



## Survey on the Antibiotic Prescription Pattern: A Questionnaire Based on North Indian Population

Radhika Goyal<sup>1</sup>, Sreejith Krishna<sup>2\*</sup> and Yukti Gupta<sup>3</sup>

<sup>1</sup>Oral and Maxillofacial Radiology, Maharishi Markandeshwar College of Dental Sciences and Research, Mullana, India

<sup>2</sup>Periodontology, Maharishi Markandeshwar College of Dental Sciences and Research, Mullana, Ambala, India

<sup>3</sup>Dentistry, Maharishi Markandeshwar College of Dental Sciences and Research, Ambala, India

\*Corresponding Author: Sreejith Krishna, Periodontology, Maharishi Markandeshwar College of Dental Sciences and Research, Mullana, Ambala, India

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### Abstract

**Objectives:** Dental professionals all across the world frequently overuse prescriptions for antibiotics. Multiple negative effects and the potential of bacterial resistance are linked to the overuse of these medications. This research's purpose was to evaluate systemic trends of antibiotic prescription among North Indian population.

**Methods:** A cross-sectional prospective study was carried out. A total of 150 dentists from various Dental colleges in the North Indian demographic region were selected for this study. The questionnaire was forwarded through google forms. The questions were closed ended. It includes questions about attitude and knowledge of dentists towards prescribing antibiotics to dental patients.

**Results:** A total of 10 valid questionnaires were considered in the final analysis. The majority of dentists (72%) prescribed antibiotics once a week, whereas 5.6% only sometimes provided antibiotics, according to the numbers of accurate and erroneous patterns of prescription for various dental/oral disorders. A majority of dentists (58%) recommended Augmentin as their first-choice antibiotic, followed by amoxicillin (36.7%), whereas none of the dentists who participated in the survey chose Clindamycin. For treating acute oral infections, 132 (88%) participants favour antibiotic therapy. Surprisingly 73.2% of the dentists prescribes antibiotics for pain.

**Conclusion:** The current study gave insight into the knowledge and mindset of dentists who prescribed antibiotics to patients and lack of awareness regarding the prescription of it in cases of pain. Instead antibiotics should be used as an adjunct in treatment of oral conditions.

**Keywords:** Drug Dosage; Dentistry; Prescription; Resistance; Antibiotics

### Introduction

The oral biofilm is the primary cause of the majority of oral and dental disorders, and several treatments, including drainage, scaling, root canal therapy, and other procedures, are typically used to remove the oral biofilm [1]. In some circumstances, prescribing antibiotics is advised in addition to active dental therapy to control acute infection. Only a few oral and dental conditions, such as face cellulitis, severe necrotizing gingivitis, reimplantation of teeth, and trismus, necessitate the prescription of antibiotics. Additionally, those with medical problems who run the risk of developing infective endocarditis are advised to take antibiotics [2,3].

The problem of bacterial resistance development brought on by the overuse of antibiotics, which might trigger a worldwide crisis if ignored, has been known for many years [4]. The World Health Organisation (WHO) has been sounding the alarms since

May 2015 in response to reports coming in from all over the world regarding the advent of new bacterial strains that are resistant to antibiotics, which are the final line of defence [5,6]. WHO in Cook Islands 2018 introduced revised guidelines for targeted and empiric antibiotic treatment, dosing, prophylaxis and allergies [7].

Between 2000 and 2010, the world's antibiotic consumption increased by 40%, and the BRICS nations-Brazil, Russia, India, China, and South Africa-were responsible for around three-quarters of this consumption [8]. In India, where self-medication is widespread and antibiotics are easily accessible, the causes of antibiotic resistance at the community level are a major issue [9]. According to estimates, sepsis caused by bacteria resistant to first-line medicines kills 56,524 newborns in India every year [10]. In fact, India was the greatest consumer of antibiotics for human treatment in 2010 with one-sixth of the global population [11].

With a global increase in morbidity and mortality, antibiotics have been a complete success. The ability of bacteria to adapt and multiply in order to protect themselves, however, undermines this early success by reducing or eliminating the therapeutic effects of antibiotics [12]. According to estimates, 10% of antibiotic prescriptions are because of oral infections. In fact, it is regarded as a “panacea” for all infectious diseases [13].

