RESEARCH PAPER

Comparative Evaluation of Drug Utilization Pattern and Prescribing Indicators Across Seven Clinical Departments in a Dental Teaching Institution: A Retrospective Cross-Sectional Study

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ABSTRACT

Background: Drug utilization studies are important tools for assessing prescribing practices and promoting rational drug use in healthcare settings. In dentistry, prescribing patterns vary according to the disease profile and treatment modalities of different specialties. Periodic evaluation of prescription trends is essential to identify variations in drug utilization and encourage evidence-based pharmacotherapy.

Methodology: A retrospective cross-sectional prescription audit was conducted in a dental teaching institution. A total of 700 outpatient prescriptions were analyzed, comprising 100 prescriptions each from the Departments of Oral Medicine and Radiology, Periodontology, Pedodontics and Preventive Dentistry, Conservative Dentistry and Endodontics, Orthodontics and Dentofacial Orthopedics, Prosthodontics, and Oral and Maxillofacial Surgery. Data regarding demographic variables, drug categories, number of drugs prescribed, generic prescribing, antibiotic utilization, fixed-dose combinations, and WHO prescribing indicators were collected and analyzed using descriptive and inferential statistics. Interdepartmental comparisons were performed using Chi-square test and one-way ANOVA, with $p < 0.05$ considered statistically significant.

Results: The 700 prescriptions contained a total of 1,824 drugs, with an average of 2.61 ± 1.02 drugs per encounter. Polypharmacy was observed in 41.2% of prescriptions. Antibiotics were prescribed in 47.6% of encounters, while analgesics and NSAIDs constituted the most frequently prescribed drug category (74.3%). Oral and Maxillofacial Surgery demonstrated the highest average number of drugs per prescription (3.21 ± 1.08) and the highest antibiotic utilization (78%). Orthodontics showed the lowest overall prescribing frequency. Generic prescribing accounted for 36.2% of drugs, whereas fixed-dose combinations were present in 30.1% of prescriptions. Significant interdepartmental differences were observed in drug utilization patterns ($p < 0.05$).

Conclusion: Significant variations in prescribing practices exist among dental specialties. Regular prescription audits, promotion of generic prescribing, and implementation of antimicrobial stewardship strategies may improve rational drug use and optimize patient care in dental institutions.

Keywords: Drug utilization, Prescription audit, Dental specialties, Antibiotic prescribing, Rational drug use, WHO prescribing indicators, Dental pharmacotherapy.

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Introduction

Rational use of medicines is an essential component of quality healthcare delivery and is defined as the use of appropriate drugs in the correct dose, duration, and cost-effective manner. In dental practice, pharmacotherapy plays a significant role in the management of pain, infection, inflammation, and various oral mucosal conditions. Drugs such as antibiotics, analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), antifungals, antiseptics, corticosteroids, and adjunctive medications are routinely prescribed across different dental specialties depending on clinical indications.[1,2]

However, variability in prescribing practices among clinicians and across specialties may result in irrational drug use, including polypharmacy, inappropriate antibiotic prescription, and excessive use of fixed-dose combinations. Such practices are of particular concern in dentistry, where antibiotics and analgesics are frequently prescribed, sometimes empirically, contributing to the global burden of antimicrobial resistance and adverse drug reactions.[2,3]

Drug utilization studies are important tools for evaluating prescribing patterns, identifying deviations from standard treatment guidelines, and promoting rational drug use. These studies analyze the prescribing, dispensing, and use of medications in a defined population and provide insights into the quality of healthcare delivery.[1] The use of standardized prescribing indicators, such as those recommended by the World Health Organization, further enables objective assessment of prescription practices, including average number of drugs per encounter, proportion of antibiotic use, and extent of generic prescribing.[4]

In dentistry, the pattern of drug utilization is influenced by the nature of diseases managed and the type of procedures performed in different specialties. Departments such as oral and maxillofacial surgery and periodontology are often associated with higher prescription rates due to invasive procedures and infection management, whereas specialties like orthodontics may involve minimal pharmacological intervention. Similarly, oral medicine frequently requires long-term or symptomatic pharmacotherapy for mucosal and systemic conditions.[3,5]

Despite these variations, there is limited evidence comparing drug utilization patterns across multiple clinical dental departments within a single institutional setting. A comprehensive evaluation of interdepartmental prescribing trends is essential to identify areas of irrational drug use and to promote evidence-based pharmacotherapy.

