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Analgesic and Antibiotic Prescription Pattern among Dentists in Pakistan

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ABSTRACT

Background: In Pakistan, where dental practitioners often serve as frontline prescribers, understanding their prescription habits is crucial to promoting safe, evidence-based care and improving health care systems. It is also essential to combat the growing global threat of antibiotics resistance. **Objective:** This study was conducted to examine the prescribing patterns of antibiotics and analgesics among dentists in Pakistan, our main objective is to identify common trends, clinical judgements, and the underlying factors which influence such decisions. **Methods:** A self-administered questionnaire was distributed online among registered dentists. Almost 205 dental practitioners participated in this cross-sectional quantitative study. The survey explored demographic profiles, preferred drug prescription choices, rationale for prescriptions, and familiarity with standard guidelines. Data were analyzed using SPSS (Version 25), applying inferential statistics, ANOVA and chi-square tests to identify significant associations. **Results:** The participant pool was predominantly young, with 85.3% aged between 20 and 30 years, and a female majority (69.6%). Amoxicillin emerged as the most frequently prescribed antibiotic (83.8%), followed by Metronidazole (12.3%). Diclofenac potassium was the most commonly prescribed analgesic. Nearly half (48.5%) of the dentists reported prescribing antibiotics for conditions like chronic pulpitis, which typically do not warrant antibiotic intervention. 88.7% of respondents consistently adhered to established prescribing guidelines. **Conclusion:** The study reveals a prevalent tendency towards unnecessary prescription of antibiotics and analgesics among dentists in Pakistan. These findings indicate the urgent need for targeted educational programs, enforcement and monitoring of clinical guidelines and prescribing practices to promote public health.

INTRODUCTION

A medical prescription is an official document that tells healthcare providers what medications and treatments are needed to treat a condition. Being able to safely and effectively prescribe commonly used medications is an important skill for any qualified medical professional (Shah et al., 2024) In dentistry, the most commonly prescribed medications are pain relievers (like NSAIDs) and antibiotics. It's essential for dentists to ensure the correct dosages and be mindful of any potential side effects (Arshad et al., 2024; Shah et al., 2024). The misuse or overuse of antibiotics and painkillers like opioids is a significant issue, and unfortunately, it's something that can happen, among healthcare practitioners (das Neves et al., 2024; Teoh, Marino, et al., 2019). However, junior and inexperienced practitioners are often prone to making prescription errors. This problem is more pronounced in countries with struggling healthcare systems, like Pakistan (Shah et al., 2024). Antibiotic resistance is a growing global health threat. It's estimated that dentists prescribe around 10-13% of all antibiotics and analgesics use worldwide (das Neves et al., 2024). Prescription mistakes are common, with error rates ranging from 39% to 74%. To help reduce these mistakes, the World Health Organization (WHO) has created guidelines for writing prescriptions properly (Shah et al., 2024). Prophylactic antibiotic use and whether antibiotics should be used before or after dental procedures like tooth extractions is under debate in dentistry. Many infections can be treated with simple oral care or, in some cases, surgical interventions, without needing antibiotics (Sheikh Rezaei et al., 2022; Teoh, Marino, et al., 2019). Without clear guidelines and coordinated global action, we could be heading back to a time when simple infections could be fatal, due to

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antibiotic resistance (das Neves et al., 2024). Besides dealing with general epidemics, we're also facing a growing problem with antibiotic resistance. Dentists are among the healthcare providers who prescribe antibiotics, but there's limited research on how well they understand the proper use of these medications in practice. Dentists account for roughly 7% to 11% of prescriptions for common antibiotics like metronidazole, clindamycin, tetracycline, macrolides, and beta-lactams. However, using antibiotics isn't without risk. They can cause side effects ranging from mild stomach issues to life- threatening allergic reactions, and overuse contributes to resistance. One well-known example of antibiotic resistance is methicillin-resistant Staphylococcus aureus (MRSA). In dentistry, antibiotics are often used to manage a variety of infections, both dental (odontogenic) and non-dental (non-odontogenic).These prescriptions can be for treatment or prevention. In fact, around 6% to 10% of all antibiotic prescriptions come from dental professionals (Mahmood et al., 2022; Saadat et al., 2013). Still, there are only a few clear reasons for using systemic antibiotics in dental care. Most oral problems stem from inflammation and pain caused by infections in the tooth pulp, which usually need dental procedures, like operative or endodontic intervention, rather than medication. The U.S. Centers for Disease Control and Prevention (CDC) estimates that about one-third of antibiotic prescriptions given to outpatients are unnecessary (Arshad et al., 2024; Mahmood et al., 2022). A study from Canada also found that younger or newly graduated dentists tend to prescribe antibiotics less often than older, more experienced practitioners. This reflects a key difference between medical and dental conditions: most dental infections can be treated effectively by addressing the root cause, rather than intervention of antibiotics (Arshad et al., 2024).

