, while dental practitioners completed self-administered forms regarding prescribing behavior and antibiotic use. Clinical examinations and specimen collection were performed during the patients' dental visits. Laboratory findings were documented and linked to the corresponding clinical data using coded identification numbers to maintain confidentiality.

Outcome Measures

The primary outcome measures included the prevalence of antibiotic-resistant bacteria isolated from dental infections and the patterns of antimicrobial resistance against commonly prescribed antibiotics. Secondary outcome measures included the frequency of antibiotic prescription for dental infections, practitioner awareness regarding antibiotic stewardship, and the association between prior antibiotic exposure and resistant bacterial isolates.

Data Management and Statistical Analysis

Collected data were checked for completeness, coded, and entered into a computerized database for analysis. Statistical analysis was performed

using appropriate statistical software. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics, prescribing patterns, and microbiological findings. Inferential statistical tests were applied to determine associations between variables related to antibiotic resistance and clinical characteristics. Statistical significance was determined at a predefined confidence level.

Validity and Reliability

To ensure validity, the data collection tools were reviewed and evaluated by experts in dentistry and microbiology before implementation. A pilot assessment was conducted on a small group of participants to assess the clarity and feasibility of the questionnaires and clinical forms. Necessary modifications were made prior to the main study.

Results

A total of 220 participants were included in this study, consisting of 160 patients diagnosed with dental infections and 60 dental practitioners involved in antibiotic prescribing for odontogenic conditions. The study evaluated demographic characteristics, types of dental

infections, antibiotic prescribing patterns, bacterial isolates, antimicrobial resistance profiles, and awareness regarding antibiotic stewardship. The findings demonstrated a considerable prevalence of antibiotic-resistant microorganisms associated with dental infections and revealed variations in prescribing practices among dental practitioners.

Ethical Considerations

Reliability was enhanced through standardized clinical examination procedures, uniform specimen collection methods, and consistent laboratory testing protocols.

Ethical approval for the study was obtained from the appropriate institutional review authority prior to data collection. Participation was voluntary, and all participants provided informed consent before enrollment. Confidentiality and privacy were maintained throughout the study by using coded identifiers instead of personal information. Participants were informed that they had the right to withdraw from the study at any stage without affecting their access to treatment or professional responsibilities. All collected data were used solely for research purposes.

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Table 1. Demographic Characteristics of Patients with Dental Infections (n = 160)

Variable	Frequency (n)	Percentage (%)
Age Group (Years)		
18–30	58	36.3
31–45	49	30.6
46–60	37	23.1
>60	16	10.0
Gender		
Male	92	57.5
Female	68	42.5
Smoking Status		
Smokers	71	44.4
Non-smokers	89	55.6

Previous Antibiotic Use within 6 Months		
Yes	103	64.4
No	57	35.6

The majority of patients were aged between 18–30 years (36.3%), followed by patients aged 31–45 years (30.6%). Male participants represented 57.5% of the study population. Previous antibiotic use within the last six months was

reported in 64.4% of patients, indicating widespread prior exposure to antimicrobial agents, which may contribute to increased bacterial resistance

Table 2. Distribution of Dental Infections among Patients (n = 160)

Type of Dental Infection	Frequency (n)	Percentage (%)
Periapical Abscess	52	32.5
Periodontal Abscess	38	23.8
Pericoronitis	27	16.9
Cellulitis	19	11.9
Acute Pulpal Infection	15	9.4
Facial Space Infection	9	5.6

Periapical abscesses were the most common dental infections identified among patients, accounting for 32.5% of cases, followed by periodontal abscesses (23.8%). Facial space

infections represented the least common condition (5.6%) but were clinically significant due to their potential severity and complications.

Table 3. Antibiotics Commonly Prescribed by Dental Practitioners (n = 60)

Antibiotic	Frequency (n)	Percentage (%)
Amoxicillin	24	40.0
Amoxicillin-Clavulanic Acid	14	23.3
Metronidazole	10	16.7
Clindamycin	7	11.7
Azithromycin	5	8.3

Amoxicillin was the most commonly prescribed antibiotic among dental practitioners (40.0%), followed by amoxicillin-clavulanic acid (23.3%). Clindamycin and azithromycin were prescribed less frequently. These findings demonstrated reliance on broad-spectrum antibiotics in the management of dental infections.

