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ORIGINAL ARTICLE

The Perception of Recent Dental Graduates Regarding Antibiotics after a Routine Extraction

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ABSTRACT

Introduction: Dentistry has historically placed a high value on dental extractions, and routine dental extractions have long included the prescription of analgesics and anti-inflammatory drugs. Antibiotics have unfortunately been misused and overused in today's society, and it is not uncommon to see patients receiving prescriptions for them after a straightforward extraction. Antibiotic resistance is no longer a far-fetched theory, but the World Health Organization has warned about it because of the excessive, unnecessary use of these treatments.
Objective: To evaluate the attitudes of recent dental graduates against the use of antibiotics during a routine extraction
Materials & Methods: A questionnaire-based cross-sectional study was undertaken between June and September 2022, involving 410 recent graduates from Karachi's medical universities to explore prevalent trends in antibiotic prescription practices in dentistry. The study aimed to identify commonly prescribed antibiotics, dental conditions necessitating antibiotic therapy, barriers encountered during antibiotic prescription, information sources influencing drug prescribing, and awareness levels regarding the WHO Guide to Good Prescribing. Statistical analysis was performed using SPSS software, and the results were presented as frequency distributions expressed in percentages.
Results: The majority of dental infections were treated with amoxicillin and metronidazole, respectively, 52.9% and 36.8% of the time. It was used to treat 97.5% of a dentoalveolar abscess and 100% of orofacial infections. "Not understanding the drug brand" (27.3%) and "not knowing what to prescribe" (26.82%) were the primary obstacles to the prescription. 85.36% of people did not adhere to the WHO recommendations for good prescribing, despite the fact that 97.8% were aware of antibiotic resistance and its potential causes, with the majority of them assuming that patient noncompliance (28.53%) was the primary cause.
Conclusion: Recent dental graduates' perceptions of the need for antibiotics following an extraction were found to be inadequate, and they regretfully showed a very low level of adherence to the relevant professional recommendations. Amoxicillin was the most frequently prescribed medication, and the biggest difficulty in writing prescriptions was an ignorance of the correct drug brand names.
Keywords: Antibiotics, dental graduates, extraction, resistance, prescription, drugs.

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INTRODUCTION

Dental extractions have always been an important aspect of dentistry, similarly, prescribing analgesics and anti-inflammatory medications has always been a part of routine dental extraction. Antibiotics, in particular, were always set aside for use in extreme cases that required their attention. Regrettably, in today's world, antibiotics have been used and abused, and it is not unusual to see a patient being prescribed them following a simple case of extraction. One of the most common prescriptions after a dental procedure includes an antibiotic followed by an analgesic usually a nonsteroidal anti-inflammatory drug. In dental clinics, antibiotics are often prescribed to assist with surgical procedures, treat inflammatory conditions such as acute ulcerative gingivitis, and prevent systemic infections such as bacterial endocarditis.[1]

The idea of antibiotic resistance is no more a far-stretched reality but due to the excessive unwarranted use of these drugs World health organization has issued a warning regarding it. A recent study reported that infection with antibiotic-resistant bacteria may kill 10 million people every year until 2050.[2] Additionally, another study that showed alarming results of Staphylococcus aureus in saliva samples collected from 122 participants showed that 88.6% of the strain exhibited resistance to two or more antibiotics.[2] Patients usually seek dental consultation for the management and treatment of oral cavity infections, for which they are prescribed medications by a general dentist. Analgesics for pain handling but mostly antibiotics are advised to the patients. Dentists worldwide typically prescribe between 7% to 11% of commonly used antibiotics, such as beta-lactams, macrolides, tetracyclines, clindamycin, and metronidazole. However, each antibiotic prescription carries risks of adverse effects, ranging from mild issues like diarrhea to severe complications such as allergic reactions or anaphylaxis of particular concern is the long-term consequence of antibiotic resistance development, which poses significant challenges in healthcare.[3]