Dentists frequently prescribe pain relief medications and anxiolytics. However, opioid misuse, abuse, and related harms are significant public health concerns. In Australia, pharmaceutical opioid poisonings have now exceeded those caused by heroin. Systematic reviews and other studies indicate that antibiotics should only be used in dental treatment when there is clear evidence of systemic infection or spreading superficial infection. The most effective way to manage localized infections is through active treatment rather than relying on antibiotics alone (Teklay & Tefera, 2024). The common misconception that antibiotics can reduce localized swelling to enhance the effectiveness of local anesthesia needs correction, as treating acute odontogenic infections solely with antibiotics can worsen the infection and lead to airway complications (Teklay & Tefera, 2024; Teoh, Marino, et al., 2019). Once an abscess forms, surgical drainage is essential for resolution. Antibiotics are only recommended in specific clinical situations, such as in patients with compromised immune systems. To prevent antibiotic resistance, the use of antibiotics should be minimized and carefully controlled. The chosen antibiotic should be the most effective and well-tolerated for empirical therapy. Globally, penicillin or amoxicillin remains the standard first-line treatment for odontogenic infections, with clindamycin as an alternative for patients allergic to penicillin. In the analysis, pain medications fall under the ATC subgroup M01, and antibiotics are classified under group J01. The share of NSAIDs increased from 65.9% to 80.1% by 2021. Meanwhile, prescriptions for metamizole nearly doubled, making up 3.8% of prescriptions in 2021. Dental prescriptions themselves rose to 13.6% in 2021, marking nearly a 50% increase over the past 10 years (Albrecht et al., 2024; Teklay & Tefera, 2024). In the age of AI, there's an opportunity to use technology to help reduce prescription errors.AI software could help doctors and dentists double-check their prescriptions, ensuring they follow proper guidelines. This study seeks to investigate the prescribing patterns of analgesics and antibiotics among dentists in Pakistan, as well as evaluate their awareness of global antibiotic resistance concerns, through an online questionnaire administered via Google Forms.

METHODOLOGY

The research is Quantitative in nature with a view to assess the prescription pattern of analgesics and antibiotics among dentists in Pakistan, a cross sectional study was conducted. The survey was carried among house officers, general dentist, postgraduate trainees and dental professionals across Pakistan from April 2025 to May 2025. The data is cross-sectional in nature and has been collected over an estimated time of two months approximately. A pre-designed, validated questionnaire was made on Google forms, the questionnaire included 30 close ended questions, integrating demographic details, antibiotic and analgesic options in Pakistan. Review of existing articles was also done. The sample respondent's i.e. the employees of different organizations has contacted on their jobs to fill the questionnaire in their actual work environment. The unit of analysis for this research thesis is the different level of employees of different organizations. The participants of the study are House Officers, General Dentists, Postgraduate trainees and Senior Dental Surgeons across Pakistan. The survey was anonymous, maintaining the participants privacy and confidentiality A sample size of 380 participants was calculated using World Health Organization sample size calculator Inclusion Criteria House Officers, General Dentist, Postgraduate Trainees and Senior Dental Professionals across Pakistan Exclusion Criteria Foreign Dentist Non Dental Graduates After completion of data collection, the collected questionnaire was systematically entered in Microsoft excel and statistical analysis was carried out using SPSS version.

