

KNOWLEDGE AND AWARENESS LEVEL OF GENERAL DENTISTS REGARDING ANTIBIOTIC PRESCRIBED RELATED ENDODONTIC TREATMENT

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ABSTRACT

Endodontic and periapical diseases are often caused by pulp infections, in dentistry, antibiotics are not commonly prescribed because surgical intervention is usually needed for inflammatory oral diseases. Antibiotics can be used as an additional treatment for localized lesions and orofacial infections. Implementing a training program in microbiology and immunology for dental students and practitioners can help improve antibiotic prescription practices and raise treatment standards in Saudi Arabia. To assess knowledge and awareness level about antibiotics prescription in endodontic treatment among general dentists in KSA. A 14-questioned cross-sectional questionnaire survey was conducted in Saudi Arabia, and was circulated among general dentists consisting general-knowledge questions about antibiotics where participants were asked to indicate whether an antibiotic prescription was necessary or not. Information was collected through surveys using SPSS version 25.0. The study included 460 participants, 71.7% of whom were females. The majority of participants fall within the 20-30 years age bracket, accounting for 82.6% of the total. The majority of the population, comprising 47.4%, is in the high knowledge level category, followed by moderate and low knowledge level categories at 38.0% and 14.6%, respectively. All sociodemographic characteristics showed a statistically significant association with knowledge level. The study showed that participants exhibited sufficient knowledge regarding antibiotic-prescribed related endodontic treatment; however the study highlights the need for continued education and training for general dentists on the appropriate use of antibiotics in endodontic treatment.

Key words: Antimicrobials, Dental practitioners, Endodontic pain, Antibiotics, Knowledge.

Introduction

The majority of endodontic and periapical diseases are caused by pulp, and are typically detected during routine dental radiography examinations or when teeth experience sudden discomfort. Obligate anaerobic bacteria predominate in primary endodontic infections, which are polymicrobial in origin. Endodontic therapy is justified by the need to get rid of the infection and stop microorganisms from infecting or re-infecting the periradicular tissues or the root. The onset of periapical illness is directly linked to the presence of microorganisms in the dental pulp [1].

Antibiotic indications in dentistry are rare due to the need for surgical intervention for most inflammatory oral diseases. However, some clinical circumstances require empirical antibiotic therapy, such as fever and systemic dissemination [2]. Antibiotics are recommended for localized lesions and are used as an additional therapy for orofacial infections. Dentists must have expertise and

information on appropriate treatment methods to effectively manage these conditions [3].

Numerous studies have assessed the global trend in dental antibiotic prescriptions. For instance, it was discovered that dentists and dental professionals in the USA annually prescribed more than 2.9 million antibiotics [4]. The primary cause of over-prescription is the lack of reliable scientific evidence demonstrating clinical circumstances in which a systemic supply of antibiotics is necessary [5]. While over-prescription of antibiotics can contribute to the development of resistance, widespread and/or excessive antibiotic use can considerably enhance the occurrence of resistance. Antimicrobial resistance occurs when bacteria adapt and proliferate in the presence of antibiotics [6].

Through previous studies on knowledge and awareness of prescribing antibiotics during root canal treatment, we found that most practitioners consider the diagnosis, and prefer amoxicillin and metronidazole in most of their cases. The

lowest percentage was for prescribing antibiotics for specific cases. Also, gender played an important role in those studies [7-10].

The previous studies have shown an irrelevant number of articles that support this topic, especially in Saudi Arabia as most studies were conducted outside of Saudi Arabia. A gap of knowledge has been shown to exist between dental students and general dental practitioners in cases of an endodontic infection where the prescription of an antibiotic is applicable or not, highlighting the necessity of a better understanding in the mechanism of survival of the resistant bacteria inside an endodontically treated tooth, and a better understanding of the association between particular microorganisms and the oral infection sustained by specific strains. Suggesting that a training program in microbiology and immunology should be implemented among dental students and general dental practitioners, to have a better understanding and knowledge about antimicrobial resistance, hence, improving the practices of antibiotic prescription, and raising the standards of treatment in Saudi Arabia.