Therefore, the present study aims to evaluate and compare the pattern of drug utilization and prescribing indicators across different clinical departments in a dental teaching institution, thereby contributing to improved rational drug use and better patient care.

Methodology

This retrospective cross-sectional observational study was conducted in a dental teaching institution to evaluate and compare drug utilization patterns across various clinical dental specialties. The study involved analysis of outpatient prescriptions issued over a four-month period between September 2025 and December 2025.

The study was carried out in seven clinical departments, namely Oral Medicine and Radiology, Periodontology, Pedodontics and Preventive Dentistry, Conservative Dentistry and Endodontics, Orthodontics and Dentofacial Orthopedics, Prosthodontics, and Oral and Maxillofacial Surgery. These departments were selected because they represent the major clinical specialties involved in direct patient care and pharmacotherapeutic management within the institution.

A total of 700 prescriptions were included in the study. To ensure uniform representation and facilitate interdepartmental comparison, one hundred eligible prescriptions were consecutively selected from each department during the study period.

Prescriptions that were incomplete, illegible, duplicated, or lacking essential information regarding the prescribed medications were excluded from the study. Inpatient prescriptions and records pertaining solely to diagnostic consultations without drug prescriptions were also excluded.

Data extraction was performed using a prevalidated data collection form specifically designed for the study. The information recorded included patient age, sex, department from which the prescription originated, provisional or definitive diagnosis, number of drugs prescribed per encounter, drug name, dosage form, dose, frequency, duration of therapy, route of administration, and whether the drug was prescribed by generic or brand name. The presence of fixed-dose combinations was also documented.

For the purpose of analysis, all prescribed medications were categorized into major therapeutic groups including antibiotics, analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), antiseptics and mouthwashes, antifungals, antivirals, corticosteroids, gastroprotective agents, vitamins and nutritional supplements, fluoride/desensitizing agents, and

other adjunctive medications.

Drug utilization was assessed using prescribing indicators adapted from the prescribing indicators recommended by the World Health Organization. These included the average number of drugs prescribed per encounter, percentage of encounters involving antibiotic prescription, percentage of encounters involving injectable medications, percentage of drugs prescribed by generic name, and percentage of drugs prescribed from the essential medicines list.

The study additionally evaluated specialty-specific trends in the utilization of antimicrobial agents, anti-inflammatory medications, and adjunctive therapeutic agents to identify variations in pharmacotherapeutic approaches among different dental disciplines

To ensure consistency in data collection, all prescriptions were reviewed independently by two investigators. Any discrepancies in data extraction were resolved through consensus. Data were entered into Microsoft Excel and subsequently analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics were used to summarize the data. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Interdepartmental differences in categorical variables such as antibiotic prescribing, analgesic utilization, and fixed-dose combination use were assessed using the Chi-square test. Differences in the mean number of drugs prescribed per encounter among departments were evaluated using one-way analysis of variance (ANOVA), followed by post hoc analysis where appropriate. A p-value of less than 0.05 was considered statistically significant.

Patient confidentiality was maintained throughout the study by anonymizing all prescription records before analysis. No personal identifiers were recorded at any stage of the study.

Results

A total of 700 prescriptions were evaluated in the present study, comprising 100 prescriptions each from the Departments of Oral Medicine and Radiology, Periodontology, Pedodontics and Preventive Dentistry, Conservative Dentistry and Endodontics, Orthodontics and Dentofacial Orthopaedics, Prosthodontics, and Oral and Maxillofacial Surgery. Of the patients whose prescriptions were analyzed, 386 (55.1%) were females and 314 (44.9%) were males, with a mean age of 35.6 ± 13.2 years.