RESULTS

The study population consisted of 204 dentists. The respondents included 30.4% (n=62) male and 69.6% (n=142) females (Table 1).The mean age of participants was 28.4+/- 4.2 years. The majority of participants were aged between 20-30 years with predominant percentage of 85.3% (n=174) and only 12.7% (n=26) aged between 31-40 years (Table 2). In terms of academic qualification 88.7% (n=181) of respondents were graduates holding a BDS degree and only a small percentage of 11.3% (n=23) had complete postgraduate studies (Table 3). Regarding workplace setting, 44.1% (n= 90) were employed in a teaching hospital, 35.3% (n= 72) worked in private

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practice and 20.6% (n= 42) were working in public hospitals (Table 5). Participants clinical experience showed that 82.8% (n =169) had less than 5 years of clinical experience whereas only 13.7% (n=28) had 5-10 years of clinical experience (Table 4). The average number of patients treated per month was 32.4 ± 11.6. A significant number almost 41.7% respondents reported that they treat 21-50 patients per month on average including both adults and children (64.2%). Tables 1-5 summarizes the socio-demographic characteristics of the respondents.

Table 1
GENDER

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Male	62	30.4	30.4	30.4
	Female	142	69.6	69.6	100.0
	Total	204	100.0	100.0	

Table 2
AGE

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	20 - 30 Years	174	85.3	85.3	85.3
	31 - 40 Years	26	12.7	12.7	98.0
	41 - 50 Years	2	1.0	1.0	99.0
	51 - 60 Years	2	1.0	1.0	100.0
	Total	204	100.0	100.0	

Table 3
QUALIFICATION

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Graduation	181	88.7	88.7	88.7
	Masters	23	11.3	11.3	100.0
	Total	204	100.0	100.0	

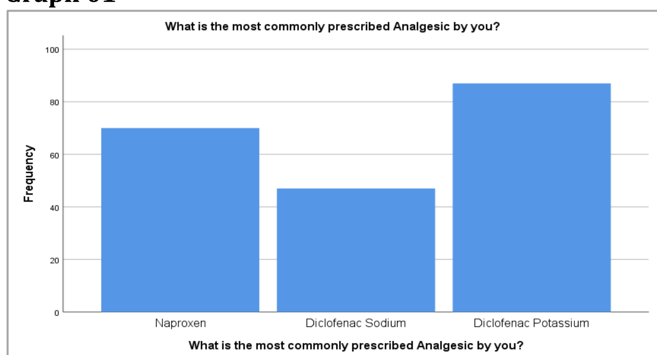
Table 4
EXPERIENCE

Frequency			Percent	Valid + Percent	Cumulative Percent
Valid	Less than 5 years	169	82.8	82.8	82.8
	5-10 years	28	13.7	13.7	96.6
	10-20 years	7	3.4	3.4	100.0
	Total	204	100.0	100.0	

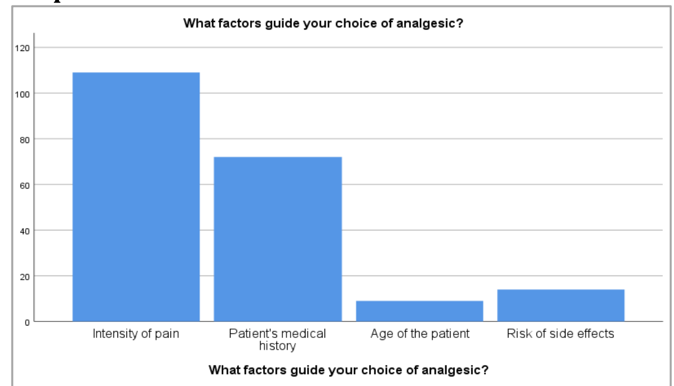
Table 5
WORKPLACE

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Private Clinic	72	35.3	35.3	35.3
	Public Hospital	42	20.6	20.6	55.9
	Teaching Hospital	90	44.1	44.1	100.0
	Total	204	100.0	100.0	

