



Antibiotics Prescription among Nigeria Dental Surgeons: A Cross-Sectional Study

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Abstract

Background: Dentists frequently prescribe antibiotics, prophylactically or therapeutically, but sometimes incorrectly due to a lack of guidelines. This study aimed to determine the pattern of antibiotic prescriptions among Nigerian dental surgeons.

Methods: This was an online cross-sectional survey conducted among dental surgeons in Nigeria between March and April 2024 using the Nigeria Dental Association (NDA) platform with ethical clearance from the Federal Capital Territory Health, Research, and Ethics Committee, Abuja. The data collection tool was a self-developed validated questionnaire. Data analysis was done using SPSS 25.0

Results: The numbers of dental surgeons that participated in this study were 81 with a male-to-female ratio of 5:4. The majority (60.3%), are in residency training with an average age of 33 years old and an average of 5 years of postgraduate experience. Commonly prescribed antibiotics were Amoxicillin and Metronidazole for acute pulpitis and root canal treatment; Doxycycline after scaling and polishing with deep curettage; and Clindamycin for dentoalveolar abscesses. The adjusted OR for the association between sex and prescribing pattern under Dentoalveolar abscess was 0.186 (95% CI: 0.058-0.591) with a corresponding p-value of 0.004, indicating a statistically significant association between sex and prescribing pattern under dentoalveolar abscess, with females less likely to be associated with the prescribing pattern compared to males.

Microscopy culture and sensitivity tests (MCS) were occasionally done by 75.3% of the respondents. More dental surgeons (58.0%) gave patients information about antibiotic usage and asked them to contact the dentist if adverse reactions happened.

Conclusion: Amoxicillin and metronidazole were the most commonly prescribed antibiotics and this was done empirically indicating a need for training on antibiotic prescription in dentistry to ensure standardization

Keywords: Antibiotics; Acute Pulpitis; Dentoalveolar Abscess; Dental Surgeon; Prescription

Introduction

In dental practices, antibiotics are prescribed to patients either as Prophylaxis or for therapeutic reasons. Antibiotic prophylaxis (AP) is prescribed when infection could occur easily but yet to manifest itself such as in immunocompromised patients, diabetic patients, and aged patients, and to prevent endocarditis in patients that had undergone open heart surgery [1]. Antibiotics are also used therapeutically to manage infection of the hard and soft tissues [1,2]. The dental surgeon faces several oral health conditions that demand the prescription of antibiotics to effectively manage infections whose origin could be of the dental hard tissue, periodontal tissues, or the result of the imbalance between normal oral flora and compromised host defense [3]. Antibiotics remain frequently prescribed medication by dentists; for instance, 15% of dental surgeons in the UK were reported to prescribe antibiotics daily in 2004, while 40% prescribed antibiotics at least thrice a week [4]. The situation is not peculiar to the UK alone; the report from a leading tertiary institution in Nigeria indicated that out of 1798 medications prescribed to dental patients, 65.5% were antibiotics [5].

Furthermore, it has been reported that some dentists may display poor judgment on the choice of antibiotics and over-prescribe a choice due to a lack of knowledge of antibiotics such as prescribing antibiotics for a viral infection and social reasons [6]. While others, such as dentists from the Eastern Mediterranean region were reported to succumb to pressures from patients to prescribe antibiotics that were not necessary [6]. A cross-sectional study conducted in Jeddah involving all the practicing dentists showed an inconsistency in prescription patterns and a lack of adherence to professional guidelines in antibiotic prescription [7]. Similarly, among 250 dentists in Istanbul, it was reported that patients were not given sufficient information about the prescribed antibiotics which led to taking inappropriate doses and at the wrong time, indicating abuse of antibiotics [8]. In addition, a report from Amman City Hashemite, the kingdom of Jordan on 253 dental practitioners stated that they were prescribing antibiotics for endodontic cases without defined scientific indications, pointing to the need for a national standard for antibiotics prescription [9]. A pattern of overprescribing certain antibiotics because of reported efficacy was noticed among most of the 90 dentists surveyed in Imphal City, Northeast India [10]. They displayed prescription patterns for antibiotics that were often conflicting and sometimes incorrect due

to a lack of guidelines [10]. Fadare, *et al*, [11] reviewed 607 prescriptions in the dental clinic of a Nigerian Teaching Hospital and reported a pattern of over-prescribing only a certain brand-named antimicrobial agent by the dentists while ignoring other antibiotics.