The misuse of broad-spectrum antibiotics such as amoxicillin and metronidazole aids in antibiotic resistance. When there is an unjustified and frequent subjection of the bacteria to antibiotics, they grow immunity to antibiotics by developing a defense mechanism. We have now entered a stage where some bacterial species are resistant to even the full range of antibiotics currently available, with methicillin-resistant staphylococcus aureus being the most widely known example of extensive resistance.[4] During the last six decades, extensive use of antibiotics has selected resistant strains, increasing the rate of fatal infectious diseases, and exerting an economic burden on society. This situation is widely accepted as a global problem, yet its degree is not well elucidated in many regions of the world.[5] There is a need for a system or an organization to monitor the awareness and perception of antibiotic prescription among dental graduates to reduce antibiotic resistance. A check and balance system to which the graduates should be accountable for prescribing futile medications, especially antibiotics. It's the need of the hour to put in policies to battle antibiotic resistance at the root of it all, hence a study that evaluates the perception of recent dental graduates is of vital importance in these times.

MATERIALS AND METHODS

Study Design and Sample Size

A descriptive, cross-sectional survey was conducted in Karachi, Pakistan from June to September 2022. Ethical approval (AIDM/ERC/12/2022/05) was obtained from the ethical review committee of Altamash Institute of Dental Medicine, Pakistan, in accordance with the Declaration of Helsinki principles. The study enrolled recent graduates who had completed their degree program and a one-year house job within the past four years from various dental colleges and universities in Karachi, Pakistan, using non-probability convenience sampling. Written consent was obtained from participants after explaining the study's purpose, ensuring the anonymity of their data.

A well-structured questionnaire was created using Google Forms and distributed online through social media platforms like Facebook, WhatsApp, and email to groups of dental professionals and through referrals from healthcare connections due to limitations imposed by the COVID-19 pandemic. The questionnaire was circulated among healthcare professionals working in private and public medical universities in Karachi, Pakistan. The sample size for the study was determined using Open-Epi software, considering a 95% confidence interval and a desired percentile of 50,[6] resulting in a total sample size of 410 ($n = [DEFFNp(1-p)]/ [(d2/Z21-\alpha/2(N-1)+p*(1-p)]$), with reference to a parent article.

Questionnaire Design and Distribution

Approximately 475 questionnaires were distributed to

candidates to gather information on their demographic details and their knowledge and attitudes regarding antibiotic usage. Out of these, 410 responses were deemed suitable for inclusion in the study. The questionnaire utilized for this research was a modified version of a semi-structured pretested form containing 15 closed-ended questions. These questions aimed to assess various aspects, including the most commonly prescribed antibiotics in dentistry and the recommended duration for antibiotic prescriptions. Additionally, questions were included to gauge participants' knowledge of WHO guidelines. The purpose of the questionnaire was to evaluate graduates' perceptions and attitudes towards appropriate and excessive antibiotic prescriptions, considering the potential development of antibiotic resistance. It was initially drafted in English and translated into Urdu for certain individuals. To mitigate bias, participants self-administered the questionnaire, and any duplicate responses were eliminated. A pilot study, involving approximately 15% of the total sample size, was conducted to assess the feasibility of the research methodology and participants' comprehension of the questionnaire. Notably, the findings from this pilot study were not incorporated into the final article.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Recent graduated dental professionals who had done their house job in the last 4 years.
- Freshly graduated dental students undergoing their house job.

Exclusion Criteria:

- General population.
- Dental assistants and technicians.
- Healthcare professionals such as nurses and medical doctors.
- Older graduates with more than 4 years of experience.
- People not willing to be part of the study.

Statistical Analysis

The analysis utilized the Statistical Package for Social Sciences (IBM Corporation, SPSS Inc., Chicago, IL, USA, version 25) to compute the mean, frequency, and percentage of demographic data. Following this, the responses were gathered and percentages were calculated to represent the questionnaire results through a frequency distribution.