Table 4. Reasons for Antibiotic Prescription among Dental Practitioners (n = 60)

Reason for Prescription	Frequency (n)	Percentage (%)
Facial Swelling	21	35.0
Acute Dental Abscess	16	26.7
Postoperative Prevention	11	18.3
Severe Pain without Swelling	8	13.3
Patient Request	4	6.7

Facial swelling was the leading reason for antibiotic prescription (35.0%), followed by acute dental abscesses (26.7%). Notably, 13.3% of practitioners prescribed antibiotics for severe pain without swelling, and 6.7% prescribed antibiotics based on patient request, indicating potential inappropriate prescribing practices.

Table 5. Bacterial Isolates Identified from Dental Infection Samples (n = 160)

Bacterial Isolate	Frequency (n)	Percentage (%)
Streptococcus viridans	49	30.6
Staphylococcus aureus	37	23.1
Prevotella species	28	17.5
Fusobacterium species	21	13.1
Peptostreptococcus species	15	9.4
Others	10	6.3

Streptococcus viridans was the most frequently isolated microorganism (30.6%), followed by Staphylococcus aureus (23.1%). Anaerobic bacteria such as Prevotella and Fusobacterium species were also commonly isolated, highlighting the polymicrobial nature of dental infections.

Table 6. Antibiotic Resistance Patterns among Isolated Bacteria (n = 160)

Antibiotic	Resistant Isolates (n)	Resistance Rate (%)
Penicillin	92	57.5
Amoxicillin	74	46.3
Erythromycin	68	42.5
Clindamycin	39	24.4
Metronidazole	28	17.5
Amoxicillin-Clavulanic Acid	19	11.9

Penicillin demonstrated the highest resistance rate among bacterial isolates (57.5%), followed by amoxicillin (46.3%) and erythromycin (42.5%). Amoxicillin-clavulanic acid showed the lowest resistance rate (11.9%),

indicating better effectiveness against resistant strains compared to other antibiotics commonly used in dental practice.

Table 7. Association between Previous Antibiotic Use and Resistant Bacterial Isolates (n = 160)

Previous Antibiotic Use	Resistant Isolates Present n (%)	Resistant Isolates Absent n (%)	p-value
Yes (n = 103)	79 (76.7)	24 (23.3)	<0.001
No (n = 57)	21 (36.8)	36 (63.2)	

A statistically significant association was observed between previous antibiotic use and the presence of resistant bacterial isolates ($p < 0.001$). Patients with a history of antibiotic use within the previous six months demonstrated substantially higher resistance rates (76.7%) compared to patients without previous antibiotic exposure (36.8%).

Table 8. Awareness of Antibiotic Stewardship among Dental Practitioners (n = 60)

Awareness Variable	Frequency (n)	Percentage (%)
Familiar with Antibiotic Stewardship	41	68.3
Attended Training on Rational Antibiotic Use	26	43.3
Followed Clinical Prescribing Guidelines	38	63.3
Believed Antibiotic Resistance is a Major Dental Concern	55	91.7

Most dental practitioners (91.7%) considered antibiotic resistance a major concern in dentistry. However, only 43.3% had attended formal training related to rational antibiotic use, suggesting a gap between awareness and professional education regarding antimicrobial stewardship.

Table 9. Clinical Outcomes of Patients with Resistant Infections (n = 100)

Clinical Outcome	Frequency (n)	Percentage (%)
Delayed Healing	41	41.0
Recurrent Infection	28	28.0
Need for Antibiotic Change	19	19.0
Hospital Referral	12	12.0

Delayed healing was the most common clinical outcome among patients with resistant infections (41.0%), followed by recurrent infection (28.0%). Hospital referral was required in 12.0% of resistant cases, reflecting the serious implications of antimicrobial resistance in dental infections.

The overall findings of this study demonstrated a high prevalence of antibiotic resistance among microorganisms isolated from dental infections. Resistance was particularly high against commonly prescribed antibiotics such as penicillin and amoxicillin. Previous antibiotic

exposure was significantly associated with resistant infections. In addition, inappropriate prescribing practices and insufficient antimicrobial stewardship training among dental practitioners may contribute to the ongoing increase in antibiotic resistance within dental settings.

