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Antibiotic Prescription Practices among Dentists After Extractions in Lahore

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ABSTRACT

Antibiotics, discovered by Sir Alexander Fleming in 1929, have significantly advanced medical therapeutics. However, the rising antibiotic resistance has been the result of its overuse in the past few decades. **Objective:** To evaluate the antibiotic prescribing practices after dental extractions of house officers in Lahore. **Methods:** A study was conducted with a sample size of 127 house officers/interns from March to June 2024, from various dental hospitals in Lahore. These participants were asked to complete an anonymous questionnaire that explored their knowledge, attitudes, and practices related to prescribing antibiotics following tooth extractions. The data collected were analyzed using SPSS version 25.0 to identify trends and gaps in their understanding. **Results:** The participants had an average age of 23.77 years, with slightly more females than males. A vast majority (92.1%) prescribed antibiotics when a patient had a periapical abscess with a fever, while fewer (18.9%) did so simply because a patient requested it after a routine extraction. A significant knowledge gap among house officers in classifying antibiotics, with 81.1% incorrectly identifying Azithromycin as a broad-spectrum antibiotic and 64.6% misclassifying narrow-spectrum antibiotics. **Conclusions:** This study highlighted that while there is a general awareness of antibiotic resistance among house officers, there is still a significant gap in their adherence to proper guidelines when prescribing antibiotics after tooth extractions. The findings suggested a need for multi-prog strategies and their application to ensure that antibiotics are used judiciously, thereby helping to combat the growing problem of antibiotic resistance.

INTRODUCTION

Antibiotics, defined by Britannica as chemical substances produced by living organisms to inhibit other microorganisms, were accidentally discovered by Sir Alexander Fleming in 1929. This breakthrough significantly revolutionized 20th-century therapeutics. Initially used for military purposes during World War II, antibiotics became widely available, reducing life-threatening illnesses [1]. Dentists frequently treat bacterial infections originating in the orofacial region, primarily originating in tooth pulp. Standard treatments include fillings, scaling, root planning, root canal therapy, extractions, and abscess [2]. When surgery is not suitable, antibiotics are prescribed for conditions like necrotizing ulcerative gingivitis, bacterial sialadenitis, certain periodontitis, pericoronitis, and facial cellulitis [3]. Tooth extraction is common in dental practice, though its frequency has declined over the years [4]. Caries and periodontal disease remain the main reasons for extractions, with impacted third molars often requiring removal due to inflammation or complications [5]. Post-extraction care aims to minimize discomfort and prevent complications like trismus, pain, trismus, edema, fever, and dry socket, which can disrupt daily life. These issues stem from inflammatory responses or postoperative infection, especially in cases of severe periodontitis, extensive caries, or aggressive extractions [6, 7]. Alveolar osteitis (dry socket) occurs when a blood clot dissolves due to bacterial invasion causing severe pain. Although rare, postoperative infections are more likely

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after complex facial surgeries, especially after roadside accidents or in patients with systemic conditions like SLE, HIV, diabetes, or cancer [8]. In such cases, prophylactic antibiotics are necessary. Common antibiotics include erythromycin, amoxicillin, penicillin, metronidazole, doxycycline, and clindamycin, administered orally or parenterally [9, 10]. A review of Canadian dentists' prescribing habits revealed a 62% increase in antibiotic use from 1996 to 2013. A Cochrane review found that antibiotics reduced the risk of infection, dry socket, and pain after third molar extraction but questioned their use in routine extractions due to the potential for antibiotic resistance [5]. Antibiotic resistance highlights the importance of evaluating prescribing patterns following post-tooth extraction. Inappropriate use not only contributes to resistance but also incurs significant healthcare costs. Studies have shown over 50% of antibiotics are inappropriately prescribed raising safety concerns [9]. Furthermore, antibiotics are not necessary after routine dental extractions supplementing the need to reduce its misuse [11, 12]. Addressing this issue requires continuous professional development and targeted educational program initiatives to improve antibiotic prescribing practices [13]. However, research indicates dentists do not always follow the guidelines, often prescribing antibiotics unnecessarily. Evidence indicates prophylactic antibiotics are frequently prescribed without assessing the patient's endocarditis risk status [14]. Despite improvements following interventions and audits, adherence to the latest guidelines from the American Heart Association and the American Association of Orthopaedic Surgeons remains inconsistent [15].

The study aimed to evaluate the antibiotic prescribing practices of house officers/interns at various dental hospitals in Lahore. This would help us assess their knowledge and awareness of rational antibiotic use post-tooth extraction.

