

Antibiotics in Dentistry: To Prescribe Or Not To Prescribe? That Is The Question.

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ABSTRACT

Background

Established principles form the basis of guidelines for the effective usage of antibiotics in dentistry. These standards have been demonstrated to be effective in eradicating and controlling odontogenic infections. Yet, anecdotal evidence suggests that these well-established guidelines are often ignored by dentists. This study sought to assess trends in antibiotic prescribing among dentists.

Aim

To analyse the antibiotic prescribing patterns among dentists and evaluate dentists' views on antibiotic resistance.

Methodology

This cross-sectional analysis examined antibiotic prescribing patterns among registered dentists in the Durban metro region, South Africa, in 2022. A sample size of 183 participants was calculated, and a survey was electronically distributed to 210 dentists via closed dental groups. Responses were recorded in Microsoft Forms, captured in Excel, and analysed using Stata.

Results

A survey of 210 participants yielded 91 responses. Amoxicillin was the most frequently prescribed antibiotic (48%), with clindamycin as the common alternative for penicillin allergies (58%). The majority prescribed antibiotics for at least five days, with 89% citing facial swelling as the primary indication. Over half (57%) reported no adverse effects, while 80% acknowledged their contribution to antibiotic resistance, and 71% identified unclear guidelines as a factor in inappropriate prescribing.

Conclusion

This study highlights that dentists in South Africa continue to prescribe antibiotics contrary to evidence-based guidelines. Ongoing monitoring and research are crucial for developing clear, evidence-driven guidelines that encourage responsible antibiotic use in dental practice.

Keywords

Antibiotics, dentistry, antibiotic resistance, overuse, antibiotic prescribing patterns, dental prescribing behaviour, guidelines, South Africa.

Introduction

Antimicrobial resistance (AMR) is the ability of microorganisms, including bacteria, viruses, protozoa, fungi, archaea, and algae, to resist treatment. AMR has become a global health crisis, causing approximately 700,000 deaths annually. Without effective interventions, projections suggest that AMR could result in up to ten million deaths per year by 2050.¹

Antibiotic resistance (ABR), a subset of antimicrobial resistance (AMR), refers specifically to bacterial resistance to antibiotics. ABR is a significant global threat, leading to longer hospital stays, higher mortality rates, and difficulty managing even simple infections. This also has severe economic implications, with global losses projected at \$100 trillion by 2050. The overuse and misuse of antibiotics, including their accessibility for self-medication and inappropriate prescribing by healthcare professionals, are primary drivers of resistance.^{1,2}

In response, the World Health Organisation (WHO) developed a global action plan in 2015 to improve antimicrobial stewardship, focusing on raising awareness of AMR, reducing infection rates, and optimizing antimicrobial use.² Although resistance is a natural biological process, evidence shows that excessive antibiotic use accelerates resistance, making infections such as pneumonia, gonorrhea, and tuberculosis harder to treat. This issue is further compounded by stagnation in the development of new antibiotic classes since the 1980s.^{2,3}

Dentists contribute significantly to the global antibiotic burden, with an estimated 10% of all antibiotic prescriptions originating from dental practices. Alarming, studies indicate that approximately 80% of dental antibiotic prescriptions do not align with established guidelines. Between 2000 and 2015, global antibiotic use surged by 91%, with a particularly rapid increase in low- and middle-income countries.⁴

Although antibiotic stewardship programs are prevalent in medical settings within high- and middle-income nations, there is a paucity of data regarding antibiotic use in lower-income countries, and even less so in the dental field. Recent studies in England, for example, have shown a rise in dental

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antibiotic prescriptions, particularly due to the SARS-CoV-2 pandemic.^{4,5}

Dentists play a critical role in combating the AMR crisis through antibiotic prescribing. While basic guidelines exist, they vary across countries. In the UK, antibiotic treatment targets therapeutic intervention, whereas in the USA, prophylactic antibiotics are commonly prescribed. The absence of standardised guidelines complicates the assessment of prescribing patterns globally, hindering international consensus on best practices.⁵

Antibiotic stewardship (ABS) programs are essential for monitoring dental prescribing patterns, identifying knowledge gaps, and highlighting areas for improvement. Given the rise in antibiotic resistance, evaluating the knowledge, attitudes, and prescribing behaviors of dental professionals is critical. This study, conducted in Durban, South Africa, aims to assess these factors and contribute to responsible antibiotic prescribing in dental practice.^{4,5}

MATERIALS AND METHODS

Study Design and Population

Ethical approval for this study was obtained from the University of Witwatersrand Human Research Ethics Committee (Ref M210921). The study involved qualified dentists registered with the HPCSA and practicing at state owned or private institutions in the Durban metro region. A quantitative, cross-sectional study was conducted in 2022.