RESULTS

In this cross-sectional study, we enrolled a total of 410 participants. Concerning participants' ages, the majority, comprising 279 (68.04%), fell within the 25-26 year bracket, followed by 123 (30%) participants aged 23-24 years. There were 179 (43.65%) male participants and 231 (56.34%) female participants. The majority, consisting of 191 (46.58%) participants, reported having 1-2 years of experience, as depicted in Table 1.

In this study, the majority of the 217 (52.9%) participants believed that Amoxycillin is the most commonly prescribed antibiotic in dentistry followed by Metronidazole 151 (36.8%). When the participants were asked about their reason for giving an antibiotic prescription, all of them strongly believed that it should be given in cases of Orofacial infections with signs of systemic involvement (100%) followed by 400 (97.5%) participants who would advise it in cases of dentoalveolar abscess and minor surgical procedures. Ironically almost half of them still prescribe it in patients with simple extractions, 212 (51.2%) and 151 (36.8%) for patient satisfaction.

Table 1. Demographic characteristics of the participant

Variables		Frequency (n) and Percentage (%)
Age	23-24 years 25-26 years 27-28 years	123 (30%) 279 (68.04%) 8 (1.95%)
Gender	Male Female	179 (43.65%) 231 (56.34%)
Years of experience	3-4 years 1-2 years <1 year	77 (18.78%) 191 (46.58%) 142 (34.63%)

Moreover, 300 (73.1%) believed that antibiotics should be prescribed at least for 5 days. About 300 (73.1%) respondents believed that whenever they have to manage a case of a dentoalveolar abscess, they will prescribe antibiotics and give an appointment later. Few of the students 70 (17.17%) said that dentoalveolar abscess is treated postoperatively by drainage and antibiotics, while 300 (73.17%) said that treatment should merely involve medication and relaxation. 40 (9.7%) people believed that the abscess could be drained without the need for antibiotics. Before prescribing, ask about the use of antibiotics in the previous week: Before prescribing

antibiotics, the majority of the students 215 (52.4%) asked their patients if they had ever taken them. The remaining 195 (47.9%) did not.

According to Table 2, students sought advice for a prescription from faculty members 175 (42.68%), followed by 100 (24.1%) medical representatives, 95 (23.17%) classmates, and 20 (4.87%) representatives from pharmacology classes and prescription books. According to several students, the biggest obstacle while filling a prescription is "not recognizing the brand names." 106 (25.85%) said they did not know the proper dosage for the drugs, as opposed to 112 (27.3%) who said they did not know what to prescribe. Only 29 people, or 7.04%, reported they were unsure about the precise length of the antibiotic course.

Important considerations before prescribing antibiotics include: Of the students, 203 (49.5%) chose undesirable drug interactions, 157 (38.29%) selected its side effects, and 50 (12.19%) selected patient disobedience as their response. 350 students (85.36%) did not know the WHO

Table 2. Dental Practitioners' Knowledge, Attitudes, and Practices on Antibiotic Prescription

S. No	Questions	Frequency	Percentage
1	**Which are the most commonly prescribed antibiotics in dentistry?**		
	Amoxycillin	217	52.9
	Metronidazole	151	36.8
	Ampicillin	20	4.87
	Cephalosporin	20	4.87
	Doxycyclin	2	0.48
2	**In which of the following situations should you prescribe antibiotics?**		
	Dentoalveolar abscess	400	97.5
	Orofacial infections with signs of systemic involvement	410	100
	Pain relief	398	97
	Simple extraction	212	51.2
	Minor surgical procedures	400	97.5
	Endodontic treatment	378	92.1
	Patient Satisfaction	151	36.8
3	**What is the minimum number of days you should prescribe antibiotics?**		
	3 days	70	17.07
	5 days	300	73.1
	7 days	21	5.12
	10 days	19	4.63
4	**How will you manage a case of a dentoalveolar abscess?**		
	Prescribe antibiotics and give an appointment later	300	73.17
	Establish drainage immediately and then prescribe antibiotics	70	17.07
	Establish drainage only; no antibiotic prescription	40	9.7
5	**Do you enquire from your patient whether he/she has taken a course of antibiotics in the past week before you prescribe it?**		
	Yes	215	52.4
	No	195	47.9
6	**What is your main source of prescription information?**		
	Faculties	175	42.68
	Pharmacology courses	20	4.87
	Prescription books	20	4.87
	Classmates	95	23.17
	Medical representatives	100	24.1
7	**What could be your barrier to prescribing antibiotics?**		
	Not knowing when to prescribe	53	12.92
	Not knowing what to prescribe	110	26.82
	Not knowing the brand names	112	27.3
	Not knowing the appropriate drug doses	106	25.85
	Not knowing the exact duration of the course	29	7.04