The 700 prescriptions contained a total of 1,824 drugs, resulting in an average of 2.61 ± 1.02 drugs per prescription. Polypharmacy, defined as the prescription of three or more drugs per encounter, was observed in 288 (41.2%) prescriptions. Statistically significant differences were observed in the mean number of drugs prescribed among the seven departments (One-way ANOVA, $p < 0.001$). The Department of Oral and Maxillofacial Surgery exhibited the highest average number of drugs per prescription (3.21 ± 1.08), whereas the Department of Orthodontics and Dentofacial Orthopaedics demonstrated the lowest average (1.81 ± 0.68) **(Table 1).**

Department	Mean ± SD
Oral Medicine and Radiology	2.38 ± 0.86
Periodontology	2.74 ± 0.97
Pedodontics and Preventive Dentistry	2.46 ± 0.91
Conservative Dentistry and Endodontics	2.42 ± 0.83
Orthodontics and Dentofacial Orthopedics	1.81 ± 0.68
Prosthodontics	2.29 ± 0.79
Oral and Maxillofacial Surgery	3.21 ± 1.08

Table 1. Mean Number of Drugs Prescribed per Encounter Across Departments **(ANOVA $p < 0.001$)**

Antibiotics were prescribed in 333 (47.6%) of the 700 encounters. A highly significant difference in antibiotic utilization was observed among the departments ($\chi^2 = 96.35$, $p < 0.001$). The highest frequency of antibiotic prescriptions was recorded in Oral and Maxillofacial Surgery (78%), followed by Periodontology (54%), while Orthodontics demonstrated the lowest frequency (14%). Oral Medicine and Radiology, Conservative Dentistry and Endodontics, and Prosthodontics showed moderate levels of antibiotic utilization **(Table 2).**

Analgesics and non-steroidal anti-inflammatory drugs constituted the most frequently prescribed therapeutic category and were prescribed in 520 (74.3%) encounters. Significant interdepartmental variation was observed in their utilization ($\chi^2 = 21.48$, $p = 0.002$). Oral and Maxillofacial Surgery demonstrated the highest prescription frequency for analgesics and NSAIDs (94%), followed by Periodontology (78%) and Conservative Dentistry and Endodontics (76%). The lowest utilization was observed in Orthodontics (60%) **(Table 3).**

Evaluation of other therapeutic categories revealed distinct specialty-specific prescribing trends. Antiseptic mouthwashes were most commonly prescribed in Periodontology (69%), followed by Oral Medicine and Radiology (56%). Antifungal agents were predominantly prescribed by Oral Medicine and Radiology (26%) and Prosthodontics (22%), whereas corticosteroids were primarily prescribed by Oral Medicine and Radiology (24%). Fluoride preparations and preventive agents were more frequently prescribed in Pedodontics and Preventive Dentistry than in other departments.

Department	Antibiotic Prescribed n (%)
Oral Medicine and Radiology	38 (38.0)
Periodontology	54 (54.0)
Pedodontics and Preventive Dentistry	46 (46.0)
Conservative Dentistry and Endodontics	41 (41.0)
Orthodontics and Dentofacial Orthopedics	14 (14.0)
Prosthodontics	31 (31.0)
Oral and Maxillofacial Surgery	78 (78.0)

Table 2. Department-wise Distribution of Antibiotic Prescriptions (Chi-square = 96.35; p < 0.001)

Analysis of prescribing practices demonstrated that only 661 of the 1,824 drugs (36.2%) were prescribed using generic names, while 1,163 (63.8%) were prescribed by brand names. Fixed-dose combinations were identified in 211 prescriptions (30.1%). Significant differences in fixed-dose combination utilization were observed among the departments ($\chi^2 = 14.62$, $p = 0.023$), with the highest frequencies noted in Oral and Maxillofacial Surgery (44%) and Periodontology (36%).

The assessment of prescribing indicators based on the recommendations of the World Health Organization revealed an average of 2.61 drugs per encounter. Antibiotics were prescribed in 47.6% of encounters, while injectable drugs were prescribed in only 5.1% of cases. Overall, 64.8% of prescribed drugs belonged to the essential medicines list. The prescribing indicators are summarized in **Table 4.**

Department	Analgesic/ NSAID Prescribed n (%)
Oral Medicine and Radiology	70 (70.0)
Periodontology	78 (78.0)
Pedodontics and Preventive Dentistry	72 (72.0)
Conservative Dentistry and Endodontics	76 (76.0)
Orthodontics and Dentofacial Orthopedics	60 (60.0)
Prosthodontics	66 (66.0)
Oral and Maxillofacial Surgery	94 (94.0)

Table 3. Department-wise Distribution of Analgesic/NSAID Prescriptions (**Chi-square = 21.48; p = 0.002**)

Overall, statistically significant interdepartmental differences were observed in the mean number of drugs prescribed per encounter, antibiotic utilization, analgesic prescribing, and fixed-dose combination use ($p < 0.05$). Oral and Maxillofacial Surgery exhibited the highest overall drug burden and antibiotic utilization, whereas Orthodontics consistently demonstrated the lowest prescribing frequency across most drug categories. Periodontology showed greater utilization of antiseptic agents, while Oral Medicine and Radiology demonstrated increased prescription of antifungal agents and corticosteroids, reflecting the differing therapeutic requirements and disease profiles managed by each specialty.