While we can consider the alternative approaches to curb antibiotic resistance by using Probiotics, Natural products, Low Level Laser Therapy (LLLT), PDT (Photo Dynamic Therapy) and new development in antibiotics or by using adjuncts like judicious use of antibiotics in conjugation with surgical therapy is most appropriate method to treat odontogenic infections and medically compromised patients like cardiovascular disease and diabetes mellitus [14].

Children with orofacial infections have been documented to have unjustified usage of antibiotics, which has also been acknowledged as a contribution by paediatric dentists (PD). Additionally, surveys show that dentists have a low level of knowledge about the effects of antibiotic prescriptions and antibiotic resistance [15].

When it comes to paediatric dentistry, the observed prescribing behaviour may be the consequence of parental pressure, which has been identified as one of the main reasons for inappropriate prescriptions. Other non-clinical circumstances that affect antibiotic use include a case’s questionable diagnosis, the necessity for treatment delaying due to unavailability of appointments, issues including poor sterilization, and social interactions. Additionally, it was recommended that medical professionals presume that prescribing antibiotics is the quickest approach to resolve any type of consultation [15].

Dentists have been seen to make a significant contribution to the problem of antibiotic resistance, as they prescribe 10% of all common antibiotics. Yingling, *et al.* [16], concluded from his survey of members of the American Association of Endodontists (AAE) that they were prescribing antibiotics incorrectly.

We have now entered an era in which some bacterial species are resistant to the entire spectrum of antibiotics now accessible, with methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Staphylococcus aureus* being the most well-known examples of widespread resistance [17].

The National Center for Disease Control and Prevention discovered that nearly one-third of all outpatient antibiotic prescriptions are unnecessary. In 2015 WHO initiated global action plan to tackle AMR (Antimicrobial Resistance).

On 22<sup>nd</sup> October 2015 WHO initiated GLASS (Global Antimicrobial resistance and use Surveillance System), the first actual effort to standardise AMR surveillance its objective to “strengthen knowl-

edge through surveillance and research”. From 2016 through 2023, CDC initiated in more than 700 innovative AR projects in more than 80 countries to slow the spread of resistance domestically and globally [18].

NAP the Indian National Action Plan for AMR was released on 2017 whose objectives were on improving awareness, enhancing surveillance measures, strengthening infection prevention and by controlling research and development [19].

A review of the scientific literature found that there have been very few studies in India evaluating the antibiotic prescribing trend among dentists. This provided incentive for conducting this survey in order to analyse and comprehend antibiotic prescribing behaviours among dentists. The survey’s goal was to investigate antibiotic prescription patterns for common oral illnesses, routine dental treatment, and antibiotic resistance awareness among dentists in North India.

## Materials and Methods

A cross-sectional prospective study was carried out. The google forms were mailed mainly in colleges of Punjab, Haryana, Delhi NCR and UP through Snowball Sampling. 220 responses were received through google forms out of which 150 responses were randomly allocated by Microsoft Excel Version 2021. It was made sure that each person could only answer the questionnaire once and that all the questions had to be answered. The questions were close ended. Participants were asked to return the form within two to three weeks of receiving it, and those that were returned beyond the deadline of February 2022 would not be accepted.

## Elements of questionnaire

- A questionnaire with multiple choices in pertinence to antibiotic regimen was formulated. It includes questions about attitude and knowledge of dentists towards prescribing antibiotics to dental patients.
- The first question was based on specification of the designation (faculty, intern, post graduates), followed by the frequency of prescribing antibiotics in Dental infections. The third and fourth question was designed based on the choice of antibiotic prescribed and frequently used route of antibiotic administration (Oral and Intravenous).
- Knowledge was obtained about whether antibiotics were prescribed for pain or prior to any surgical procedure and prescription was given to age groups under 15 years of age.
- The last section of the questionnaire was based on the duration of antibiotic prescription and whether medical history was taken prior prescribing antibiotics to patients.
- A total of 150 responses were recorded in a duration of 1.5-2 months and statistical analysis was done based on the percentage of the individual responses.