The study's goal was to assess how well general dentists followed the recommendations of the American Association of Endodontists (AAE) while prescribing antibiotics to patients with endodontic treatment in Saudi Arabia.

Objectives

To assess knowledge and awareness level about antibiotics prescription in endodontic treatment among general dentists in KSA.

Materials and Methods

Study design

This study was a cross-sectional questionnaire survey conducted in Saudi Arabia. Based on a structured questionnaire.

Study setting: Participants, recruitment, and sampling procedure

An online survey was conducted that had 14 questions, and was circulated among general dentists in Saudi Arabia and became accessible in 2023, with the questionnaire consisting of general knowledge questions about antibiotics and clinical vignettes where participants were asked to indicate whether an antibiotic prescription was necessary or not. This helped gauge the various antibiotic treatment regimens used across the country. Each response was confirmed because the questionnaire was distributed using Google Forms, which also obtained the candidates' phone numbers and email addresses. The questions asked about general information and awareness of the existence of antibiotic prescription guidelines for endodontic therapy.

Sample size

Taking into account a margin of error of 5%, a confidence

level of 95%, a population size of 20,000, and a response distribution of 50%, the recommended sample size would be 384. This sample size allows us to obtain accurate and reliable results while maintaining a high level of confidence.

Method for data collection and instrument (Data collection Technique and tools)

The participants' answers to the questions were used to collect the data. Age, gender, and educational level were among the demographic questions on the survey, along with questions about respondents' familiarity with the topic of antibiotic prescriptions. They were questioned about the endodontic diseases for which antibiotics were prescribed before beginning therapy. After consulting pertinent studies carried out in Saudi Arabia and overseas, this tool was created. The final questionnaire had eight questions.

Scoring system

8 questions made up our poll

Overall, evaluations of knowledge and attitude were made using statements.

Knowledge rating

Dentists have to answer 6 questions correctly in order to consider them high knowledge level, whereas the moderate knowledge level is between 4 to 6 questions, and any question below 4 is considered a low knowledge level.

Analyzes and entry method

Information collected through surveys using SPSS version 25.0. The overall response rate and the percentage of responses for each question were obtained from this database and placed into the Statistical Package for Social Sciences®. Both descriptive and analytical statistics were employed. The Chi-square test was utilized to test the association between variables. The P value is considered significant if less than 0.05.

Results and Discussion

Table 1 shows that the age distribution indicates that the majority of participants fall within the 20-30 age bracket, accounting for 82.6% of the total, followed by the 31-40 age group at 8.7%, the 41-50 age group at 6.5%, and the 51-60 age group at 2.2%. In terms of gender, the data reveals a higher representation of females, constituting 71.7% of the participants, while males make up 28.3% of the total. Nationality-wise, the majority of participants are Saudi nationals, comprising 91.3% of the total, with non-Saudis making up 8.7%. The data also provides insights into the geographical distribution of participants, with the highest representation from the western area (50.0%), followed by the southern area (39.1%), the governmental hospital (45.7%), the private hospital (54.3%), the northern area (6.5%), the eastern area (2.2%), and the central area (2.2%). Furthermore, the academic qualification breakdown indicates that the majority of participants hold a BDS

degree, accounting for 93.5% of the total, followed by board certification at 4.3% and fellowship at 2.2%.

Table 1. Sociodemographic characteristics of participants (n=460)

	Parameter	No.	%
Age	20_30	380	82.6
	31_40	40	8.7
	41_50	30	6.5
	51_60	10	2.2
Gender	Male	130	28.3
	Female	330	71.7
Nationality	Saudi	420	91.3
	Non-Saudi	40	8.7
Location	Central area	10	2.2
	eastern area	10	2.2
	Northern area	30	6.5
	southern area	180	39.1
	western area	230	50.0
Academic Qualification	BDS	430	93.5
	Board Certification	20	4.3
	Fellowship	10	2.2
Working place	governmental hospital	210	45.7
	Private hospital	250	54.3

Table 2 presents the situations in which antibiotics would be prescribed. It shows that the highest percentage (67.4%) of respondents would prescribe antibiotics in the case of a patient with diffuse swelling. Additionally, 15.2% of respondents would prescribe antibiotics for all of the mentioned situations.