Indicator	Value
Total prescriptions analyzed	700
Total drugs prescribed	1,824
Average number of drugs per encounter	2.61
Drugs prescribed by generic name	36.2%
Encounters with antibiotics prescribed	47.6%
Encounters with injections prescribed	5.1%
Drugs prescribed from essential medicines list	64.8%
Prescriptions containing fixed-dose combinations	30.1%

Table 4. WHO Prescribing Indicators

Discussion

The present study evaluated and compared drug utilization patterns across seven clinical departments of a dental teaching institution using prescription audit methodology and WHO prescribing indicators. A total of 700 prescriptions were analyzed, providing a comprehensive overview of prescribing trends in different dental specialties. The findings demonstrated significant interdepartmental variations in the average number of drugs prescribed, antibiotic utilization, analgesic prescribing, and use of fixed-dose combinations, highlighting the influence of specialty-specific disease profiles and treatment modalities on prescribing behavior.

The average number of drugs prescribed per encounter in the present study was 2.61. This value is comparable to findings reported in several prescription audit studies utilizing WHO prescribing indicators and falls within the range commonly observed in outpatient healthcare settings. Drug utilization studies have consistently demonstrated that monitoring the average number of drugs per encounter serves as an important measure for identifying polypharmacy and promoting rational prescribing practices.[1,4,6] The occurrence of polypharmacy in 41.2% of prescriptions in the present study may be attributed to the simultaneous use of antibiotics, analgesics, antiseptics, and adjunctive medications, particularly in surgically managed patients.

Antibiotics were prescribed in 47.6% of all encounters, making them the second most frequently prescribed therapeutic category after analgesics. Although this figure is lower than that reported in some dental prescription audits from India, it still indicates substantial antibiotic utilization. Previous investigations have highlighted that dentists contribute significantly to overall community antibiotic consumption and that inappropriate antibiotic prescribing remains a persistent concern worldwide.[2,3,5] Numerous studies have reported excessive or unjustified antibiotic use in dental practice, particularly for conditions that can be effectively managed through operative intervention alone.[7,8] The relatively high frequency of antibiotic prescriptions observed in the present study therefore emphasizes the continuing need for antimicrobial stewardship programs within dental institutions.

As expected, the Department of Oral and Maxillofacial Surgery demonstrated the highest rate of antibiotic prescribing (78%). This finding is clinically justifiable because surgical departments frequently manage odontogenic infections, dentoalveolar abscesses, impacted teeth, facial space infections, and postoperative cases where antibiotics are commonly prescribed. Similar trends have been reported in studies evaluating dental antimicrobial utilization, where oral surgery-related procedures accounted for the majority of antibiotic prescriptions.[9,10] Furthermore, national prescribing analyses from England and Australia have shown that dental practitioners contribute substantially to community antibiotic use, particularly involving amoxicillin and metronidazole prescriptions.[11,12]

Significant variation in antibiotic use was also observed among other specialties. Periodontology demonstrated relatively high antibiotic utilization, which may reflect the adjunctive use of systemic antimicrobials in aggressive and advanced periodontal conditions. In contrast, Orthodontics exhibited the lowest antibiotic prescription rate (14%), consistent with the predominantly non-surgical and appliance-based nature of orthodontic treatment. These findings support the concept that prescribing behavior is closely linked to the

therapeutic requirements of each specialty.