S. No	Questions	Frequency	Percentage
8	**What are the important things to be kept in mind before prescribing antibiotics?**		
	Adverse drug interaction	203	49.5
	Side effects	157	38.29
	Patient noncompliance	50	12.19
9	**Are you aware of the current WHO guidelines to good prescribing?**		
	Yes	60	14.63
	No	350	85.36
10	**Do you follow the same?**		
	Yes	55	91.6
	No	5	8.3
11	**Do you think you should advise your patient on strict adherence to prescribed antibiotics?**		
	Yes	340	82.9
	No	70	17.07
12	**Do you believe that antibiotic resistance is a growing concern?**		
	Yes	401	97.8
	No	09	2.19
13	**Have you encountered any cases of antibiotic resistance?**		
	Yes	66	16.09
	No	344	83.9
14	**What could be the possible reason for antibiotic resistance?**		
	Inappropriate antibiotic choice	90	21.9
	Inappropriate dose	110	26.8
	Inadequate duration	93	22.68
	Patient noncompliance	117	28.53
15	**How do you primarily keep yourself updated?**		
	Lecture	110	26.8
	Internet	179	43.6
	Scientifically published literatures and journals	52	12.6
	CDE and/or Conferences	60	14.63
	Other sources	9	2.19

recommendations for appropriate prescription. Five (8.3%) of those who were aware do not adhere to it. 340 students, or 82.9%, of the class, concurred that they should advise their patients to take the antibiotics recommended to them strictly.

The results show that 340 graduates (82.9%) indicated knowing about antibiotic resistance and that roughly 401 (97.8%) have come across instances of antibiotic resistance. Inadequate duration 93 (22.68%), incorrect choice 90 (21.9%), inappropriate dose 110 (26.8%), and most of the patient noncompliance 117 (28.53%) are the potential causes, accordingly. According to the statistics, 179 (43.6%) professionals said they get their updates from the Internet, 110 (26.8%) from continuing medical education lectures, 52 (12.6%) from books and journals, 60 (14.63%) from CDE and conferences, and 9 (2.19%) said they get their updates from other sources.

DISCUSSION

We discovered that the dental graduates' understanding of antibiotic prescription was judged to be insufficient and that their level of adherence to the relevant professional standards was disappointingly low. Prescribing medicine needs both academic and clinical knowledge, along with practical abilities, to prescribe medicine. The clinical justifications for an antibiotic prescription must be fully understood and known by students. Specific justifications for prescribing an antibiotic are crucial. Additionally, they must be aware of the dangers of unfavorable effects and the emergence of resistant strains.[5]

When it comes to clinical prescribing practice, there is a sense of doubt and confusion because the training technique frequently forces students to memorize medication knowledge while inadequately preparing them to make rational prescriptions. Prescriptions are written by students with the assistance of seniors; therefore, they are not their responsibility.[6] Since our results further support this, the faculty becomes the primary source of prescription knowledge.

