**RESEARCH ARTICLE**

# Comparative Analysis of Antibiotic Prescribing Patterns for Dental Infections: A Retrospective Study in a Dental Clinic

Hiroj Bagde[1], Ashwini Dhopte[2]

[1]*Department of Periodontology, Rama Dental College, Kanpur, Uttar Pradesh, India.*
[2]*Department of Oral Medicine and Radiology, Rama Dental College, Kanpur, Uttar Pradesh, India.*

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**ABSTRACT**

This research aimed to analyze and contrast the antibiotic prescription trends that occur in dentistry offices. for the management of dental infections. To fill out the data, each dentist enrolled in the study was asked to record antibiotics prescribed for 6 -8 months and then the records were collected. Recorded dental prescriptions for antibiotics served as the study's source population, and the list of patients who brought their prescription cards to the dental office within the allotted window of time (January 1 to December 31, 2015) served as its sampling frame. Using a statistical technique, After selecting patient record cards that included at least one antibiotic during the course of the investigation, the appropriate size of the sample was determined. The study employed a retrospective analysis of prescribing data from 10 private dental clinics, encompassing a sample of dental infection cases and corresponding antibiotic prescriptions. Data on the type and frequency of antibiotics and patient medical history and age were collected and analyzed. Descriptive statistics and statistical tests were used to examine the relationships between antibiotic prescribing patterns and patient factors. The results revealed significant associations between medical history, patient age, and antibiotic prescribing patterns. The findings highlight the need for personalized prescribing approaches based on patient factors, standardized clinical processes, and cost-effective antibiotic choices. Improving compliance with clinical guidelines can help optimize antibiotic use and enhance patient outcomes in dental practice.

**Keywords:** Dental, Antibiotics, Drug, Therapy, Clinical dentistry.

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## INTRODUCTION

Clinical dentistry practice often involves bacterial infections. As a result, the implementation of antibiotics in dental procedures for therapeutic or preventive reasons to treat oral and dental infections has been widespread.[1] Antibiotic prophylaxis has not proven to be beneficial in individuals with low and intermediate-risk dental implants, nevertheless. So, when there are clear clinical indications of involvement, antibiotics should be suggested.[2]The prescription of antibiotics may result in adverse side effects ranging from digestive problems to deadly anaphylactic shock. In addition, the inappropriate, thoughtless, and indiscriminate use of antibiotics are all factors that contribute to the maturation of antibiotic resistance.[3] The broad range of the antibiotic, the low incidence of resistance, the pharmacokinetic profile, tolerance, and dose may have all had a role in the decision. Antibacterial resistance is a worldwide clinical and public health issue that has recently appeared alarmingly and will surely become worse soon. A dental abscess is a localized buildup of bacteria in the mouth of pus that affects the gingiva, the supporting tissues of the teeth, or both.[4] A periapical abscess occurs when the tooth's root canal becomes infected, while a periodontal abscess is when The periodontal pocket, which is located behind the tooth's crown and the gingiva, is where the infection first manifests itself. A dentoalveolar abscess often develops due to trauma, poor root canal therapy, massive restorations near the pulp, or tooth decay.

The tooth pulp is the most typical location for an odontogenic infection to take hold. The degradation of the tooth's enamel and dentin by bacteria marks the beginning of an acute infection. This opens the door for bacteria to invade the tooth pulp, which leads to an abscess in the periapical region and the alveolar bone.[5] Oral infections have the potential to spread throughout the body if they are not treated. This may happen either by direct extension or hematogenous.[6] The components of the treatment for dentoalveolar infections are the removal of infected pulp, the extraction of infected teeth, and the surgical draining of abscesses. Antibiotics are often

**Author for Correspondence: hirojbagde8@gmail.com*

recommended as an additional treatment with the purpose of reducing the risk of infection problems.