METHODS

This cross-sectional study used anonymous self-administered questionnaires distributed via Google Forms using a convenience sampling technique. This was conducted at various dental hospitals in Lahore from March to June 2024. Ethical approval was obtained from the Ethical Review Board of the University College of Dentistry, Lahore (UCD/ERCA/24/205). A sample size of 127 participants was calculated using $n=\frac{Z^2_{1-\alpha/2}\ P\ (1-P)}{d^2}$ with a 90% confidence level, a 6.76% margin of error, and an expected 69% average knowledge score on antibiotics prescription [16]. House Officers were briefed on completing the questionnaire. Informed consent was obtained. Only recently graduated house officers (BDS) were included while dental students, post-graduate trainees, general dentists, and specialists were excluded. The questionnaire had three parts: (a) Fifteen questions assessing knowledge of antibiotic prescriptions [17, 18]; (b) Eight questions evaluating attitude towards antibiotic use after routine dental extractions. [2, 19]; and (c) Questions assessing knowledge of broad- and narrow-spectrum antibiotics for odontogenic. Data were analyzed using SPSS version 25.0. Quantitative variables were presented with mean +/- standard deviation. Qualitative variables were presented with frequency and percentages. An Independent sample t-test was applied and p-value ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of the house officers surveyed was 23.77 years, with a standard deviation of 1.009 years. The sample consisted of 48% males and 52% females, resulting in a male to female ratio of 1:1.2. The survey explored the antibiotic prescription practices of house officers after routine tooth extraction under various conditions. It was found that 92.10% of house officers prescribed antibiotics for periapical abscesses with fever. For atraumatic single tooth extraction in immunocompromised patients, 74.00% of house officers prescribed antibiotics. Notably, only 18.90% of house officers prescribed antibiotics on patient's demand after simple tooth extraction. The detailed results are summarized in the following (Table 1).

Table 1: Knowledge of House Officers Towards Antibiotic Prescription Practices After Tooth Extraction

S.No.	Are Antibiotics Recommended For Use?	Yes Frequency (%)	No Frequency (%)	Don't Know Frequency (%)
1.	Asymptomatic chronic periapical pathology	63 (49.6%)	55 (43.3%)	9 (7.1%)
2.	Acute periapical abscess with no signs of fever or chills	70 (55.1%)	56 (44.1%)	1 (0.8%)
3.	Periapical abscess with fever	117 (92.1%)	6 (4.7%)	4 (3.1%)
4.	Periapical pathology progressed into cellulitis	111 (87.4%)	12 (9.4%)	4 (3.1%)
5.	3rd molar extraction with mild pericoronitis	71 (55.9%)	52 (40.9%)	4 (3.1%)
6.	3rd molar extraction with moderate pericoronitis	86 (66.9%)	35 (27.6%)	7 (5.5%)
7.	3rd molar extraction with severe pericoronitis	110 (86.6%)	13 (10.2%)	4 (3.1%)
8.	On patient's demand after simple tooth extraction	24 (18.9%)	100 (78.7%)	3 (2.4%)
9.	Trismus resulting from dental infection	77 (60.6%)	40 (31.5%)	10 (7.9%)
10.	Atraumatic single tooth extraction in immunocompetent patients	37 (29.1%)	83 (65.4%)	6 (4.7%)
11.	Atraumatic multiple tooth extraction in immunocompetent patients	51 (40.2%)	72 (56.7%)	4 (3.1%)

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12.	Atraumatic single tooth extraction in immunocompromised patient	94 (74%)	30 (23.6%)	3 (2.4%)
13.	Atraumatic multiple tooth extraction in immunocompromised patients	106 (83.5%)	16 (12.6%)	5 (3.9%)
14.	Severe pain not attributed to infection	36 (28.3%)	82 (64.6%)	9 (7.1%)
15.	Alveolar osteitis (Dry Socket)	32 (25.2%)	86 (67.7%)	9 (7.1%)

Males and females showed similar awareness of drug resistance and antibiotic guidelines with no significant gender-based differences. However, significantly more females (86.9%) believed self-medication contributes to antibiotic resistance than males (67.4%) (p=0.33). Additionally, males reported noticing adverse drug reactions more frequently (60.5%) compared to females (34.5%) (p=0.018). Other responses, such as dosage calculation and allergy inquiries did not show significant gender variation(Table 2).