Moving on to the prophylactic prescription of antibiotics, the data reveals that the majority of respondents (43.5%) would prescribe antibiotics for immunocompromised patients, followed by 37.0% who would prescribe antibiotics for all of the listed situations. Regarding antibiotic preferences for adult patients, the table indicates that the majority of respondents (82.6%) prefer Amoxicillin for patients with no medical allergies. However, in cases of penicillin allergy, Clindamycin is the preferred choice, with 60.9% of respondents opting for this antibiotic.

In situations where improvement is not seen after 2-3 days

with the first choice of antibiotic, the data shows that the highest percentage of respondents (47.8%) would opt for Metronidazole. The table also addresses special situations in which antibiotics are likely to be prescribed, with a notable 58.7% of respondents indicating that they would prescribe antibiotics for other special situations. When it comes to the duration of antibiotic prescriptions, the data reveals that the majority of respondents (45.7%) would prescribe antibiotics for 5 days. The table also includes information about the types of antibiotics prescribed by dentists, with Amoxicillin and clavulanic acid in combination being the most commonly prescribed (67.4%). Furthermore, the data indicates a high level of awareness about antimicrobial resistance, with 91.3% of respondents being aware of this issue. Additionally, 93.5% of respondents consider antimicrobial resistance a public health problem. The table also addresses the potential link between overprescription of antibiotics and antimicrobial resistance, with 91.3% of respondents acknowledging this connection.

Table 2. Knowledge of general dentists regarding antibiotic prescribed related endodontic treatment (n=460).

	Parameter	No.	%
In which of the situations would you prescribe antibiotics:	a. Acute pulpitis	10	2.2
	b. Acute apical abscess	20	4.3

	c. Chronic apical abscess with sinus tract	40	8.7	
	d. Necrosis	10	2.2	
	e. In patient with diffuse swelling	310	67.4	
	f. All of the above	70	15.2	
In which of the following situations would you prescribe antibiotics prophylactically:	a. Only before endodontic surgery	10	2.2	
	b. Immunocompromised patients	200	43.5	
	c. Un –controlled diabetic patients	30	6.5	
	d. Systemic disease	40	8.7	
	e. History of cancer and radiotherapy.	10	2.2	
	f. All of the above	170	37.0	
Antibiotic preference for adult patients with no medical allergies:	a. Amoxicillin 250mg QID/ 500mgBD	380	82.6	
	b. Azithromycin 500mg stat, 250mgBD	30	6.5	
	c. Ciprofloxacin mg"D	20	4.3	
	e. Metronidazole 250mg /500mgQID	10	2.2	
	f. Other	20	4.3	
		b. Azithromycin 500mg stat, 250mgBD	70	15.2
Antibiotic preference for adult patients with penicillin allergy:	c. Ciprofloxacin mg"D	30	6.5	
	d. Clindamycin 150mg/300mgQID	280	60.9	
	e. Metronidazole 250mg /500mgQID	50	10.9	
	f. Other	30	6.5	
		a. Amoxicillin 250mg QID/ 500mgBD	60	13.0
		b. Azithromycin 500mg stat, 250mgBD	50	10.9
What would be your choice in cases where improvement is not seen after 2-3 days with Your First Choice of Antibiotic:	c. Ciprofloxacin mg"D	30	6.5	
	d. Clindamycin 150mg/300mgQID	60	13.0	
	e. Metronidazole 250mg /500mgQID	220	47.8	
	f. Other	40	8.7	
		a. You are going on vacation	30	6.5
	For which of the following special situations are you likely to prescribe antibiotics	b. Patient is going on vacation	40	8.7
c. Upcoming long weekend		120	26.1	
d. Other		270	58.7	
		- until resolution	10	2.2
Antibiotic Prescription Duration:	-3 days	50	10.9	
	-5 days	210	45.7	
	- 7days	190	41.3	
		1 Amoxicillin and clavulanic acid in combination	310	67.4
Antibiotics Prescribed by dentists:	2 Amoxicillin	70	15.2	
	3 Amoxicillin and Metronidazole in combination	70	15.2	
	6 Metronidazole	10	2.2	
		Yes	420	91.3
Are you aware of antimicrobial resistance	No	40	8.7	
	Yes	430	93.5	
Is antimicrobial resistance considered a public health problem	No	30	6.5	
	yes	420	91.3	
Can overprescription of antibiotics lead to antimicrobial resistance	No	40	8.7	
	yes	420	91.3	