Data collection and analysis

The study used a pre-tested, pre-validated questionnaire adapted from a Kolkata study, constructed with Qualtrics.⁶ The 15-item questionnaire covered demographics (gender, years of practice, practice type) and antibiotic prescribing trends. Data analysis was performed using IBM SPSS version 28.0, and results were presented using descriptive statistics, graphs, cross-tabulations, and figures for the quantitative data.

Results

The survey link was shared with a closed dental group of 210 participants. The response rate was 91 out of 210 participants, or 43%. Among the survey respondents, 56%

were female and 44% were male. Additionally, 38.5% of the participating dentists had been practicing for 1 to 5 years post-graduation. Most respondents (75.8%) were employed in private practice settings.

Table 1: Demographic information

Gender			
	Frequency (n)	Percent (%)	p-value
Female	51	56.0	0.249
Male	40	44.0	
Total	91	100.0	
Number of years practicing after qualification			
	Frequency (n)	Percent (%)	p-value
1 – 5	35	38.5	0.512
6 – 10	26	28.6	
11 – 30	30	33.0	
Total	91	100.0	
Practice type			
	Frequency	Percent	p-value
Private practice	69	75.8	< 0.001
Academic institution	4	4.4	
Hospital dentistry	13	14.3	
Health centre	3	3.3	
Other	2	2.2	
Total	91	100.0	

Source of information on antibiotics:

The internet was the most frequently utilised source by dentists for obtaining information on antibiotics (36.3%), followed by continuous professional development (29.7%), peer-reviewed scientific literature (24.2%), and the latest editions of textbooks (9.9%), which were less commonly referenced for antibiotic-related knowledge.

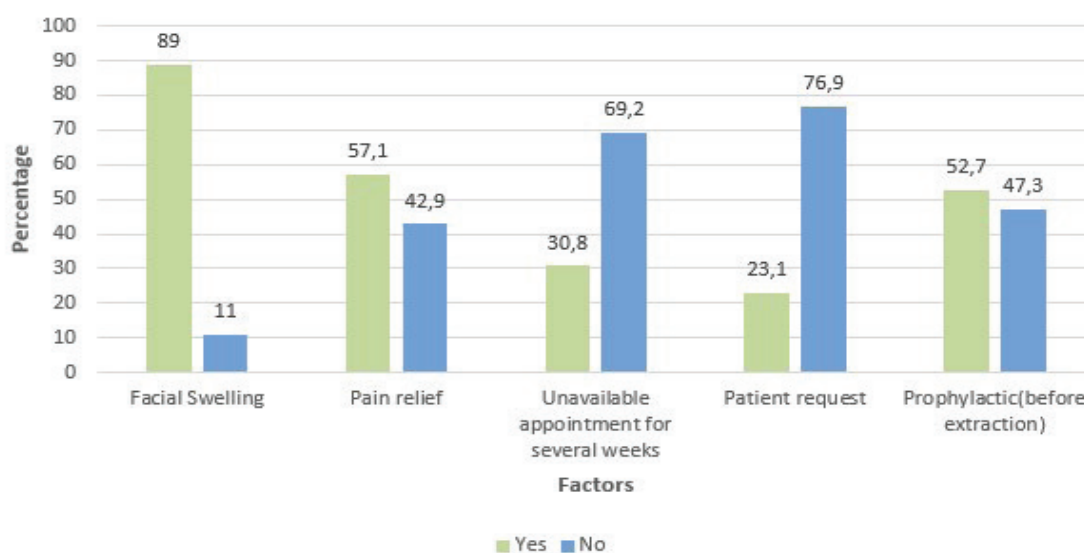


Figure 1: Bar graph of reasons dentists prescribed antibiotics

Table 2: Table of pulpal and peri-radicular conditions for prescribing antibiotics

	No		Yes		p-value
	N	N %	N	N %	
Reversible pulpitis	70	76.9%	21	23.1%	<0.001*
Irreversible pulpitis	35	38.5%	56	61.5%	0.028
Localized dentoalveolar abscess	16	17.6%	75	82.4%	<0.001*
Localized dentoalveolar abscess with draining fistula	19	20.9%	72	79.1%	<0.001*
Facial cellulitis	11	12.1%	80	87.9%	<0.001*

*p-values of <0.005 are significant.