Disagreements as to the use of antibiotics such as when to use AP in immunocompromised patients, the extent of antibiotics interactions with contraceptives, whether to use AP after or before minor surgeries, and the use in intermediate dental surgical procedures still abound [12-15]. The lack of a universally accepted guideline has resulted in the abuse of antibiotics since they are either over-prescribed or under-utilized resulting in the rise of antibiotic-resistant strains [16]. Other factors that may contribute to over-prescription/under-prescription of antibiotics are the severity and duration of illnesses, patient expectations, insufficient knowledge of antibiotics, overstock/near expiry drugs, financial considerations with regards to the cost of the antibiotics, fear of adverse side effects, diagnostic uncertainty, and the influence of pharmaceutical companies [17-20]. However, it is known that prescription in dentistry is mostly empirical since microscopy culture and sensitivity test (MCS) is usually not done therefore, the prescription of broad-spectrum antibiotics is the usual practice which has also contributed to the increase in oral microorganisms that are resistant to antibiotics [21]. Medical complaints concerning the adverse reactions of antibiotics such as their effect on the gastrointestinal tract, allergy, and hematologic reactions may not be considered [21]. It is imperative that the rational use of antibiotics in dental practices should include reducing the incidence of antibiotic resistance to oral pathogens and adverse reactions on one hand while increasing the efficacy of the antibiotics on the other hand [21].

Thus, appropriate use of antibiotics in dental practices should involve giving patients information concerning the recommended antibiotics and the information may include the dosage of medication, duration of the antibiotics, adverse effects, drug-drug interactions with other medications patients may be taking, and the cost of the antibiotics that are prescribed [21]. This, however, is only possible if the dentist accepts possible prescription guidelines and adheres to them strictly [21-26]. While it is noted that there is no standard universal prescribing regimen that has been accepted unanimously on antibiotics to the best of our knowledge [21,27,28],

it is believed that countries could develop a harmonious prescription pattern based on knowledge of antibiotics and their efficacy on oral pathogens. The objectives of this study include:

- Determining the pattern of antibiotic prescriptions among Nigerian dental surgeons.
- Identifying common indications for antibiotics in dental practice in Nigeria.

Methodology

This is a cross-sectional survey using the internet to investigate the prescription pattern of antibiotics and identify common indications for antibiotics in dental practice in Nigeria. In this study, Nigeria is divided into six [6] geopolitical zones namely South-south, South-east, South-west, North-east, North-west, and North-central, six states were randomly selected from each zone and an electronic questionnaire was sent to dentists through the various states Nigeria Dental Association (NDA). The questionnaire was divided into 4 sections with section A seeking to gather information concerning the age, sex, years of experience, Postgraduate qualification, and geographical location of respondents. Section B lists a few dental challenges such as acute Pulpitis and dentoalveolar abscess, after simple forceps extractions, after scaling and root planning, and what antibiotics are commonly used by the dentist to manage infections. The antibiotics listed included: Amoxicillin, Metronidazole, Clindamycin, Doxycycline, and Azithromycin. Respondents were required to match the dental conditions against the antibiotic indicating the choice of antibiotic for each condition. Section C listed various medical conditions that could influence the decision to give antibiotics during dental treatment. Medical conditions such as diabetes mellitus, smoking, immunosuppressed

conditions, and bone loss were included. Respondents were also required to indicate if microscopy culture and sensitivity test (MCS) were done before drug prescription. Finally, section D was to investigate if information concerning the prescribed antibiotics was given such as duration of drug administration, dosage, and side effects.

