

# Antibiotic Prescribing Practices Among Dental Professionals in Saudi Arabia: A Cross-Sectional Study

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## Abstract

**Objective:** This study examined antibiotic prescribing patterns among dental professionals in Saudi Arabia.

**Methods:** A cross-sectional electronic survey was distributed to licensed dentists across Saudi Arabia from November 30, 2024, to April 21, 2025. The questionnaire assessed demographics, clinical experience, and prescribing practices for common dental conditions and procedures. Descriptive and inferential statistics were applied.

**Results:** A total of 407 dentists participated, most of them general practitioners in the public sector. Amoxicillin 500 mg was the predominant choice (72.2%), while clindamycin was most often used for penicillin-allergic patients. Antibiotics were appropriately prescribed for cellulitis (53.1%) and abscesses with systemic involvement (59.2%), but were also unnecessarily used for pulpitis (33.2%) and implant procedures (29.2%).

**Conclusion:** Although Saudi dentists generally recognize appropriate indications, inappropriate prescribing for localized conditions remains common. Strengthening antibiotic stewardship through clear national guidelines, education, and regular audits is essential to reduce misuse and align practice with global standards.

**Keywords:** Antibiotic, antibiotic resistance, prescribing, dental professionals, oral health care, Saudi Arabia

## Introduction

Antibiotics have transformed modern medicine, including dentistry, where they are routinely prescribed to prevent and manage oral and maxillofacial infections. However, their misuse contributes to the global rise of antimicrobial resistance (AMR), a serious public health threat that compromises the effectiveness of essential treatments and endangers patient safety.<sup>1,2</sup> The World Health Organization has emphasized the urgent need for stewardship, yet dentistry continues to see frequent prescribing for conditions that do not warrant systemic therapy, such as pulpitis, localized abscesses without systemic involvement, or routine extractions.<sup>3</sup> In contrast, antibiotics are clearly indicated for cellulitis, facial space infections, trismus, and for patients at elevated risk, such as those predisposed to infective endocarditis.<sup>4-6</sup>

Several factors influence inappropriate prescribing, including limited awareness of updated guidelines, perceived patient expectations, defensive practice among less experienced dentists, and variations across practice settings.<sup>7</sup> General practitioners, often the first point of contact for patients, may be particularly prone to uncertainty regarding when systemic antibiotics are truly required.<sup>8,9</sup>

In Saudi Arabia, rapid expansion of dental education and services has enhanced access to care but may also contribute to variability in clinical practice.<sup>10</sup> Although national initiatives to combat AMR exist, data on dentists' little is known about prescribing behaviors.<sup>11-13</sup>

This study addresses this gap by evaluating antibiotic prescribing patterns among dentists in Saudi Arabia. Specifically, it examines: conditions and procedures prompting antibiotic use, preferred antibiotics and alternatives for penicillin-allergic patients, associations between professional characteristics and

prescribing behaviors, and the role of education in shaping prescribing practices.

## Methods

### Study Population and Sampling

The study recruited practicing licensed dentists in the Central, Eastern, Northern, Southern, and Western regions of Saudi Arabia. The invitations were sent through professional networks, institutional e-mail lists, and messaging apps to approximately 1,200 dentists. The response rate was 34%, with 407 dentists filling out the questionnaire. The size of the sample required was 370, with an additional 10% cushion in case of non-response, and hence the target was 407 participants. The cross-sectional study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.<sup>14</sup>

The sampling strategy was non-probabilistic and convenience-based, aiming to include a broad cross-section of the dental workforce.<sup>15</sup> While this approach allowed timely recruitment across diverse regions and practice settings, it may introduce selection bias and limit generalizability. The demographic diversity of respondents (in terms of region, sector, and specialty) partially mitigates this concern.