Most prescribed antibiotic brands; route of administration and duration:

More dentists prescribed Amoxicillin (48.4%) than Augmentin (46.2%) and fewer responders prescribed Metronidazole (2.2%) and Cephalosporins (3.3%). In patients with an allergy to Penicillin, Clindamycin was the most common drug choice (58.2%) with fewer prescribing Erythromycin (26.4%) and Azithromycin (14.3%). All dentists (100%) prescribed antibiotics orally in the form of tablets. A 5-day course was the preferred duration of prescribing antibiotics (78%), compared to 7-days (10%), 10-days (4%) and 3-days (8%).

Reasons for prescribing antibiotics:

Antibiotics were most prescribed by dentists for facial swelling (89%), followed by pain relief (57.1%) and as prophylaxis prior to extractions (52.7%). Fewer dentists reported prescribing antibiotics when appointments were unavailable for several weeks (30.8%) or when patients requested them (23.1%).

Pulpal and peri-radicular conditions for prescribing antibiotics:

Facial cellulitis (87.9%) was the condition most dentists prescribed antibiotics for, localized dentoalveolar abscess (82.4%), localized dentoalveolar abscess with draining fistula (79.1%), irreversible pulpitis (61.5%), and reversible pulpitis (23.1%) were other conditions for which antibiotics were prescribed.

Prescribing antibiotics for dental trauma:

The common trauma responders prescribed antibiotics for was Replantation of a tooth after avulsion (89.0%) fewer prescribed for Subluxation (34.1%), Extrusion (33%), Lateral

luxation (30.8%), Intrusion (27.5%) and Noncontaminated dental injuries (25.3%).

Antibiotic prophylaxis:

Responders prescribed antibiotics prophylactically before treatment for patients with Previous infective endocarditis (96.7%), Cardiac transplant after valvular damage (86.8%), Mitral valve prolapse with regurgitation (72.5%), Cyanotic heart disease (51.6%), Mitral valve prolapse without regurgitation (54.9%) and Rheumatoid arthritis (30.8%).

Adverse effects reported after prescribing antibiotics

More than half of dentists did not report adverse effects after prescribing antibiotics (57.1%) with less noting adverse effects (42.9%). Of those who did observe adverse effects, most noted adverse effects were nausea, vomiting and gastro-intestinal disturbances (64%); followed by hives, itching and rash (28%); while vaginal thrush (8%) being the least reported adverse effect.

Dentists' contribution to antibiotic resistance

Majority of dentists (80.2%) believed they contributed to antibiotic resistance, while 19.8% disagreed. Antibiotic resistance contribution factors were unclear guidelines, patient requests for antibiotics, poor access to information, and incorrect prescribing duration, while some dentists cited "other" reasons.

Improving prescribing methods

Current guidelines on antibiotic prescribing for South African dentists are inadequate, with a lack of routine monitoring and insufficient studies on antibiotic efficacy for specific dental conditions. Antibiotics are often misused for conditions like reversible and irreversible pulpitis, due to incorrect diagnoses