It's notable in **Figure 1** that a significant portion of the population falls within the high knowledge level category,

comprising 47.4% of the total. Additionally, the moderate knowledge level and low knowledge level categories make up 38.0% and 14.6% of the population, respectively.

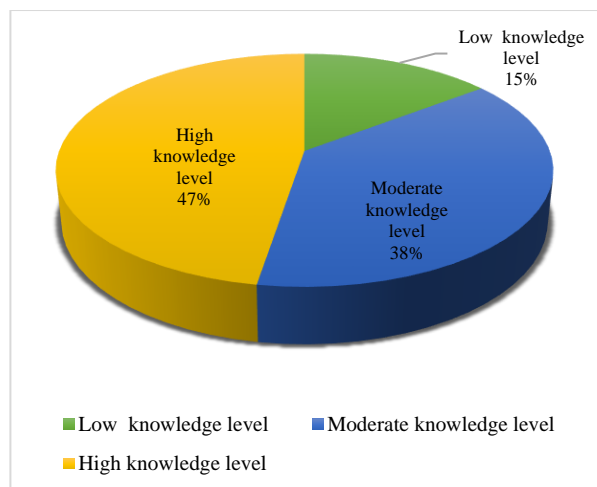


Figure 1. Knowledge score of general dentists regarding antibiotic prescribed related endodontic treatment

Starting with the age parameter, **Table 3** shows the distribution of individuals across different age groups and their knowledge levels. For instance, in the 20-30 age group, 32.2% exhibited a high knowledge level, while 35.9% demonstrated a moderate knowledge level. The p-value for this age group was 0.001. Moving on to the gender parameter, the table delineates the distribution of male and female participants across different knowledge levels. For instance, 15.7% of males demonstrated a high knowledge level, while 8.3% of males exhibited a moderate knowledge level. While 31.7% of females exhibited high knowledge level, 29.8% exhibited moderate knowledge level. The p-value for gender was 0.044, suggesting a statistically

Table 3. Association between sociodemographic characters and knowledge score of general dentists regarding antibiotic prescribed related endodontic treatment (n=460).

Parameter	Knowledge score			Total (N=460)	P value
	High knowledge level	Moderate knowledge level	Low knowledge level		
Age	20_30	148 32.2%	165 35.9%	67 14.6%	0.001
	31_40	32 7.0%	8 1.7%	0 0.0%	
	41_50	29 6.3%	1 0.2%	0 0.0%	
	51_60	9 2.0%	1 0.2%	0 0.0%	
Gender	Male	72 15.7%	38 8.3%	20 4.3%	0.044
	Female	146 31.7%	137 29.8%	47 10.2%	
Nationality	Saudi	185 40.2%	175 38.0%	60 13.0%	0.001

significant association between gender and knowledge level.

The nationality parameter highlights the distribution of Saudi and Non-Saudi participants across different knowledge levels, as Saudi individuals exhibited higher knowledge than Non-Saudi. For instance, 185 Saudi individuals demonstrated high knowledge level, representing 40.2% of the total, while 38.0% of individuals exhibited moderate knowledge level. The p-value for nationality was 0.001, indicating a statistically significant correlation between nationality and knowledge level. The table also provides insights into the distribution of individuals across various locations and their corresponding knowledge levels. For instance, in the southern area, 53 individuals demonstrated high knowledge level, representing 11.5% of the total, while 18.9% of the individuals exhibited moderate knowledge level. The p-value for location was 0.001, signifying a statistically significant relationship between location and knowledge level.