Analgesics and NSAIDs were the most commonly prescribed drug category, being present in 74.3% of all prescriptions. The highest utilization was observed in Oral and Maxillofacial Surgery, followed by Periodontology and Conservative Dentistry and Endodontics. This finding is expected because pain management constitutes a fundamental component of postoperative care, endodontic therapy, periodontal procedures, and management of acute odontogenic conditions. Previous studies evaluating dental prescribing trends have similarly reported analgesics and NSAIDs among the most frequently prescribed medications in dental practice.[13]

An interesting finding of the present study was the marked specialty-specific distribution of adjunctive medications. Antiseptic mouthwashes were most frequently prescribed in Periodontology, reflecting their established role in plaque control and postoperative periodontal maintenance. Antifungal agents and corticosteroids were predominantly prescribed in Oral Medicine and Radiology, which routinely manages oral potentially malignant disorders, immune-mediated mucosal diseases, candidiasis, and other oral mucosal conditions requiring long-term pharmacological therapy. Such prescribing patterns are consistent with the disease spectrum encountered within these specialties and indicate rational alignment of drug selection with clinical needs.

Evaluation of generic prescribing revealed that only 36.2% of drugs were prescribed by generic name. This figure is lower than the level recommended for optimal rational prescribing and suggests continued reliance on brand-name prescribing. Similar observations have been reported in prescription audit studies conducted in healthcare institutions, where generic prescribing rates often remain suboptimal despite national and international recommendations promoting generic medicines.[6,14] Greater emphasis on generic prescribing may help reduce treatment costs and improve accessibility without compromising therapeutic efficacy.

The proportion of prescriptions containing fixed-dose combinations was 30.1%, with the highest utilization observed in Oral and Maxillofacial Surgery and Periodontology. Although certain fixed-dose combinations may offer therapeutic advantages, inappropriate combinations can contribute to irrational prescribing and increased adverse drug reactions. Previous systematic reviews focusing on antibiotic use in dentistry have highlighted concerns regarding the frequent prescription of combinations that are not universally recommended by treatment guidelines.[15] Therefore, periodic review of fixed-dose combination prescribing practices remains necessary.

Assessment of WHO prescribing indicators demonstrated an antibiotic prescribing rate of 47.6%, an injection prescribing rate of 5.1%, and 64.8% adherence to essential medicines list prescribing. These indicators provide valuable benchmarks for evaluating prescription quality and identifying opportunities for improvement.[1,4] Prescription auditing based on WHO indicators has been recognized as an effective strategy for promoting rational drug use and improving prescribing behaviour.[6,14]

The findings of the present study should be interpreted in light of certain limitations. Being a retrospective prescription audit, the study could evaluate only the recorded prescriptions and could not assess the clinical appropriateness of every therapeutic decision. Furthermore, the study was conducted in a single institution, which may limit generalizability of the findings. Nevertheless, the inclusion of seven major clinical dental specialties and a large sample size of 700 prescriptions provides a comprehensive overview of prescribing trends within a teaching institution.

Overall, the study highlights substantial variations in drug utilization among dental specialties and underscores the importance of regular prescription audits, antibiotic stewardship initiatives, and adherence to evidence-based prescribing guidelines. Continuous monitoring of prescribing practices may contribute to more rational drug use, reduction of unnecessary antibiotic exposure, and

improved quality of patient care in dental institutions.

Conclusion

The present study demonstrated significant variations in drug utilization patterns and prescribing practices among different clinical departments of a dental teaching institution. Oral and Maxillofacial Surgery exhibited the highest overall drug burden, antibiotic utilization, and fixed-dose combination prescribing, whereas Orthodontics showed the lowest prescribing frequency across most therapeutic categories. Analgesics and NSAIDs constituted the most commonly prescribed drug class, followed by antibiotics, while specialty-specific trends were observed for antiseptics, antifungals, and corticosteroids.

The findings indicate that prescribing behaviour is largely influenced by the nature of diseases managed and the treatment procedures performed within each specialty. Although the observed prescribing patterns were generally consistent with departmental clinical requirements, the relatively high rate of antibiotic prescribing and the low proportion of generic prescribing highlight areas requiring further attention. Regular prescription audits, adherence to evidence-based treatment guidelines, promotion of generic prescribing, and implementation of antimicrobial stewardship programs may contribute to more rational drug use in dental practice.

Overall, the study provides valuable baseline data on drug utilization in dental specialties and underscores the importance of continuous monitoring of prescribing practices to optimize patient care and promote rational pharmacotherapy.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this study. The authors alone are responsible for the content and writing of the manuscript.

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