Table 2: Attitude of House Officers Towards Antibiotic Prescription Practices After Tooth Extraction

Questions	Responses	Total	Males Frequency (%)	Females Frequency (%)	p-value
Have you heard about the word 'Drug Resistance'?	Yes	111	36 (83.7%)	75 (89.3%)	0.268
	No	16	7 (16.3%)	9 (10.7%)	
Are you aware of the latest antibiotic guidelines for prescribing antibiotics in patients after tooth extraction?	Yes	52	16 (37.2%)	36 (42.9%)	0.488
	No	75	27 (62.8%)	48 (57.1%)	
Do you follow the latest antibiotic guidelines for prescribing antibiotics in patients after tooth extraction?	Yes	54	18 (41.9%)	36 (42.9%)	0.285
	No	73	25 (58.1%)	48 (57.1%)	
Do you enquire from your patient about whether he/she has taken a course of antibiotics in the past 1 week before prescribing antibiotics?	Yes	95	29 (67.4%)	66 (78.6%)	0.274
	No	32	14 (32.6%)	18 (21.4%)	
Do you think self-medication with antibiotics by patients to get relief from dental pain may be responsible for antibiotic resistance?	Yes	102	29 (67.4%)	73 (86.9%)	0.033*
	No	25	14 (32.6%)	11 (13.1%)	
Do you calculate the dosage of the drugs according to the age and weight of the patient?	Yes	61	21 (48.8%)	40 (47.6%)	0.94
	No	66	22 (51.2%)	44 (52.4%)	
Have you ever noticed any adverse drug reactions to antibiotics in the patients?	Yes	55	26 (60.5%)	29 (34.5%)	0.018*
	No	72	17 (39.5%)	55 (65.5%)	
Do you ask patients about any known antibiotic allergy?	Yes	110	34 (79.1%)	76 (90.5%)	0.193
	No	17	9 (20.9%)	8 (9.5%)	

The study evaluated the knowledge of house officers regarding broad and narrow-spectrum antibiotics used for treating odontogenic infections. Participants were presented with four antibiotic options for each category. For broad-spectrum antibiotics, Azithromycin and Amoxicillin with clavulanic acid were the correct choices. The results showed that while 67% of the participants correctly recognized Amoxicillin with clavulanic acid, only 18.9% recognized Azithromycin as a broad-spectrum antibiotic, meaning 81.1% were unaware of its correct classification. For narrow-spectrum antibiotics, Clindamycin and Penicillin were the correct options. An equal percentage of participants (35.4%) correctly identified both Clindamycin and Penicillin as narrow-spectrum antibiotics, leaving 64.6% who incorrectly classified them. These findings highlight significant knowledge gaps among house officers, particularly in recognizing Azithromycin as a broad-spectrum antibiotic and the correct classification of narrow-spectrum antibiotics. The detailed response distribution is summarized in (Table 3).

Table 3: Knowledge of House Officers about the Broad and Narrow-Spectrum Antibiotics

Broad Spectrum Antibiotic		
Name of Antibiotic	**Yes Frequency (%)**	**No Frequency (%)**
Azithromycin*	24 (18.90%)	103 (81.10%)
Amoxicillin with clavulanic acid*	18 (66.90%)	42 (33.10%)
Metronidazole	18 (14.20%)	109 (85.80%)
Penicillin	47 (37.00%)	80 (63.00%)
Narrow Spectrum Antibiotic		
Name of Antibiotic	**Yes Frequency (%)**	**No Frequency (%)**
Azithromycin	22 (17.30%)	105 (82.70%)
Clindamycin*	45 (35.40%)	82 (64.60%)
Moxifloxacin	38 (29.90%)	89 (70.10%)
Penicillin*	45 (35.40%)	82 (64.60%)

*Correct Answers [17]

DISCUSSION

This study aims to evaluate the knowledge of house officers regarding antibiotic prescribing practices after tooth extraction in various dental hospitals across Lahore. Antibiotics are frequently prescribed after dental procedures, including tooth extractions, to prevent or manage postoperative infections. It is still debatable