Discussion

The present study investigated the implications of antibiotic resistance in dental infections through the evaluation of bacterial resistance patterns, prescribing practices, and clinical outcomes associated with odontogenic infections. The findings demonstrated a considerable prevalence of antibiotic-resistant microorganisms among patients with dental infections, highlighting the growing challenge of antimicrobial resistance within dental practice. These findings support previous evidence indicating that antibiotic resistance has become a major public health concern affecting both medical and dental healthcare systems (Nizami et al., 2025).

In the current study, the majority of patients with dental infections were within the younger age groups, particularly between 18–30 years and 31–45 years. This may be attributed to greater exposure to dental caries, poor oral hygiene habits, smoking, and delayed dental treatment among younger adults. Similar observations were reported by Haque et al. (2019), who noted that odontogenic infections frequently affect active adult populations due to lifestyle factors and inconsistent preventive dental care. Male predominance observed in the present study may also reflect differences in healthcare-seeking behavior and oral hygiene practices between genders.

The findings of this study showed that 64.4% of patients had used antibiotics within the previous six months. This high level of previous antibiotic exposure is clinically important because repeated antibiotic use creates selective pressure favoring the survival of resistant microorganisms. The significant association found between prior

antibiotic use and resistant bacterial isolates in the present study further supports this relationship. Similar conclusions were reported by Ardila and Bedoya-García (2022), who identified prior antimicrobial exposure as one of the strongest predictors of resistance development in odontogenic infections.

Periapical abscesses represented the most common dental infection among the studied patients, followed by periodontal abscesses and pericoronitis. These findings are consistent with the literature indicating that pulpal and periodontal infections remain the leading causes of odontogenic infections requiring antibiotic therapy. Fischer et al. (2025) similarly reported that periapical infections accounted for a substantial proportion of severe odontogenic infections evaluated over a long-term clinical analysis.

Regarding antibiotic prescribing practices, amoxicillin was the most commonly prescribed antibiotic among dental practitioners in the present study. This finding is expected because amoxicillin remains the first-line antibiotic for many dental infections due to its broad-spectrum activity and favorable safety profile. Comparable findings were documented by Becker et al. (2024), who observed widespread use of amoxicillin among dentists for the management of oral infections. However, the extensive use of amoxicillin may contribute to increasing resistance rates when prescriptions are not evidence-based.

Amoxicillin-clavulanic acid was the second most commonly prescribed antibiotic in this study. The preference for this combination therapy may reflect attempts by practitioners to overcome resistance associated with beta-lactamase-producing bacteria. Although this antibiotic demonstrated lower resistance rates in the present study compared with penicillin and amoxicillin alone, excessive dependence on broad-spectrum agents may eventually contribute to further resistance development. Schmid et al. (2026) emphasized that inappropriate escalation

to broad-spectrum antibiotics without microbiological indication may worsen antimicrobial resistance trends in dentistry.

An important finding in this study was that some practitioners prescribed antibiotics for severe pain without swelling and in response to patient requests. These findings suggest the persistence of inappropriate prescribing behaviors among dental professionals. Antibiotics are not routinely indicated for uncomplicated dental pain in the absence of systemic involvement or spreading infection. Similar concerns were highlighted by Agarwal et al. (2026), who reported that diagnostic uncertainty, patient pressure, and fear of treatment failure frequently contribute to unnecessary antibiotic prescriptions in dental settings.

Microbiological analysis in the current study demonstrated that *Streptococcus viridans* was the most frequently isolated microorganism, followed by *Staphylococcus aureus* and several anaerobic species including *Prevotella* and *Fusobacterium*. These findings confirm the polymicrobial nature of dental infections and are consistent with previous reports describing mixed aerobic and anaerobic bacterial flora in odontogenic infections. Kulis et al. (2025) also identified oral streptococci and anaerobic bacteria as predominant pathogens associated with resistant oral infections.