### Survey Instrument

Data were collected using a structured, self-administered questionnaire developed specifically for this study. The questionnaire was adapted from existing validated surveys in the literature on antibiotic prescribing patterns and modified to fit the Saudi context.<sup>16,17</sup> To ensure contextual relevance, the

instrument was reviewed by academic and clinical experts in Saudi Arabia and translated into Arabic where necessary, followed by back-translation to confirm accuracy. A pilot test was conducted with 15 dentists to assess clarity, cultural appropriateness, and feasibility. Minor revisions were made based on feedback. Reliability of key sections was assessed, with Cronbach's alpha exceeding the accepted threshold ( $\geq 0.70$ ), indicating internal consistency.<sup>18</sup>

### Data Collection and Ethical Considerations

The survey was distributed electronically via professional dental networks, emails, and messaging platforms from November 30, 2024, to April 21, 2025. Participation was voluntary, anonymity was maintained, and no incentives were offered. Ethical approval was obtained from the Institutional Review Board (reference number 25-39-28). Informed consent was implied through completion of the survey.<sup>19</sup>

### Data Analysis

Data from completed questionnaires were entered and analyzed using IBM SPSS Statistics.<sup>20</sup> Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables. Inferential analysis was performed using the chi-square ( $\chi^2$ ) test to examine associations between demographic/professional variables (e.g., experience, sector, specialty) and antibiotic prescribing behaviors. Statistical significance was set at  $P < 0.05$ . The use of SPSS enabled a more robust analysis and improved the interpretability and generalizability of the results.

## Results

### Descriptive Statistics

A total of 407 dental professionals participated in the survey. The sample showed a balanced gender distribution, with most respondents younger than 40 years and in the early stages of their careers (Table 1). Nearly half had less than five years of experience, and general practitioners constituted the largest specialty group (51.4%) (Table 2). Respondents represented

Table 1. Demographic characteristics of participants

Characteristic	Category	Frequency	Percentage (%)
Gender	Female	222	54.5%
	Male	185	45.5%
Age group	<30 years	190	46.7%
	30–40 years	127	31.2%
	41–50 years	69	17.0%
	>50 years	21	5.2%

Table 2. Clinical experience vs. sector

Experience (years)	Government sector	Private sector	Total	% (Total = 407)
<5	100	81	181	44.5%
5–10	77	51	128	31.4%
10–15	43	32	75	18.4%
>15	14	9	23	5.6%

all major regions, with the Central region most highly represented (Table 3).

### Antibiotic Prescribing by Condition and Procedure

Antibiotics were most frequently prescribed for systemic conditions such as abscesses with systemic symptoms (59.2%) and cellulitis (53.1%) (Figure 1). However, they were also used for localized conditions such as pulpitis (33.2%) and pulp necrosis (32.4%) (Figure 2). Prescribing for dental procedures varied: routine use was highest for implant surgery (29.2%) and complex extractions (22.1%)<sup>21</sup> (Table 4).

Table 3. Geographic and specialty breakdown

Region	Govt sector	Private sector	Total	% of total
Central	144	71	215	52.8%
Eastern	30	29	59	14.5%
Northern	16	22	38	9.3%
Southern	16	16	32	7.9%
Western	28	35	63	15.5%
Specialty	Frequency	%		
General dentist	209	51.4%		
Oral surgery	54	13.3%		
Periodontology	51	12.5%		
Endodontology	40	9.8%		
Pediatric dentistry	32	7.9%		

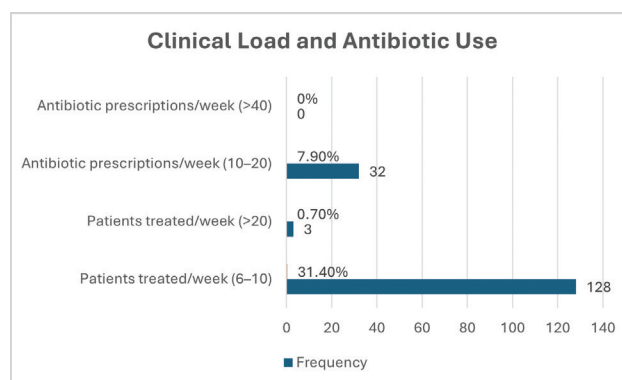


Fig. 1 Clinical load and antibiotic use.

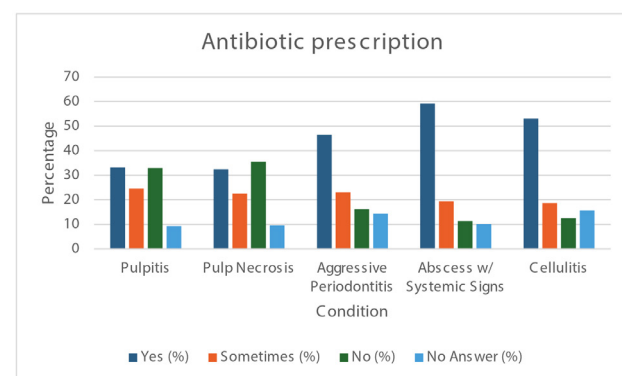


Fig. 2 Antibiotic prescription by clinical condition.