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whether to administer an antibiotic medication before or following tooth extractions to avoid issues following tooth exodontia. Regarding the efficacy and appropriateness of antibiotic prescriptions in avoiding surgical site infections, there is disagreement in the research [20]. In this cross-sectional survey, data were collected from house officers in hospitals across Lahore to assess their antibiotic prescription practices for periapical infections without systemic involvement. The results revealed that 55.1% of participants in this study prescribed antibiotics in these cases. In contrast, only 15% of participants in India prescribed antibiotics post-tooth extraction, and 47.1% of participants in Saudi Arabia did not use any antibiotics for periapical infections after drainage [18, 16]. Despite the understanding that antibiotics aren't necessary for mild to moderate pericoronitis, nearly 60% of participants prescribed antibiotics for mild cases, and 67% did so for moderate cases. However, 86.6% correctly identified the need for antibiotics in severe pericoronitis. In comparison, 78.7% of junior dentists in Sudan prescribed antibiotics for pericoronitis [2]. A study in Pakistan found 32% prescribed antibiotics, whereas a Saudi Arabian study found that 36.7% answered correctly about antibiotic use in this condition, while only 4.1% of participants in India prescribed antibiotics for pericoronitis [21, 16, 18]. Böttger S *et al.*, recommended combining surgical intervention with antibiotic treatment in cases of infection accompanied by pus discharge [22]. Additionally, it is advised that children with odontogenic cellulitis be treated with broad-spectrum antibiotics [23]. In this study, 87% of participants chose to prescribe antibiotics for cellulitis, whereas Yousufi S *et al.*, found that only 14.2% of participants in Peshawar opted for the same approach [21]. In India, 12.5% of dentists prescribed antibiotics in such cases; however, a study from Saudi Arabia reported a much higher rate of 90.8% [18, 16]. These findings highlight significant variations in antibiotic prescription practices across different studies. Many clinicians prefer to administer antibiotics and painkillers over several days to manage trismus and infection, allowing time for the symptoms of trismus to alleviate before investigating the root cause of the problem. More than 60% of participants in this study gave the right answer about the use of antibiotics in trismus, and atraumatic extraction in healthy and immunocompromised patients. Only 27.5% and 11.8% answered correctly in two other studies. [16, 24]. Al Marah ZA *et al.*, found that 51.1% of their participants prescribed antibiotics in dry Socket [24]. In this study, 25.5% of participants were prescribed antibiotics in dry sockets. 61.1% of participants in the Saudi study correctly answered that they don't prescribe antibiotics in this condition [16]. Overprescribing antibiotics can lead to various serious issues, such as bacterial resistance, gastrointestinal and blood-related complications, and disruption of bacterial flora in the body [24]. Additionally, standard infection treatments will lose their efficacy, and illnesses will continue to survive and spread more readily among people [25]. In this study, 83.7% of male and 89.3% of female participants were aware of the word drug resistance whereas 37.2% of males and 42.9% of females were aware of the latest antibiotic prescribing guideline. In a study in India, 98.5% of interns knew about drug resistance and 96.9% knew about the latest guidelines which were far better than our study's observations [19]. In Australia, dentists most frequently prescribed amoxicillin, accounting for 66.3% of all antibiotic prescriptions [26]. 66.90% and 18.9% of participants knew that amoxicillin with clavulanic (the most prescribed antibiotic in this study) and azithromycin is a broad-spectrum antibiotic. The discrepancy in antibiotic prescribing practices between the study and others, such as those conducted in India (26.6%) and Sudan (31% for dentoalveolar infections) highlights the influence of regional or institutional practices, as well as individual clinician preferences [18, 2]. Understanding these variations is crucial for identifying areas of improvement and implementing targeted interventions to promote appropriate antibiotic stewardship. The frequent prescribing of antibiotics for conditions like pericoronitis, periapical infections, cellulitis, and trismus suggests a potential for overreliance on antibiotics. This may be due to factors such as perceived patient expectations, insufficient awareness of evidence-based guidelines, or precautionary approaches to prevent complications from surgeries in oral and facial regions [25]. However, it is crucial to emphasize that antibiotics should be prescribed only when there are significant risks of complication or clear evidence of systemic involvement [26]. Studies with findings on participants' awareness and knowledge of antibiotic resistance and their adherence to prescribing guidelines reveal both strengths and areas for further improvement. The concept of antibiotic resistance is not novel anymore, but a notable number of the participants were unfamiliar with the latest prescribing guidelines and antibiotic-specific properties. This stresses the dire need for ongoing educational training programs to ensure and revise the knowledge and provide the means necessary for evidence-based decision-making. This study has, like all the other studies, had a few limitations. Since the questions were self-administered, participants might have replied with the answers they thought were correct rather than what they practice in clinics. This study focuses on one point in time, so it doesn't show how these practices have evolved or how they might be affected after educational interventions. Future studies should be longitudinal and include more intuitions across the country for a more comprehensive overview. Regular training and audits would help to ensure that guidelines are followed, and antibiotics are used responsibly in dental care.

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CONCLUSIONS

The study highlights gaps in house officers' knowledge of antibiotic prescription after tooth extractions. While most prescribed antibiotics for conditions like periapical abscess with fever and cellulitis, inconsistencies were noted. Many struggled to differentiate between broad and narrow-spectrum antibiotics. These results emphasize the need for rational antibiotic use in dental practice. Regular training and audits can help ensure adherence to guidelines and responsible antibiotic prescribing.

Authors Contribution

Conceptualization: SA, MAA
Methodology: SA, RS, IUR, AA
Formal analysis: SA, RS, IUR, AA
Writing, review and editing: MAA, TS, MAB

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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