## Statistical Analysis

The data was numerically coded and analyzed using SPSS 20 database and using descriptive statistics. Chi square test and Z pro-

portion were used to calculate the significance in the differences of proportion of responses with  $p < 0.05$  which was considered statistically significant.

**Results**

The questionnaire was circulated among 20 dental institutions in North India and a total of 150 participants responded to the questionnaire. Out of these the majority of responders were post graduates (41%), interns (31%) and faculty (21%) (Figure 1).

Following the preliminary analysis of the duration of drug prescription it was noted that 72% of the responders prescribed antibiotics once a week, accompanied by 41% everyday, 6% prescribed monthly and only 5.4% advised antibiotics rarely, which was highly significant ( $p = 0.0001$ ) (Figure 2). The most commonly prescribed antibiotics among the participant dental professionals was combination of amoxicillin and clavulanic acid (58%) and amoxicillin (36.7%), finally penicillin, clindamycin and cephalexin i.e. (5.3%) were the least prescribed alternatives, with a highly significant  $p$  value of 0.0001 (Figure 3).

Oral route of drug administration of antibiotics was preferred among majority of the participants (99.3%, noticeably 0.7% were in favor of using the intravenous route (Figure 4). On further analysis 68% of the responders were in support of antibiotic prescription to patients below 15 years of age and the remaining 32% dental professionals do not recommend prescribing antibiotics to patients under this category (Figure 5).

Regarding the attitude of participants towards antibiotic prescription for acute dental infection was 88% participants choose to advise the drugs and on contrary less percentage (12%) of respondents were in favor of it (Figure 6).

In case of antibiotic prophylaxis prior to surgical procedure 90.7% of the respondents choose yes to prescribe them and 9.3% were against it (Figure 7). Maximum number of participants (73.3%) preferred to prescribe antibiotics under the condition of pain ( $z$  proportion = 9.14,  $p$  value = 0.0001) (Figure 8).

Other findings for maximum duration of antibiotic therapy was 3 days (64.7%) for majority of the respondents, at the same time a noticeable number of respondents prescribed antibiotics for maximum.

Number of 5 (30%) days ( $p$  value = 0.0001) (Figure 9). Regarding the history of any medical condition before advising antibiotics 99.3% participants marked a 'yes' and as an important part before drug prescription (Figure 10).

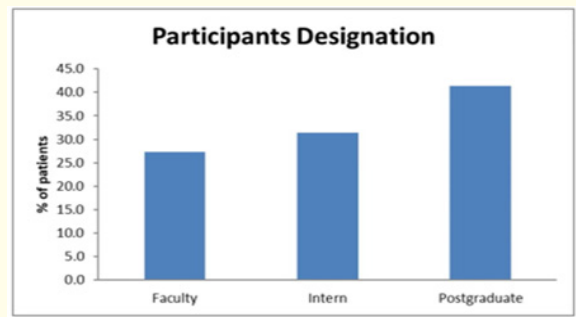


Figure 1: Participants designation.

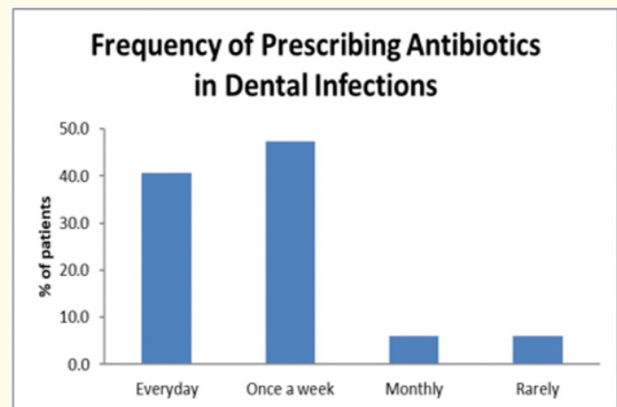


Figure 2: Frequency of prescribing antibiotics in dental infections.