### Prophylactic use and Preferred Agents

Prophylactic antibiotics were commonly prescribed for high-risk patients, including those with infective endocarditis risk (74.7%) and immunocompromised individuals (64.9%) (Figure 3). Amoxicillin 500 mg was the most frequently prescribed antibiotic (72.2%), while clindamycin was the main alternative for penicillin-allergic patients (60.2%) (Figure 4, Table 5).

### Management of Treatment Failure and Education

When initial treatment was ineffective, most dentists reported switching to another antibiotic (66.3%) or adding a second drug (38.8%), with very few using diagnostic cultures (Table 6, Figure 5). Most respondents reported receiving education on antibiotic prescribing during undergraduate training (68.3%) and through continuing education (72.5%) (Figure 6).

### Inferential Statistical Analysis

To complement the descriptive findings, chi-square tests were performed to examine associations between key demographic,

educational, and professional variables and various antibiotic prescribing behaviors. A statistically significant association was observed between years of experience and antibiotic prescribing for pulpitis ( $\chi^2 = 28.49$ ,  $df = 9$ ,  $P = 0.001$ , *Cramer's V* = 0.19), indicating a small-to-moderate effect size. Dentists with fewer years of experience were more likely to prescribe antibiotics for pulpitis in patients without systemic risk factors, suggesting potential overprescription among early-career professionals.

In contrast, the association between specialty and the types of patients prescribed prophylactic antibiotics was not statistically significant ( $\chi^2 = 140.14$ ,  $df = 315$ ,  $P = 1.000$ , *Cramer's V* < 0.10). This result suggests that decisions regarding

Table 4. Antibiotic use by procedure

Procedure	Yes (%)	Sometimes (%)	No (%)	No answer (%)
Endo treatment (vital teeth)	23.1	22.6	42.8	11.5
Extraction of impacted teeth	22.6	42.3	22.4	12.8
Implant surgery	29.2	31.7	18.2	20.9
Complex tooth extraction	22.1	36.4	29.7	11.8

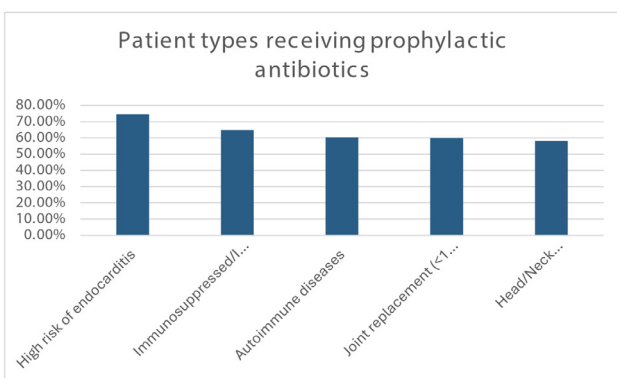


Fig. 3 Top 5 patient types receiving prophylactic antibiotics.

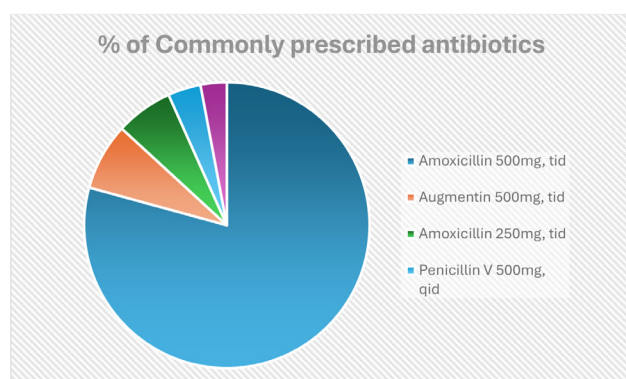


Fig. 4 Commonly prescribed antibiotics (no known allergy).