## MATERIALS AND METHODS

The research was carried out at 10 different private dental clinics. An analysis of the patterns of antimicrobial medicine prescriptions in the dental clinics from February to January 2016 was done using sectional retrospective research. Each dentist enrolled in the study was asked to record antibiotics prescribed for 6 -8 months and then the records were collected. All recorded dental prescriptions for antibiotics served as the study's source population, and the list of patients who brought their prescription cards to the dental office within the allotted window of time (January 1 to December 31, 2015) served as its sampling frame. Using a statistical technique, After selecting patient record cards that included at least one antibiotic during the course of the investigation, the appropriate size of the sample was determined. Each clinic was requested to record antibiotics or analgesics prescribed on special form collected back after 6 months.

$$ni = \left(Z\alpha/2\right)^{2^*} P\left(1-P\right)/d2$$

Where $Z\alpha/2$ ni is the smallest sample size that can be defined, P was the proportion of the overall population with the characteristics of interest (with a prevalence of 50%), d is the margin of error in sampling that can be tolerated (5%), and is the a percentage of the population which does not have the attributes of interest. is the probability coefficient for the desired interval with a confidence interval of 95%. CI stands for confidence interval.

$$ni = \frac{\left(1.96\right)^{2^*} 0.5\left(1-0.5\right)}{\left(0.05\right)^2}$$

$$ni = \frac{\left(1.96\right)^{2^*} 0.5\left(0.5\right)}{\left(0.05\right)} = 384.16 \approx 384$$

The correction method was used in order to make the necessary adjustments to the sample size. since the population was less than 10,000, which was around 4056.

$$nf = \frac{ni}{1+ni/N}$$

$$nf = \frac{384}{1+384/4056}$$

$$nf = 384/1.095 = 350.52 \approx 351$$

Ni = Initial sample size
nf = Final sample size
N = Total no of population

As a consequence of this, the total number of people in the sample was 386, with an error margin of 10%.

In order to collect the data, a sampling process that was meticulous was adopted. The sampling frame was generated by dividing the total population of the study (4056) by the sample's size (386), which allowed for an accurate determination of the sample size. A patient card was chosen at random from the frame of sampling for every 12th patient. The prescription card for the first patient was selected using a random number generator from the first batch of 12 units. The variables that were examined for this study were as follows: age, gender, the kind of medication that was prescribed, the dosage, the route of administration, the frequency of administration, the pattern of prescription, the mean amount of medications that were prescribed during each visit, the proportion of generic medication that was prescribed, and the proportion of visits during which an injection was prescribed. Hospital chemists, who are competent to extract accurate information from patient records, were responsible for collecting the data. The collected data were cleared, categorized, coded, and analyzed by using SPSS, with its version 16, is a statistical software. Tables were used to finally display the findings of the study. Throughout the research, privacy and confidentiality were taken into account.

## RESULTS

Table 1 provides a classification of medication kinds according to the names of their generic equivalents. Antibiotics are the most frequently mentioned pharmaceuticals, with 389 different medications accounting for 62.06% of the total. Analgesics come in a close second with 206 different medications, accounting for 31.5% of the total. Antiseptics make up 40 medications (7.05%), whilst anaesthetics only make up 10 pharmaceuticals (3.79%), making them the category with the lowest frequency. It is important to note that the overall %adds up to 104.4, which may suggest a little rounding mistake. This is something to keep in mind. In general, this table presents an overview of the frequency of various medication classes, drawing particular attention to the preponderance of analgesics and antibiotics within the dataset.

Additional drug categories and their corresponding frequencies and percentages are included in the table. H2O2 (3%) makes an appearance 22 times, making up 9.02% of the total, and is often used as an antiseptic for cleansing wounds. Chlorhexidine (0.12%), which is mentioned 16 times and accounts for 7.67%, is an antiseptic agent used for mouth hygiene and skin disinfection. Lidocain, a popular local anesthetic, is mentioned eight times, accounting for 4.65% of the total. Diclofenac is a nonsteroidal anti-inflammatory medicine (NSAID), and it has a frequency of 108, representing 54.09% of all drugs. In 85 instances or 34.11%, paracetamol is mentioned (Table 2). It is a common analgesic and antipyretic drug. Another NSAID that is often used for pain treatment, ibuprofen, is mentioned 20 times, or 7.01% of the total. Finally, the opioid analgesic Tramadol makes up 3.05% of the sample and is present 7 times. The sum of the percentages equals 199.6, which may indicate a little rounding mistake in the computations.

Table 3 provides an overview of the many classes of antibiotics, the frequency at which they are prescribed, and the routes of administration they take, namely oral (PO) and

intravenous (IV). Oral administration is the most popular method for taking amoxicillin, which is prescribed 270 times and accounts for 70.05% of the total. The antibiotic metronidazole is mentioned 101 times, accounting for 24.22% of the total, and it may be taken orally or intravenously. Cloxacillin is given by intravenous administration, and its occurrences number five, making up 2.02% of the total. The route of administration for erythromycin is not indicated, despite the fact that it is mentioned 18 times and accounts for 8.45% of the total. Antibiotics like these are used to treat a wide variety of bacterial illnesses, and they are given to patients in various ways, depending on variables including the severity of the infection and concerns unique to each individual patient.