Moreover, the table presents the distribution of individuals across different academic qualifications and their knowledge levels. The BDS category demonstrated a higher knowledge level, representing 43.5% of participants. The p-value for academic qualification was 0.001, indicating a statistically significant association between academic qualification and knowledge level. Lastly, the table outlines the distribution of individuals across various workplaces and their corresponding knowledge levels. As participants working in private hospitals exhibited higher knowledge, (27.4%) had high knowledge, and (23.3%) had moderate knowledge. The p-value for working places was 0.001.

Location	Non-Saudi	33 7.2%	0 0.0%	7 1.5%	40 8.7%	0.001
	Orthern area	20 4.3%	10 2.2%	0 0.0%	30 6.5%	
	Central area	10 2.2%	0 0.0%	0 0.0%	10 2.2%	
	eastern area	9 2.0%	1 0.2%	0 0.0%	10 2.2%	
	southern area	53 11.5%	87 18.9%	40 8.7%	180 39.1%	
	western area	126 27.4%	77 16.7%	27 5.9%	230 50.0%	
	BDS	200 43.5%	173 37.6%	57 12.4%	430 93.5%	
Academic Qualification	Board Certification	10 2.2%	0 0.0%	10 2.2%	20 4.3%	0.001
	Fellowship	8 1.7%	2 0.4%	0 0.0%	10 2.2%	
	governmental hospital	92 20.0%	68 14.8%	50 10.9%	210 45.7%	
Working places	private hospital	126 27.4%	107 23.3%	17 3.7%	250 54.3%	0.001

The use of antibiotics in dentistry has been widely discussed in recent years, especially in relation to endodontic treatment. Endodontic treatment is a common procedure that involves the removal of infected pulp from the roots of teeth. In some cases, antibiotics are prescribed to prevent or treat infections that may arise during or after the procedure. However, the inappropriate use of antibiotics can lead to the development of antibiotic-resistant bacteria, which can pose a serious threat to public health [8].

As such, general dentists need to have a good knowledge and awareness of the appropriate use of antibiotics in endodontic treatment.

Our study found that the majority of participants (67.4%) prescribe antibiotics in patients with diffuse swelling, followed by chronic apical abscess with sinus tract, acute apical abscess, acute pulpitis, necrosis, and 15.2% of participants prescribe antibiotics in all of the previously mentioned. Another study showed that 77% of the dentists prescribed antibiotics for cases of necrotic pulp with acute apical periodontitis, accompanied by swelling and moderate to severe preoperative symptoms. 59% of the dentists who responded prescribed antibiotics for cases of necrotic pulp with acute apical periodontitis, where there was no edema and the preoperative symptoms were moderate to severe [11]. The response rates for this condition among Indian and Spanish dentists are 90.2% and 94.5% respectively, which are comparable to the findings of the previous study [12, 13].

The majority of participants (43.5%) in our study prescribed antibiotics prophylactically with immunocompromised patients, while (37%) prescribed antibiotics before endodontic surgery, with uncontrolled diabetic patients, systemic disease, history of cancer and radiotherapy, and immunocompromised patients. The 2017 AAE guidelines advise administering antibiotics to diabetic individuals with inadequate glycemic control for antibiotic prophylaxis [14]. The position statement by the ESE regarding the utilization of antibiotics in endodontics advises administering antibiotic prophylaxis to medically compromised patients with acute apical abscess, cases involving systemic complications, progressive infections, replantation of avulsed permanent teeth, and soft tissue trauma [15]. The 2007 guidelines from the American Heart Association (AHA), which updated previous guidelines for heart conditions, specify that antibiotic prophylaxis is necessary only for patients at high risk of developing infective endocarditis. This prophylaxis is required for dental procedures that involve the manipulation of gingival tissues, oral mucosa, or the periapical region of teeth. Furthermore, the recent 2021 scientific update from the AHA advises the use of antibiotic prophylaxis in situations involving prosthetic cardiac valve/material, congenital heart disease, and cardiac transplant recipients who develop cardiac valvulopathy [5, 16].