Graph 01

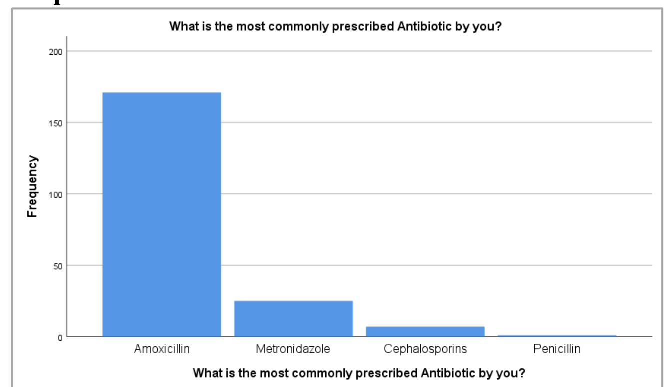


Graph 02

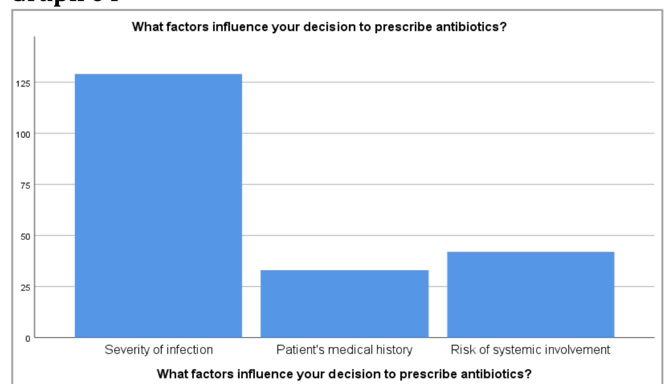


The most frequently prescribed class of analgesics was Diclofenac Potassium with 42.6% (n=87) dentists reporting routine prescription. Diclofenac Potassium was most commonly selected drug followed by Naproxen (27.3%, n = 56) and Diclofenac Sodium (18.5%, n = 38) (Graph# 01). Patient's intensity of pain 53.4% (n=110) and medical history 35.3% (n=72) were main factors guiding the choice of analgesics among respondents (Graph# 02). Naproxen was prescribed predominantly in case of acute pulpitis (50%), acute apical abscess (42.6%), chronic pulpitis (34.3%) and chronic apical periodontitis with sinus tract (32.8%) and in case of diffused swelling (47.5%). Diclofenac Potassium was predominantly prescribed prophylactically (41.2%) and post-operatively (38.7%) in root canal treatment and tooth extraction respectively.

Graph 03



Graph 04



The commonly prescribed antibiotic was amoxicillin (83.8%) followed by metronidazole (12.3%) (Graph# 03). Severity of infection was a major factor influencing the

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decision in prescribing antibiotics (63.2%) and patient's medical history (16.2%) also dictated the need for prescribing antibiotics (Graph# 04). Respondents (52.5%) considered antibiotic resistance and following guidelines and protocols (88.7%) for prescribing antibiotics and analgesics while 91.7% educating and informing their patients about the potential adverse effects of prescribed medications on GIT system. While (82.4%) respondents admitted to prescribing cost effective medications to their patients, (86.8%) reported to have encountered patients who misuse or request unnecessary antibiotics and analgesics. Amoxicillin remained the drug of choice for cases like acute pulpitis (67.6%), acute apical abscess (47.5%), chronic pulpitis (48.5%), chronic apical periodontitis with sinus tract (38.7%), diffuse swelling (47.1%), prophylactically before root canal treatment (57.8%) and after tooth extraction (61.8%).

DISCUSSION

This cross-sectional study was conducted to observe the analgesic and antibiotic prescribing patterns among Pakistani dentists. With focus on finding out the current trends and comparing them with global practices.This study revealed that Paksitani Dentists prefer prescribing Non-steroidal anti-inflammatory drugs (NSAIDs in particular naproxen and diclofenac (potassium and sodium forms) mainly due to their rapid onset, efficacy and cost-effectiveness. These results are consistent and supporting the evidence based literature that NSAIDs' are a popular analgesic drug choice among dentists due to it's rapid onset, strong efficacy. It's affordability is also a key consideration (Derry et al., 2009; Moore et al., 2018). Unlike high-income countries where ibuprofen combined with acetaminophen is often the first-line treatment due to superior gastrointestinal safety (Moore et al., 2018) - Pakistani dentists tend to favor naproxen and diclofenac. The widespread use of naproxen for acute pulpitis and apical abscess management aligns with the American Dental Association (ADA) guideline, which recommends NSAIDs over antibiotics for most pulpal and periapical conditions without systemic involvement (Lockhart et al., 2019). These recommended guidelines align with this study's findings that NSAIDs are preferred over antibiotics for most pulpal and periapical conditions.Furthermore, combining NSAIDs with acetaminophen has been shown to improve postoperative analgesia, supporting a non-opioid, multimodal pain control strategy (Moore & Hersh, 2013).