Table 5. Alternatives for penicillin-allergic patients

V	Count	%
Clindamycin	245	60.2%
Azithromycin	86	21.1%
Cephalexin	48	11.8%
Clarithromycin	28	6.9%

Table 6. Actions taken after initial treatment fails

Action	Count	Percentage (%)
Change antibiotics	270	66.3%
Add a second antibiotic	158	38.8%
Do culture	1	0.2%
Consult another dentist	1	0.2%
Consult before changing Rx	1	0.2%

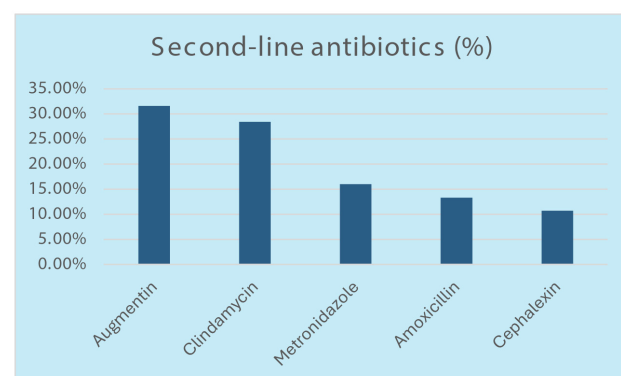


Fig. 5 Commonly used second-line antibiotics.

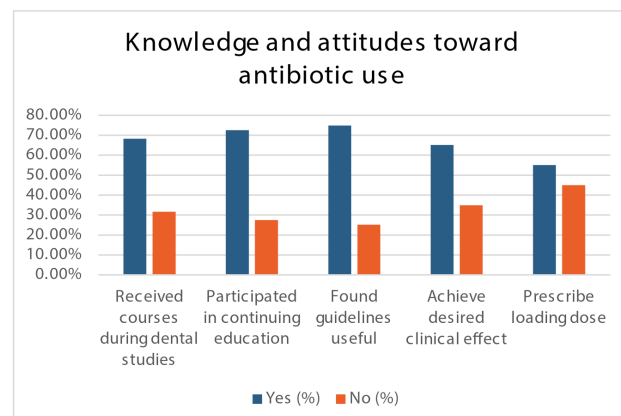


Fig. 6 Knowledge and attitudes toward antibiotic use.

prophylactic use are relatively consistent across different specialties and may not be influenced by a dentist's area of practice.

A chi-square test examining the relationship between educational exposure and the perceived usefulness of antibiotic prescribing courses found a significant association ( $\chi^2 = 4.71$ ,  $df = 1$ ,  $P = 0.030$ , *Cramer's V* = 0.11), indicating a small effect size. Dentists who had received formal education on antibiotic use during their studies were more likely to consider such courses helpful in clinical practice. However, no statistically significant association was found between specialty and the most prescribed antibiotic and dosage ( $\chi^2 = 241.73$ ,  $df = 240$ ,  $P = 0.457$ , *Cramer's V* < 0.10), indicating that choice of antibiotic appears to be independent of dental specialty in this sample.

Similarly, the association between working sector (government vs. private) and weekly frequency of antibiotic prescriptions was not statistically significant ( $\chi^2 = 5.46$ ,  $df = 3$ ,  $P = 0.141$ , *Cramer's V* < 0.10), suggesting that prescribing volume is consistent across sectors. These findings highlight the relevance of clinical experience and educational background in shaping antibiotic prescribing behaviors, while suggesting limited variation due to sector or specialty alone.

## Discussion

### Main Findings

The findings highlight both appropriate and inappropriate patterns of antibiotic prescribing among dentists in Saudi Arabia. Antibiotics were appropriately prescribed for systemic conditions such as cellulitis (53.1%) and abscesses with systemic symptoms (59.2%). However, one-third of respondents reported prescribing antibiotics for pulpitis and pulp necrosis, and nearly 30% for implant procedures, despite limited evidence supporting such use. Amoxicillin 500 mg was the most commonly prescribed antibiotic (72.2%), while clindamycin was the main alternative in penicillin-allergic patients (60.2%). Younger and less experienced dentists were more likely to prescribe antibiotics unnecessarily for localized conditions, while formal education was associated with greater confidence in guideline use.