Our results suggest that the majority of participants concluded that Amoxycillin was a top choice for a prescription followed by Metronidazole. This might be due to the readily availability of medicine throughout the country. Without a doubt, due to its broad range of applications and low likelihood of encountering resistance, it has served as the gold standard for many years. Metronidazole was regarded as the second-best option because it synergistically targets both aerobic and anaerobic bacteria when combined with Amoxycillin.[7] A study conducted by Palmer et al and Roy et al suggested that in England and Scotland, dental professionals most frequently

prescribed amoxicillin and metronidazole.[8,9] The number of dentists, who only prescribed antibiotics for pain relief (97%) or for endodontic treatment (92.1%), in which antibiotics would play no part, was extremely upsetting and only served to increase the problem of antibiotic misuse despite the lack of evidence to support the use of antibiotics in the treatment of irreversible pulpitis and periapical abscesses. One of the few situations where antibiotics were administered was for simple extractions, which ordinarily don't call for their use. Alarmingly, one-third of dentists prescribed them solely for the patient's satisfaction. Many of the study's findings support previous research from India, Malaysia, and Saudi Arabia that found the overuse of antibiotics in situations where they were not needed which caused antibiotic resistance.[10,11] Antibiotics are widely available over the counter at any pharmacy, which has led to their misuse. They can be purchased without a prescription in many South Asian countries, and the increased ease of access spells disaster. This is consistent with findings from other nations, including France,[13] the Czech Republic, which noted a 60% increase from 2006 to 2012,[14] and Italy, which noted a 62% increase from 1993 to 2013,[12] which attest to an increase in the use of dental antibiotics. On the other hand, Australia[15,16] and the UK both saw decreases in overall antimicrobial administration, with the UK experiencing a decrease of 26.8% from 2014 to 2018. Similar results were observed in a study conducted in Spain, where 40% of endodontists prescribed antibiotics in cases of irreversible pulpitis.[17,18] As a matter of fact, it has been demonstrated that systemic antibiotics are not required in situations of irreversible pulpitis, necrotic pulps, and acute apical abscesses unless there is a rapid spread of the odontogenic infection with systemic involvement.[19-21] Moreover, there is a misconception amongst the young dentists visible in our study that a patient with dentoalveolar abscess should be prescribed antibiotics followed by debridement. In fact, it should be the other way around as establishing drainage remains the core choice of treatment, and then the introduction of antibiotics if systemic signs are fairly visible. Pulpotomies are the preferred method of treating pulpitis, and according to the guidelines, antimicrobial administration should only be used when there are systemic complications.[12,22,20]

The duration of antibiotic usage remains fairly consistent in this study as the majority of the oral infections are limited to resolving in 5 days which is similar to the study conducted in the United States and Canada, it was discovered that the typical length of time dentists prescribed antibiotics was 7.58 days and 6.92 days, respectively.[23] The continuing concern is that, despite frequently engaging in clinical practice, dentists fail to adhere to the most recent clinical recommendations for antibiotic usage and therefore are not implemented into dental practice.[25] The primary factor contributing to this unfortunate crisis is a lack of awareness.[26] Recent graduates in particular seem to follow the rules laid out in their course book, which has not been updated. Dentists appeared to be influenced and inclined by their senior colleagues after finishing their house job, who gave them advice in accordance with antibiotic prescriptions. Similar results were as only 7.4% of dentists in an Italian study said they always consulted the current antimicrobial prescription guidelines, while the majority said they did so "rarely" (48%) or "never" (5.3%).[27]

Not knowing the brand names, what to prescribe, and the appropriate drug doses remain the key barrier to prescribing antibiotics. When it comes to the health and safety of the patients, this is a very important matter. Unquestionably, factors like not knowing what to prescribe, filling up prescriptions incorrectly, and not knowing how long to administer a medicine will result in therapeutic failure. This can aggravate the patient's condition and lead to potentially dangerous health complications.[28] Despite, our country's strict regulations in the pharmaceutical industry drugs such as Nimesulide causing liver failure being banned in Pakistan are still available at pharmacies. Due to a lack of information regarding the drug's name, its effect, and the recent development, fresh graduates are unaware of the higher risk of fatal hepatic disorders this non-steroidal anti-inflammatory drug brings, thus this medication is still being recommended by a few individuals. In order to counteract this, WHO guide to good prescribing was suggested, which calls for creating a personalized list of the important medications for each medical practitioner who writes prescriptions.[25] As concluded by our study, shockingly, two-thirds (85.36%) of the participants were unaware of the WHO guidelines to prescribe antibiotics. Similar results were also observed in another study conducted by.[27]