An ethical permit was obtained from the Federal Capital Territory's (FCT) Health Research Ethics Committee to carry out the survey. Clearance was also obtained from the Nigeria Dental Association (NDA) to upload the questionnaire on their platform. The questionnaire was on Google Forms and pretested twice among 35 dental surgeons in a different State of the federation, not among the selected states for the study, to determine suitability and ease of answering the questions. Feedback from these dentists was given and appropriate corrections were made. Consent was requested on the first page of the questionnaire, and any who withheld consent was required not to proceed to the next page. The questionnaire was linked to the lead author for confidential reasons. Clicking the submit button blocked further acceptance of the questionnaire from the same respondent's device, thereby reducing the chances of multiple submissions. Data was recorded in a passworded Microsoft Excel 2019 version and analyzed with the SPSS 25.0 statistics program (SPSS® Inc, Chicago, IL, USA). Descriptive and inferential statistics were calculated for each variable and Pearson's chi-squared test was used to analyze the associations between the different qualitative variables. Statistical significance was set for $p \leq 0.05$.

Results

Variable	N (%)	p-value
Gender		
Male	45 (55.6)	<0.001
Female	36 (44.4)	
Age		
21-30	22 (27.2)	
31-40	33 (40.7)	<0.001
41-50	14 (17.3)	
51-60	12 (14.8)	
Years of Experience		
0-5	25 (30.9)	
6-10	17 (21.0)	
11-20	23 (28.4)	<0.001
21-30	10 (12.3)	
Above 31	6 (7.4)	

Postgraduate Education		
Yes	55 (68.8)	<0.001
No	25 (31.3)	
Postgraduate Level		
Residency	38 (60.3)	<0.001
Masters	19 (30.2)	<0.001
PhD	2 (3.2)	
Fellows	1 (1.6)	0.001*
Houseman ship	1 (1.6)	0.016*
BDS	1 (1.6)	0.016*
Place of Practice		
Federal Medical Centres	28 (31.6)	<0.001
Teaching Hospital	38 (43.2)	<0.001
Private Practice	20 (22.7)	<0.001
Company hospital	1 (1.1)	0.011*
General Hospitals	1 (1.1)	0.011*
Specialty		
Dental Public Health	4 (5.5)	
Family Dentistry	4 (5.5)	
General practice	22 (30.1)	
Oral and Maxillofacial Surgery	18 (24.7)	
Orthodontist	4 (5.5)	
Oral Medicine	2 (2.7)	
Paediatric Dentistry	4 (5.5)	
Restorative Dentistry	10 (13.7)	<0.001
Periodontics	1 (1.4)	
Prosthodontics	1 (1.4)	
Oral and Maxillofacial Pathology	1 (1.4)	
Oral Pathology	1 (1.4)	
Dental Officer	1 (1.4)	
Geographical Locations		
South-South	10 (12.3)	
South-East	12 (14.8)	
South-West	10 (12.3)	
North-Central	31 (38.3)	<0.001
North-West	10 (12.3)	
North-East	8 (9.9)	

Table 1: Demographics and Characteristics of Respondents.

Note that the asterisk are p-values associated with Fisher's exact test. We use it in place of the Chi-square test when some cells have an expected count of less than 0.05.

Male respondents were more prevalent at 55.6% while females were 44.4%. Most of the respondents 60.3%, were in residency training.

Variable	Dental condition, n (%)				
	Acute pulpitis	Dentoalveolar abscess	After simple forceps extractions	RCT	After scaling and root planning
Amoxicillin	64 (29.0)	61 (27.6)	49 (22.2)	40 (18.1)	7 (3.2)
Metronidazole	59 (25.2)	72 (30.8)	44 (18.8)	39 (16.7)	20 (8.5)
Doxycycline	1 (2.1)	4 (8.3)	1 (2.1)	3 (6.2)	39 (81.2)
Clindamycin	3 (6.1)	36 (73.5)	2 (4.1)	2 (4.1)	6 (12.2)
Azithromycin	2 (13.3)	9 (60.0)	0 (0)	1 (6.7)	3 (20.0)

Table 2: Prescribing pattern of antibiotics under different dental conditions.