Amoxicillin was the most frequently prescribed antibiotic (83.8%), followed by metronidazole (12.3%), in line with global trends prioritizing amoxicillin for odontogenic infections and using metronidazole for anaerobic coverage. However, the high antibiotic prescribing rate for chronic pulpitis (48.5%)—a condition that typically requires operative rather than pharmacologic intervention - demonstrates a gap between clinical guidelines and practice (Lockhart et al., 2019). Non-clinical factors and behviours also contribute to prescribing decisions for example insufficient training, time constraints, patient's expectations and satisfaction,previous experience, guidelines confusion, comfort prescribing and pressure to prescribe also influence the prescription decisions (Săndulescu et al., 2024). Around one-third of dentists reported patient requests influencing unnecessary antibiotic prescriptions (Al-Khatib & AlMohammad, 2022). This phenomenon has been reported internationally, where prescribers may comply with patient expectations even when inconsistent with best practice (Teoh, Stewart, et al., 2019). Antimicrobial resistance is a growing public health threat, with dentistry contributing substantially through inappropriate antibiotic use. In one intervention study, a combination of targeted education and a prescribing tool reduced overall antibiotic prescribing by more than 40% and inappropriate prescribing by almost 45% (9). Beyond knowledge gaps, drivers include outdated undergraduate training, uncertainty about guidelines, and a "just in case" approach to risk management (Suda et al., 2019; Teoh, Marino, et al., 2019). Ethics-based prescribing training is an underutilized tool. Studies show that limited understanding of principles such as non-maleficence and beneficence among dental students correlates with irrational prescribing habits. Embedding ethics and stewardship principles into dental curricula can promote rational prescribing behaviors (Roganović & Barać, 2024).

To bridge these gaps, a multifaceted strategy is needed which must integrate Continuing Dental Education, better understanding of undergraduate pharmacology and ethics training, development of national dental prescribing protocols, and institutional monitoring mechanisms. Such measures can align practice with evidence-based standards and preserve antibiotic efficacy for future generations.

Implications

Theoretically, it contributes to dental literature by revealing prescribing trends, helping understand dentist's decision-making and supporting future guidelines. **Practically**, the findings can promote rational drug use, reduce antibiotic resistance, and guide dental education programs and influence health policies to improve prescription practices. This study can also raise patient awareness about proper medication use and lower healthcare costs by preventing unnecessary prescriptions. Overall, our work can help enhance dental care standards in Pakistan.

CONCLUSION

This study offers valuable insights into the prevailing prescription habits of dentists in Pakistan. These findings indicated prescribing patterns alignment with global practices. Diclofenac and naproxen were preserred choice of analgesics and amoxicillin was the most commonly prescribed antibiotic highlighting a general evidence based approach. Clinical factors such as patient's medical history and severity of pain influenced dentist's decisions indicatinf more patient- centered approach.However, an alarming concern was the frequent prescription of antibiotics where they are not clinically indicated revealing the over prescription pattern. The awareness among dentists on antibiotic resistance was significant still the issue of patient driven demands for antibiotic prescription demands more emphasis on clinical guidelines. Considering the cost of medicine while prescribing indicated awareness among dentists about the

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socioeconomic constraints. Still there remains a gap between knowledge and implementation among less experienced practitioners who may rely on institutional guidelines and senior mentorship.These findings calls for an urgent need for continuous professional development (CPD), updated national guidelines and structured training in rational prescribing practices. There is a dire need to improve curriculum through incorporating more clinical pharmacology into dental education, establishing institutional guidelines, and a strict monitoring in clinical practice which will ultimately enhance prescription quality and improve patient health. Responsible prescribing is not merely a clinical task—it is an ethical obligation and as the dental profession evolves in Pakistan, it must continue to balance therapeutic efficacy with public health, ensuring that every prescription is both necessary and justified.

Limitations & Future Directions

This study has some limitations, including a small sample size, potential recall bias in self-reported data and a focus on only certain regions, which may not represent all dental practices in the country. Additionally, the study did not explore the underlying reasons for prescription trends or patient outcomes. Future research should include larger, nationwide surveys with diverse participants to improve generalizability. Longitudinal studies could assess prescription impacts on antibiotic resistance and pain management efficacy. Further investigation into dentist's knowledge, attitudes, and external factors influencing prescriptions would provide deeper insights. Educational interventions and guideline implementations should also be evaluated to promote rational prescribing practices in dentistry.

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