Table 4 gives a variety of indications about prescription medication. The average number of pharmaceuticals on a prescription is 1.65, This may be calculated by multiplying the total quantity of medications, 645, by the total amount of prescriptions, 390. On the other hand, the average number of antibiotics on a prescription is 0.99 out of the total number of 390 prescriptions. These results are within the reference range provided by the WHO, indicating a rather high incidence of antibiotics among the prescriptions. The proportion of contacts where an injection was provided is 0.04 out of 634 encounters, while the percentage of prescriptions for antibiotics is 0.007 out of 390 prescriptions. Both of these numbers are much lower than the WHO recommended range of 13.4–24.1, demonstrating that minimal usage of injections is occurring. In addition, the names of all pharmaceuticals, including antibiotics, are always given using their generic names, and there is an absolute commitment to utilising generic names in every prescription. The strategy that is advised for accurate and cost-effective prescription is aligned with this practice.

Table 5 outlines several categories of medications, as well as the frequency and proportion of medications that are administered appropriately and wrongly in accordance with the standards for prescription medications. There were 389 prescriptions written for antibiotics, and out of them, 300 were written properly, equivalent to a 77.12% compliance rate with the standards. On the other hand, it was discovered that 89 prescriptions were inaccurate, which accounted for 22.87% of all antibiotic prescriptions. Analgesics demonstrated better compliance, with 200 of the 206 medications (97.08%) adhering to the rules, and just six prescriptions (2.916%) displaying errors. The adherence rate for antiseptics was divided, with only 20 out of 40 prescriptions (50%) being right while the other 20 prescriptions (50%) were erroneous. These results demonstrate disparities in adherence to prescription recommendations across various drug types, highlighting the need for a higher level of compliance for secure and efficient medication practices and highlighting the need for increased compliance to ensure safe and successful medication practices.

**Table 1:** Total drugs prescribed by generic name in Max Super Speciality Hospital New Delhi 2016.

| *Drug types* | *By generic name* | |
|---|---|---|
| | Frequency | % |
| Antibiotic | 389 | 62.06 |
| Analgesics | 206 | 31.5 |
| Antiseptic | 40 | 7.05 |
| Anesthetics | 10 | 3.79 |
| Total | 645 | 104.4 |

**Table 2:** Other drug prescribed in combination with antibiotics in Max Super Speciality Hospital New Delhi 2016.

| *Other drugs* | *frequency* | *%* |
|---|---|---|
| H2O2 (3%) | 22 | 9.02 |
| Chlorhexidin (0.12%) | 16 | 7.67 |
| Lidocain | 8 | 4.65 |
| Diclofenac | 108 | 54.09 |
| Paracetamol | 85 | 34.11 |
| Ibuprofen | 20 | 7.01 |
| Tramadol | 7 | 3.05 |
| Total | 266 | 199.6 |

**Table 3:** Commonly used route of administrations in Max Super Speciality Hospital New Delhi 2016.

| *Drugs Types antibiotic* | *Route of administration* | | | |
|---|---|---|---|---|
| | PO | | IV | |
| | Frequency | % | Frequency | % |
| Amoxicillin | 270 | 70.05 | - | - |
| Metrondazole | 101 | 24.22 | - | - |
| Cloxacillin | - | - | 5 | 2.02 |
| Erythromycin | 18 | 8.45 | - | |

**Table 4:** Prescribing pattern indicators with respect to WHO references in Max Super Speciality Hospital New Delhi 2016.

| *Indicators* | *Total drugs* | *Values Antibiotics* | *WHO reference* |
|---|---|---|---|
| Average number of drugs per | 645/390 | 389/390 | |
| prescription | 1.65 | 0.99 | 1.6–1.99 |
| Percentage of encounters with an | 28\634 | 3\390 | |
| injection prescribed | 0.04 | 0.007 | 13.4–24.1 |
| Percentage of drugs prescribed by Generic name | 645\645 | 389\398 | |
| | 100 | 100 | 100 |

**Table 5:** Drugs prescribed correctly and incorrectly in Dental clinics in Max Super Specialty Hospital New Delhi 2016.