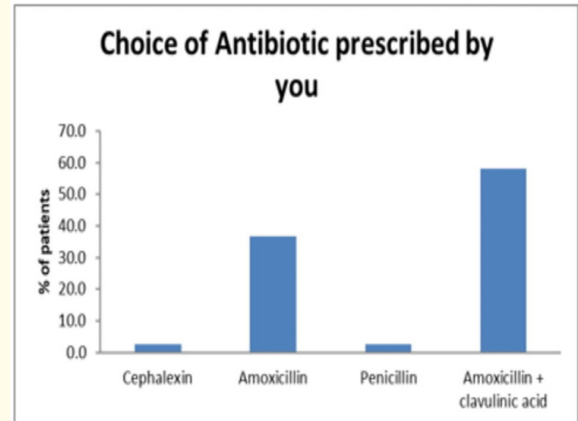


Figure 3: Choice of antibiotics prescribed by you.

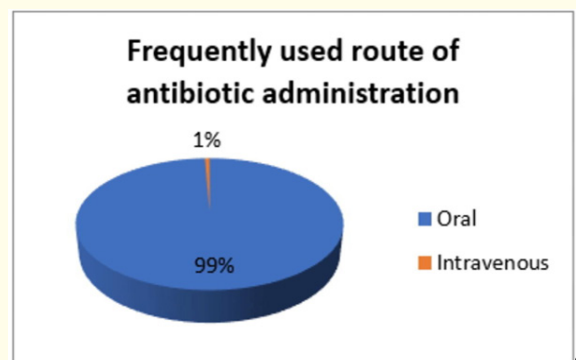


Figure 4: Frequently used route of antibiotic administration.

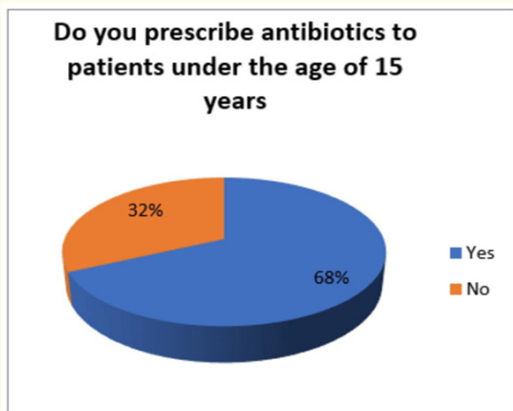


Figure 5: Do you prescribe antibiotics to patients under the age of 15 years.

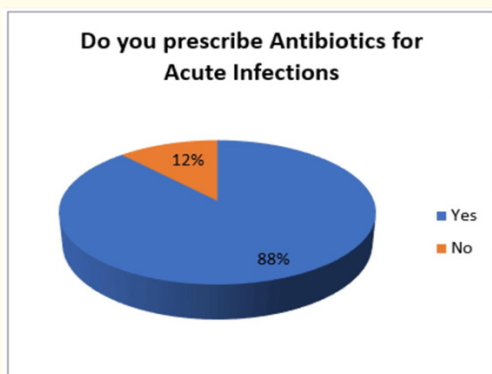


Figure 6: Do you prescribe antibiotics for acute infections.

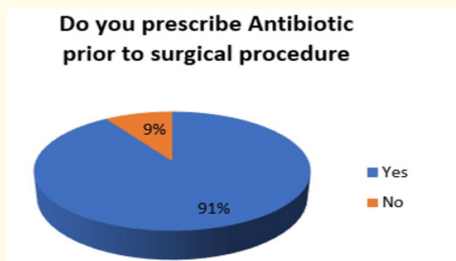


Figure 7: Do you prescribe antibiotics before surgical procedure.

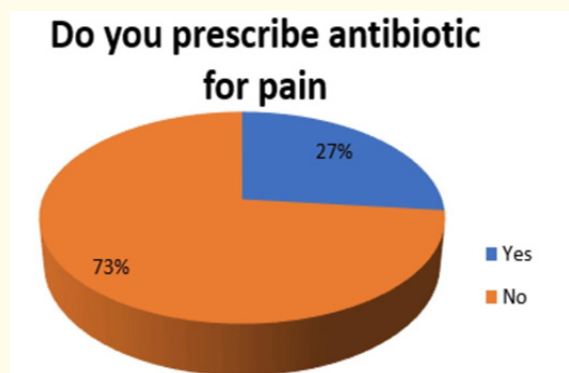


Figure 8: Do you prescribe antibiotics for pain.