In our study, 82.6% of participants prescribed Amoxicillin 250mg QID/500 mg BD for adult patients with no allergies, whereas in the case of penicillin allergy; most of the participants (60.9%) said they prescribed Clindamycin 150

mg/300 mg QID. Similarly, another study showed that approximately 87% of the individuals selected Amoxicillin as their primary choice of medication, while metronidazole was chosen by 11% of the participants [5]. This aligns with the research conducted by Maslamani *et al.* [17]. According to a survey, the antibiotic that was most commonly prescribed by the dentists who participated was a combination of amoxicillin and clavulanic acid, accounting for 45.2% of prescriptions. This was followed by amoxicillin alone, which accounted for 33.7% of prescriptions, and a combination of amoxicillin and metronidazole, which accounted for 15% of prescriptions [11]. According to a poll conducted by Spanish dentists, 61% of the participants prescribed a combination of amoxicillin and clavulanic acid, followed by amoxicillin alone. In 2007, Spanish dentists commonly administered a combination of amoxicillin and clavulanic acid as the initial antibiotic treatment, which was then followed by amoxicillin alone [18]. Amoxicillin served as a primary antibacterial agent in European countries [19].

According to our study, participants exhibited an accepted level of knowledge and knowledge score, as the majority of patients (85.4%) exhibited high to moderate knowledge. A comparative analysis was carried out in India in 2017 to assess the proficiency and behaviors of dentists in training and those who had completed their education, specifically in the area of prescription antibiotics and analgesics. The study, which involved 870 participants, demonstrated that the knowledge level of trainee dentists was inferior to that of graduate dentists [20].

The study found that while the majority of general dentists were aware of the potential risks associated with the inappropriate use of antibiotics, there were still some knowledge gaps. For example, some dentists were not aware of the appropriate indications for antibiotic use in endodontic treatment.

The study also found that there were differences in knowledge and awareness levels between those working in private hospitals and those working in governmental hospitals. Dentists who are working in private hospitals were more likely to have a better understanding of the appropriate use of antibiotics in endodontic treatment than dentists who are working in governmental hospitals.

The study provides valuable insights into the understanding and practices of general dentists in prescribing antibiotics for endodontic treatments. However, it is important to note some limitations of the study. Firstly, the sample size of the study may not be representative of all general dentists, as it may not include dentists from diverse geographical locations or practice settings. Additionally, the study may not account for the individual variations in knowledge and awareness levels among general dentists. Furthermore, the study's findings may be influenced by recall bias or self-reporting from the participants. Despite these limitations,

the study offers important implications for improving antibiotic prescribing practices in endodontic treatments.

The findings of this study can help identify gaps in dentists' knowledge and awareness regarding antibiotic prescription in endodontic treatment, which can ultimately lead to the development of targeted educational interventions to improve prescribing practices. Additionally, this study can contribute to the overall efforts in antimicrobial stewardship, as inappropriate antibiotic use can contribute to the development of antibiotic resistance. Therefore, the results of this study can potentially impact the future of dental care by promoting evidence-based and responsible antibiotic-prescribing practices among general dentists.

Conclusion

Overall, the study showed that participants exhibited sufficient knowledge regarding antibiotic prescribed related endodontic treatment; however, the study highlights the need for continued education and training for general dentists on the appropriate use of antibiotics in endodontic treatment. This can help to ensure that antibiotics are used only when necessary and in the most effective way possible, while also minimizing the risk of antibiotic resistance. It is also important for dentists to stay up-to-date with the latest guidelines and recommendations on antibiotic use in dentistry, in order to provide the best possible care for their patients.

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