Amoxicillin was the preferred antibiotic for acute pulpitis at 29.0%, after simple extractions at 22.2%, and for RCT at 18.1%.

The preferred antibiotic after scaling and root planning was Doxycycline at 81.2%.

Metronidazole was the preferred antibiotic for acute pulpitis at 25.2%.

The two preferred antibiotics for Dentoalveolar abscess were Clindamycin at 73.5%, and Azithromycin at 60.0%.

Variable	Adjusted OR	95% Confidential Interval		p-value
		Lower	Upper	
Year of Experience				
Acute pulpitis	1.126	0.408	3.114	0.818
Dentoalveolar abscess	0.369	0.134	1.014	0.053
After simple forceps extractions	1.822	0.737	4.503	0.194
RCT	1.029	0.450	2.351	0.947
After scaling and root planning	1.160	0.217	6.195	0.862
Sex				
Acute pulpitis	1.184	0.388	3.613	0.766
Dentoalveolar abscess	0.186	0.058	0.591	0.004
After simple forceps extractions	1.441	0.540	3.843	0.465
RCT	1.020	0.412	2.525	0.966
After scaling and root planning	0.189	0.021	1.695	0.137
Age				
Acute pulpitis	1.136	0.321	4.023	0.844
Dentoalveolar abscess	3.410	0.980	11.870	0.054
After simple forceps extractions	0.902	0.300	2.713	0.854
RCT	1.303	0.463	3.669	0.616
After scaling and root planning	0.933	0.117	7.443	0.948

Table 3: Demographic factors associated with the prescribing pattern under different clinical Conditions.

Adjudicated Odd Ratio (OR) for demography and prescription pattern indicates that the antibiotic used for managing dentoalveo-

lar abscesses was prescribed more in some regions of Nigeria than others and was statistically significant at a p-value of 0.004.

Variable	n (%)		
	No	Yes	Maybe
Diabetic Patients	10 (12.7)	63 (79.7)	6 (7.6)
Bone Loss	12 (16.4)	51 (69.9)	10 (13.7)
Immunocompromised	5 (6.3)	72 (91.1)	2 (2.5)
Pregnancy	15 (19.5)	52 (67.5)	10 (13.0)
Smokers	39 (52.0)	21 (28.0)	15 (20.0)
Elderly	13 (16.5)	54 (68.4)	12 (15.2)
Nonspecific	18 (26.9)	17 (25.4)	32 (47.8)
	Never	Sometimes	Always
Microscopy culture and sensitivity test (MCS)	20 (24.7)	61 (75.3)	0 (0)

Table 4: Patients' characteristics and microbial testing.

Immunocompromised patients were given antibiotics prophylaxis at 91.1%. Next were diabetics at 79.7%.

Most respondents 58.0%, always informed patients to contact them in case of adverse reactions.

Information given to Patient on Antibiotics	n (%)		
	Never	Sometimes	Always
Antibiotics interaction with other medications the patient is taking	4 (5.0)	49 (61.2)	27 (33.8)
When antibiotics should be taken, with or without food]	5 (6.2)	30 (37.0)	46 (56.8)
Storage of antibiotics	41 (51.9)	24 (34.2)	11 (13.9)
To contact the Dentist when there are adverse reactions	7 (8.6)	27 (33.3)	47 (58.0)
Cost of antibiotics	14 (17.7)	48 (60.8)	17 (21.5)
Likely adverse effect of antibiotics on GIT	10 (12.7)	48 (60.8)	21 (26.6)

Table 5: Information given to patients.