| *Types of drugs* | *Drug prescribed correctly per prescribing guideline* | | *Drugs prescribed incorrectly per pre scribing guideline* | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Antibiotics | 300 (n = 389) | 77.12 | 89 (n = 389) | 22.87 |
| Analgesics | 200 (n = 206) | 97.08 | 6 (n = 206) | 2.916 |
| Antiseptics | 20 (n = 40) | 50 | 20 (n = 40) | 50 |

**Table 6:** Prescription errors identified in Dental clinics in Max Super Speciality Hospital New Delhi 2016

| *Prescription errors* | *Antibiotics* | | *Analgesics* | | *Antiseptics* | |
|---|---|---|---|---|---|---|
| | Frequency (n = 89) | % | Frequency (n = 6) | % | Frequency (n = 20) | % |
| Physician signatures | 40 | 44.94 | 2 | 33.33 | 5 | 25 |
| Dosage forms | 20 | 22.47 | 2 | 33.33 | 5 | 25 |
| Quantity of drugs | 20 | 22.47 | 1 | 16.66 | 5 | 25 |
| Frequency of drug use | 9 | 10.11 | 1 | 16.66 | 5 | 25 |

Table 6 includes prescription error data for three types of drugs: antibiotics, analgesics, and antiseptics. Out of 89 prescriptions for antibiotics, 40 (44.94%) had problems connected to physician signatures, 20 (22.47%) had errors in dose forms, 20 (22.47%) had errors in medication amount, and 9 (10.11%) had errors in drug usage frequency. In the case of analgesics, 2 out of 6 prescriptions (33.33%) had a mistaken in physician signatures, dose forms, and medication amount, while 1 prescription (16.66%) had an error in drug frequency. Similarly, 5 out of 20 antiseptic prescriptions (25%) contained problems in physician signatures, dosage forms, medication amount, and frequency of drug usage. These mistakes emphasise areas for improvement in order to maintain accurate prescription practises, such as valid physician signatures, acceptable dose forms and amounts, and correct medication usage frequencies.

## DISCUSSION

Comparative analysis of antibiotic prescribing patterns for dental infections is an important research topic, as it can provide valuable insights into how various antibiotic treatments affect different types of dental infections. A retrospective study in a dental clinic can be used to compare the effectiveness of antibiotic treatments in different types of dental infections. The first step of the comparative analysis is to identify all the different types of dental infections that the dental clinic is treating.[7-11] Then, historical records about the dental clinic can be assessed to find information about the antibiotic treatments used for each type of dental infection. This information can be used to identify the various types of antibiotics used and the level of success in treating each type of dental infection.[12-15] Next, the effectiveness of the various antibiotic treatments for each type of dental infection can be compared. This can be done by analyzing the data from the retrospective study to determine the success rate of the different types of treatments. The analysis can also include other factors such as the side effects experienced by the patients. This can help to determine which type of treatment is most effective for which type of dental infection. Ultimately, the analysis can help to provide valuable insights into which types of antibiotic treatments are most effective for various types of dental infections. This can help guide future antibiotic prescribing practices in the dental clinic and lead to better patient outcomes. Additionally, this type of analysis can provide an understanding of the effectiveness of the various antibiotic treatments and their impact on overall healthcare costs.

## CONCLUSION

The study analyzed the prescribing patterns of medications in a dental clinic, focusing on antibiotics for dental infections. Antibiotics were the most commonly prescribed medications, accounting for 62.06% of the total, followed by analgesics at 31.5%. Antiseptics and anesthetics had lower frequencies. Among the specific medications, H2O2 (3%) and chlorhexidine (0.12%) were frequently used antiseptics, while amoxicillin (70.05%) was the most commonly prescribed antibiotic, often administered orally. According to the findings of the research, the typical prescription contains three different medications S was 1.65, with antibiotics comprising 0.99 of that average. Although the overall antibiotic prescribing rate was within the reference range provided by the WHO, indicating a relatively high incidence, the proportion of injections was much lower than recommended. Compliance with prescribing standards was observed in 77.12% of antibiotic prescriptions, while analgesics demonstrated better adherence at 97.08%. Overall, the study suggests the need for improved compliance and monitoring of antibiotic prescribing practices in the dental clinic. The study on antibiotic prescribing patterns in a dental clinic revealed a high incidence of antibiotics in prescriptions but a lower proportion of injections, indicating a need for improved monitoring. Compliance with prescribing standards varied across medication categories, with analgesics demonstrating better adherence compared to antibiotics and antiseptics.

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