The resistance profile observed in this study revealed that penicillin exhibited the highest resistance rate, followed by amoxicillin and erythromycin. These findings are alarming because penicillin and amoxicillin remain among the most frequently prescribed antibiotics in dentistry. Similar resistance patterns were documented by Fischer et al. (2025), who observed increasing resistance among odontogenic pathogens against commonly used beta-lactam antibiotics. The elevated resistance rates identified in the present study may be associated with frequent empirical prescribing and repeated exposure of oral microorganisms to these agents.

Clindamycin and metronidazole demonstrated comparatively lower resistance rates than penicillin and amoxicillin in this study. These findings may indicate preserved effectiveness of these agents against certain resistant anaerobic infections. Nevertheless, resistance to clindamycin remains clinically important because this antibiotic is commonly prescribed for patients allergic to penicillin. Ardila and Bedoya-García (2022) similarly reported variable resistance patterns to clindamycin among oral pathogens and emphasized the importance of susceptibility testing when possible.

Amoxicillin-clavulanic acid showed the lowest resistance rate among the tested antibiotics in the current study. This may be explained by the inhibitory effect of clavulanic acid against beta-lactamase-producing organisms. Comparable findings were described by Schmid et al. (2026), who noted that combination therapies containing beta-lactamase inhibitors often retain greater effectiveness against resistant odontogenic bacteria. However, overreliance on such antibiotics may accelerate future resistance if stewardship measures are not strengthened.

The present study identified a statistically significant association between previous antibiotic use and resistant bacterial isolates. Patients with recent antibiotic exposure showed markedly higher rates of resistance compared with those without prior antibiotic use. This finding reinforces the role of antibiotic misuse in the emergence of resistant microorganisms. Haque et al. (2019) similarly concluded that repeated and inappropriate antibiotic exposure significantly contributes to antimicrobial resistance in oral infections and may compromise future treatment effectiveness.

Awareness regarding antibiotic stewardship among dental practitioners was generally high in this study, with most participants recognizing antibiotic resistance as a major dental concern. However, less than half of practitioners had attended formal training programs on rational antibiotic use. This discrepancy between

awareness and practical education may contribute to inconsistent prescribing behavior. Danadneh et al. (2025) similarly found that although many dental professionals understood the seriousness of antibiotic resistance, gaps remained in formal stewardship education and implementation of prescribing guidelines.

The clinical outcomes observed among patients with resistant infections demonstrated the significant burden associated with antimicrobial resistance. Delayed healing, recurrent infections, and the need for antibiotic modification were frequently encountered in the present study. In some cases, resistant infections required hospital referral due to severity and inadequate response to initial therapy. These findings are consistent with the observations of Domínguez-Domínguez et al. (2024), who reported that resistant dental infections may increase treatment complexity, prolong recovery, and negatively affect patient quality of life.

The findings of the present study emphasize the urgent need for stronger antimicrobial stewardship programs within dental healthcare settings. Rational antibiotic prescribing, adherence to evidence-based clinical guidelines, and continuing professional education are essential strategies for reducing inappropriate antibiotic use and limiting the progression of resistance. Additionally, improving patient awareness regarding the limitations of antibiotics in managing dental pain and localized infections may reduce pressure on clinicians to prescribe unnecessary antimicrobial agents.

The current study contributes valuable evidence regarding the growing implications of antibiotic resistance in dental infections and highlights the importance of microbiological surveillance in dental practice. The identification of high resistance rates among commonly prescribed antibiotics underscores the necessity for careful antibiotic selection and consideration of local resistance patterns. Continued research and multidisciplinary collaboration are required to preserve antibiotic effectiveness and improve the management of odontogenic infections in the future.

Conclusion

The present study demonstrated a high prevalence of antibiotic resistance among microorganisms isolated from dental infections, particularly against commonly prescribed antibiotics such as penicillin and amoxicillin. Previous antibiotic exposure was significantly associated with resistant bacterial isolates, while inappropriate prescribing practices and insufficient antimicrobial stewardship training among dental practitioners were identified as important contributing factors. Resistant dental infections were associated with adverse clinical outcomes including delayed healing, recurrent infection, and increased need for advanced treatment. These findings highlight the urgent need for evidence-based antibiotic prescribing, enhanced antimicrobial stewardship programs, continuous professional education, and greater awareness among both dental professionals and patients to reduce the spread of antibiotic resistance and improve the management of dental infections.

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