Discussion

Odontogenic infections are classified as diseases originating from the dental hard tissues or periodontium, which when not treated with antibiotics can result in serious local or systemic infections [30]. Sadly, 80% of antibiotics reported to be used in a British study for acute dental diseases were unnecessary [31]. In the United States, a study reported that antibiotics were inappropriately used for prophylaxis in 80% of cases [32]. Thus, while there has been an increase in antibiotic prescription [33], there has also been a corresponding increase in misuse and overuse of antibiotics leading to increased antibiotic resistance, higher mortality rates, and longer hospital stays [31,34].

In this study, 81 dentists participated with a male-to-female ratio of 5:4 and an average age of 33years for 60.3% of the re-

spondents, amoxicillin, and metronidazole were the commonly prescribed antibiotics for acute pulpitis and root canal treatment. This pattern among dentists agrees with studies that amoxicillin is effective when prescribed alone for endodontic procedures as antibiotic prophylaxis (AP) and has better absorption except in cases of confirmed penicillin allergy when clindamycin is the recommended drug of choice [35-37]. The practice of prescribing Doxycycline after scaling and polishing with deep curettage in this study agrees with best practice for treating chronic periodontitis which recommends subgingival instrumentation with systemic antibiotics like Doxycycline [38,39]. Moreover, in a report on a hundred (100) dentists on the choice of antibiotics for treating dentoalveolar abscess, Amoxicillin was chosen as the antibiotics of first choice after drainage of the abscess, and Clindamycin was the second choice [40]. A similar study comparing the efficacy and tolerability of Clindamy-

cin and Amoxicillin/Clavulanic acid indicated Amoxicillin/Clavulanic acid as a better choice after abscess drainage, in the absence of allergic reaction to penicillin [41]. In this study, Clindamycin is the preferred antibiotic for dentoalveolar abscess and the adjusted adjudicated odd ratio (OR) for the association between sex and prescribing pattern under dentoalveolar abscess is 0.186 (95% CI: 0.058-0.591) with a corresponding p-value of 0.004. This alluded to a statistically significant association between sex and prescribing pattern under dentoalveolar abscess, with females being less likely to be associated with the prescribing pattern for Clindamycin as the preferred choice for dentoalveolar abscess compared to males and this might be because females are more likely to follow clinical guidelines [42]. The microscopy culture and sensitivity test (MCS) to antibiotics were occasionally investigated by 75.3% of respondents, which is a pointer to implementing best practices among respondents in this study which is recommended for better outcomes [43]. Prescribing AP for immunosuppressed patients, diabetic patients, and patients with bone loss resonates with prescriptions of AP from 2009-2015 among dental patients in the United States with 80% of the AP being unnecessary [44]. While it is recommended that AP should be prescribed for the prevention of endocarditis and prosthetic joint infections [45], its use in patients with immunodeficiency diseases and diabetic patients is inconclusive [46]. AP before a dental procedure is limited to infective endocarditis and prosthetic joint infections [46]. A discretionary prescription of AP in low doses should be considered in other cases such as poorly controlled diabetes, pregnancy, and patients who have undergone organ transplants [47].

Conclusion

This study revealed no clear prescription pattern for antibiotics among the dental surgeons who preferred prescribing them empirically. Microscopy culture and sensitivity tests are encouraged before giving a prescription, but since results may not be received early, an anecdotal prescription of antibiotics occurs. Patients should be given adequate information on the antibiotics that are prescribed. The immunocompromised and diabetic states were the leading factors affecting the choice of AP however, the use of AP in dentistry should be done with caution and at low doses. There is a need for regular training on antibiotic prescription in dentistry to ensure standardization.

Limitations

- A generalization on the prescription pattern for antibiotics among dental surgeons in Nigeria cannot be made because of geographic constraints, all the dentists in a region may not have participated.
- Specialization bias was noticed since participants were mostly general dentists.
- There were no indications for combining antibiotics in this study.
- There was no standardized measuring tool to verify prescription accuracy
- Selection bias since most states targeted were teaching hospitals or federal medical centers.

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