### Comparison with Existing Literature

The findings of this study are consistent with those from a number of international contexts reporting a tendency among dental clinicians towards inappropriately using antibiotics for conditions that are amenable to local treatment. For example, studies conducted in India and Iraq have shown that dentists prescribe antibiotics for symptomatic irreversible pulpitis and uncomplicated extractions fairly frequently, even though recommendations favor clear-cut operative treatment as the standard of choice.<sup>2,16</sup> This is similar to the European patterns, where there have been questionnaires of United Kingdom and French dentists that indicated routine use of antibiotics in localized periapical abscesses not involving the system, a pattern that is not in accord with evidence-based practice.<sup>9</sup> These are similarities that suggest the issue is not specific to Saudi Arabia but a global problem across different health systems, likely because of common drivers such as patient expectations, clinical doubt, and defensive practice.<sup>8,17</sup> The problem is there

despite global guidelines being present, which indicates an evidence-action gap common across geography.

In terms of antibiotic choice, the prevalence of amoxicillin reported in this study aligns with Saudi-based and overseas literature and surveys reporting it as a first-line drug for choice for odontogenic infections due to its effectiveness, safety profile, and relatively limited spectrum.<sup>4</sup> North American and European studies have also reported similar results, with amoxicillin found to be widely popular among dentists. Clindamycin dependence as first alternative in penicillin-allergic patients also conforms with prescribing tendencies elsewhere but merits critical evaluation for its tight association with *Clostridioides difficile* infection and gastrointestinal illness. More recent literature in Australia has confirmed escalating concern regarding the use of clindamycin in dentistry, with guidelines to limit its use unless no safer alternative is available.<sup>22</sup> Collectively, the consistency of these findings across regions validates the notion that dental antibiotic prescribing patterns are influenced not just by regional policy, but by shared clinical cultures and pedagogic conventions. This underscores the need for harmonized global action to improve antimicrobial stewardship in dental practice.

### Strengths and Limitations

The study's strengths include its relatively large sample size, broad regional coverage, and focus on multiple clinical scenarios. Three limitations should be acknowledged. First, the use of convenience sampling may introduce selection bias. Second, online-only distribution likely skewed participation toward younger dentists more active on digital platforms. Third, reliance on self-reported data raises the possibility of recall and social desirability bias. Despite these limitations, the findings provide valuable insights into prescribing practices in Saudi dentistry.

### Policy and Practice Implications

Clearer national guidelines are needed to reduce variability in prescribing. Recommendations should specify that antibiotics are appropriate only for systemic involvement (e.g., cellulitis, spreading abscesses, trismus, or in immunocompromised patients) and for prophylaxis in individuals at risk of infective endocarditis. Routine use for pulpitis, localized infections, or uncomplicated procedures such as implant placement in healthy patients should be avoided. Policy initiatives should prioritize continuing education, integration of stewardship principles into dental curricula, and system-level measures such as regular audits, decision-support tools, and improved access to diagnostic testing.

## Conclusion

This study shows that while Saudi dental professionals generally recognize appropriate indications for systemic antibiotics, inappropriate prescribing for localized conditions and routine procedures remains common. Addressing these gaps requires clearer national guidelines, targeted education, and integration of stewardship principles into clinical practice. Strengthening audits, decision-support tools, and diagnostic capacity can further enhance prescribing standards. By aligning with global stewardship initiatives, Saudi Arabia can help safeguard

antibiotic effectiveness and contribute to the international effort to curb antimicrobial resistance.

## Conflicts of Interest Disclosure

The authors have no conflicts of interest relevant to this article.

## Data Availability

Data supporting the findings of this study are available from the corresponding author on reasonable request.

## Author's Contributions

H.A., A.D., R.A., R.A., L.A., J.A., and R.A. contributed to the conceptualization of the study, methodology, and formal analysis; H.A. and A.D. also supervised the project. All authors contributed to writing - original draft preparation, review, and editing. All authors read and approved the final version of the manuscript and agreed to be responsible for all aspects of the study, including the accuracy of the work done.

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## Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Qassim University with reference number 25-39-28. We affirm that every procedure was carried out in accordance with the relevant rules and regulations.

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## AI use Disclosure

The authors used AI-assisted language editing tools to improve grammar and readability. No AI tools were used for data collection, statistical analysis, or interpretation of results. ■

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