According to this viewpoint, it is essential to educate dentists about antimicrobial resistance because it is a significant global public health issue that is directly linked to higher healthcare costs and subpar clinical outcomes. Our study revealed four hundred that one (97.8%) of dentists reported being aware of antimicrobial resistance,

primarily describing it as a rising issue. The need for wider dissemination of this information is evident from the fact that almost equal number of participants reported considering inappropriate prescribing antibiotic behavior which included inappropriate dosage, choice of drug, and duration. Patient noncompliance, on the other hand, was cited as the primary cause by 28.53% of respondents. Similar to our findings, overuse, and misuse of antibiotics in dentistry have been documented in France,[13] the USA,[19] and the UK, where antimicrobials were given to 37.6% of adults and 39.0% of children who visited dental clinics for emergencies and in 57.4% of those situations, antibiotics were prescribed even though no diagnosis had been made.[8,9,16] In this regard, the COVID-19 pandemic, which was brought on by the inability to diagnose the illness during the lockdown and patients' ensuing fear of visiting a dental office, most likely led to an increase in the prescription of antibiotics.[18]

The strength of our study lies in the fact that it was conducted on a subject that hasn't been thoroughly studied. This will raise awareness among dentists and help them improve their practice. Next, we focused on recent dental graduates, which is advantageous because regulations and rules change over time and medical professionals are always required to adhere to the most recent standards. We can therefore gain insight into dentists' perceptions of the current practice by learning what ideas they hold currently. This also demonstrates how we can improve those perceptions for the benefit of society. In addition, unlike other studies, the current survey paid particular attention to dentists who voluntarily participated. The examination of Pakistani dentists' knowledge of antimicrobial resistance and adherence to pertinent guidelines also brought attention to the importance of widely disseminating pertinent information to dental healthcare professionals and patients.[28]

Like other studies, ours has some limitations because we focused exclusively on Karachi's subsequent recent graduated rather than the nation as a whole and we might have been able to better resolve the issue with a wide range of responses. More experienced graduates could have been included. Given that skilled dentists are more likely to have a wide range of experiences than recent graduates, both perceptions and results could be assessed. Unfortunately, because this study is cross-sectional in nature, verifying causality was challenging. Furthermore, because the questionnaires were completed independently because they were distributed online, we were unable to guarantee the validity of the results. Confirmation bias was once more a probable issue when administering online questionnaires because participants might have responded to questions from different perspectives than we anticipated.[23] To prevent this, interviews should be conducted, which can also be beneficial because too many questions can make participants' attention spans shorter, which can result in answers that may be unreliable. Furthermore, extensive research should be conducted in Southern Asian countries in the near future since antibiotic misuse is on the rise and is becoming a day-to-day issue. It must be identified and thoroughly corrected before antibiotics lose their essence. It will further open up additional research opportunities in the future. Because governing bodies have not provided feedback on their existing educational measures on antibiotic prescription practices, the government's role in implementing rules that ensure proper protocol is set for this sensitive matter is critical.

Authors contribution

BS: Conception and design of the study, drafting the manuscript, and critical revision for important intellectual content.

ZAB: Data collection, analysis and interpretation, and manuscript writing.

HM: Data collection, literature review, and manuscript writing.

RS: Statistical analysis, interpretation of results, and manuscript revision.

SZA: Data analysis and interpretation, and manuscript revision.

MSA: Critical revision of the manuscript for important intellectual content and final approval of the version to be published.

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Institutional ethical board approval

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Informed Consent

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Availability of data and materials
The data supporting this study's findings are available from the corresponding author upon reasonable request.

Consent for publication
Not applicable.

Disclaimer of using AI tools
Not utilized. All ideas, arguments, and conclusions presented in the letter, however, are entirely the authors' original work. The authors take full responsibility for the accuracy and integrity of the content.

Conflict of interest
No conflict of interest.

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