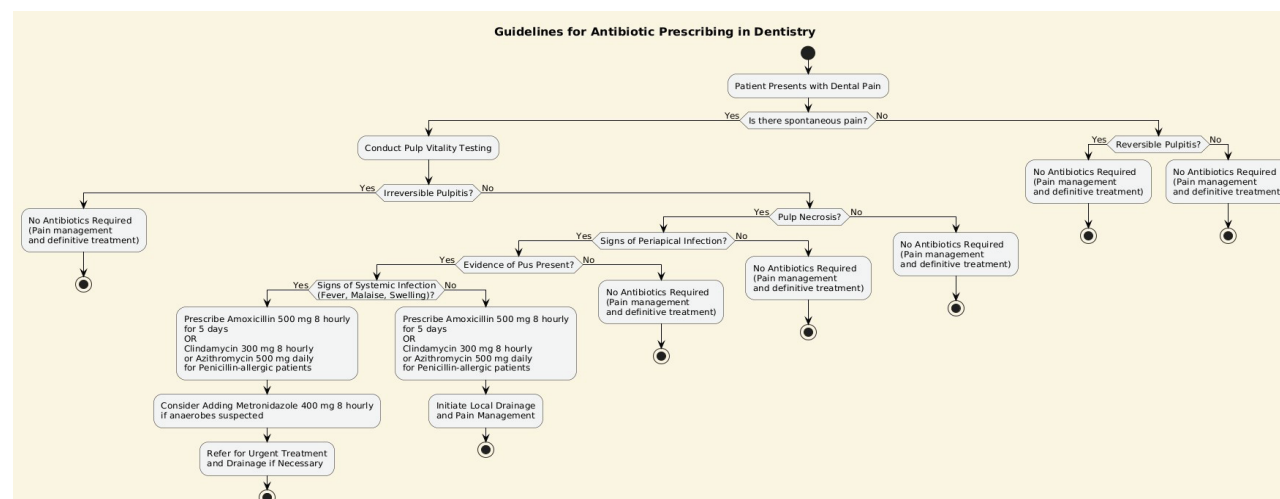


Figure II: Guidelines for antibiotic prescribing in dentistry

and indiscriminate prescribing. This study found that 39% of dentists cited poor guidelines as a major contributor to antibiotic resistance, while 11.1% attributed incorrect pulp diagnoses. Antibiotics are not recommended for irreversible pulpitis as treatment involves root canal or extraction and antibiotics do not affect pain relief or infection resolution.⁷⁻⁸ However, in this study, 61.5% of dentists prescribed antibiotics for irreversible pulpitis and 23.1% for reversible pulpitis.

A Welsh audit found 5% of antibiotics were prescribed for irreversible pulpitis. These findings align with a Saudi Arabian study showing dentists' inappropriate antibiotic use for conditions like chronic abscesses and pulpitis. Over-prescription of antibiotics, a key cause of global resistance, highlights the need for reinforced antibiotic guidelines for dentists.⁷⁻¹⁰

The World Health Organisation (WHO) has called for national antibiotic guidelines for dentists, with easily accessible, regularly updated resources. It also recommends automatic prescription surveillance and data analysis, emphasizing the dental team's role in educating patients on antibiotics. Dentists should manage patient expectations by clarifying that antibiotics do not cure toothache, and pain relief comes from procedures, not prescriptions.^{11,12} Evidence-based checklists for antibiotic prescribing are essential. For example, the Australian government developed an acronym (MINDME) to guide practitioners: Microbiology guides therapy, Indications are evidence-based, Narrowest spectrum required, Dosage appropriate, Minimize duration, and Ensure monotherapy.¹³ Regularly updating antibiotic prescribing knowledge is critical to combat antibiotic resistance. A guideline for South African dental students and practitioners based on established protocols has been developed to support evidence-based antibiotic prescribing, improving treatment effectiveness and minimizing inappropriate use.¹⁴⁻¹⁷

Antibiotic prescribing guidelines in dentistry vary, particularly regarding prophylactic use. Ahmadi et al. recommend antibiotics for patients with conditions such as immunocompromised patients, cancer, infective endocarditis, prosthetic joints, and valvular heart disease.¹⁸ However, American guidelines dispute the link between dental procedures and periprosthetic joint infections, suggesting prophylactic antibiotics only for high-risk patients, such as those with poorly controlled diabetes or a history of prosthetic joint infection.^{19,20} In contrast, countries like New Zealand, Canada, the Netherlands, and Australia do not recommend prophylactic antibiotics for patients with prosthetic joints.²¹

This study found that 71.4% of dentists attributed antibiotic resistance to unclear prescribing guidelines, with 47.3% citing patient pressure to prescribe antibiotics from patients. Given these inconsistencies, there is a need for internationally unified guidelines on prescribing antibiotics. Health organizations should prioritise patient education on the harmful effects of antibiotic misuse. Dentists should also inform patients about the risks and benefits of antibiotics to ensure informed consent before prescription. The latest American Heart Association guidelines on prophylaxis for patients at risk of infective endocarditis should also be considered in dental practices.²²

CONCLUSION

Healthcare practitioners, particularly dentists, play a key role in addressing antibiotic resistance by adopting appropriate

practices and educating patients. This study shows that while most dentists acknowledge their responsibility in contributing to resistance, they also cite unclear guidelines as a significant factor in inappropriate prescribing. A concerning trend is the reliance on internet resources for antibiotic prescription guidance, as well as the misuse of antibiotics for conditions like pulpitis. These practices contribute to the growing global issue of antibiotic resistance.

The study highlights the urgent need for evidence-based therapeutic guidelines in dentistry to ensure decisions are grounded in scientific evidence. Clear protocols from health authorities are necessary to encourage dentists to accurately diagnose conditions, select appropriate antibiotics, and consider patient history before prescribing. Given the rise in inappropriate prescribing, accessible, scientifically validated information should be made available to South African dentists. Further research across the country is recommended to gain a more comprehensive understanding of antibiotic prescribing patterns.

DECLARATION

There is no possible financial interest/s or incentives in products or service.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this study.

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