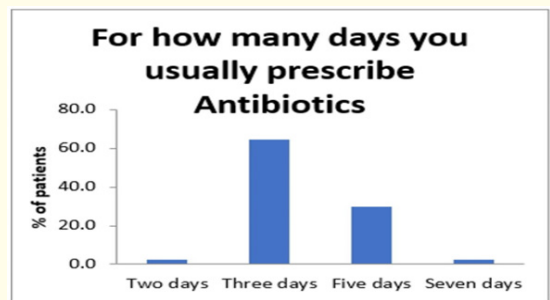


Figure 9: For how many days you usually prescribe antibiotics.

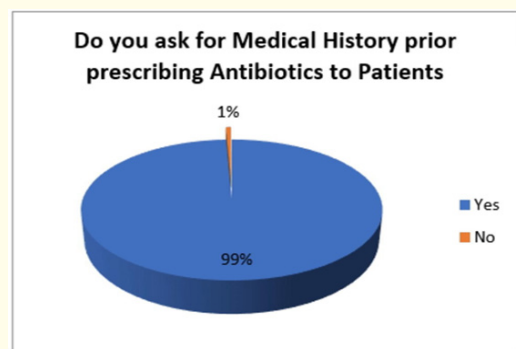


Figure 10: Do you ask for medical history prior prescribing antibiotics to patients

### Discussion

Over the past few decades, antibiotic therapy has been an essential consideration of dentistry. While dentists consistently participate in skill-based learning, a comparable effort is not committed to understanding and adopting the most recent clinical practice guidelines on antimicrobial therapy to their practices. This attitude could be attributed to a lack of understanding of the value of evidence-based standards, time restrictions, the resources required, and a lack of training [20]. During this study it was observed that most of the dentists (72%) prescribed antibiotics once a week on the other hand 5.6% rarely prescribed antibiotics.

Amoxicillin and clavulanic acid was the drug of choice for most of the dentists (more than 50%), followed by plain amoxicillin. This was in accordance with the study done by Llor C., *et al.* who reported that combination of amoxicillin and clavulanic acid was the most used antibiotic in Spain [21]. Further the rationale behind choice of amoxicillin and clavulanic acid can be due to its wide spectrum, pharmacokinetic profile, dosage, low incidence of resistance and tolerance. Combined drug prescription in dental practice is becoming more important as now a days the practitioner encounters resistant or mixed infections [1]. As it was observed in Gowri S., *et al.* study that most prescribed antibiotic in UP, India is amoxicillin. This study found that the combination was more preferred in North Indian demographic region which includes UP [22]. 72% of the participants prescribed antibiotics for dental infections once a week followed by 41% prescribed daily, the later was supported by the studies done by Segura-Egea., *et al.*

[23] and Mohan S., *et al* [1]. who also noticed 50 % of the practitioners prescribed antibiotics on a daily basis. 64 % of the participants prescribed antibiotics for three days and 30 % prescribed for five days, this was in contrast to the findings of Zaman S., *et al*. [24] who noticed 86.8 % participants were prescribing antibiotics for more than three days. Yingling., *et al*. (2002) reported that endodontist prescribe the antibiotics for 7.58 days on average. It has been noticed that the duration of prescription of antibiotics are always variable [14]. In the study 88% of the participants prescribed antibiotics for acute infections which was in accordance to a consensus report by Bascones., *et al*. in which they also recommended treatment of acute infections of the pulp origin as an adjunct to root canal treatment, periapical abscess, ANUG and aggressive periodontitis [25]. The study also showed that 90.7% of the dentists prescribed antibiotics prior to the surgical procedures and 9.3% didn't. Strikingly 73.2 % of the respondents were in favor of prescribing antibiotics for pain. Furthermore, according to a Cochrane systematic review there is little proof that supports the use of antibiotics for pain management of irreversible pulpitis [26]. In the absence of systemic involvement, antibiotics do not alleviate pain or swelling caused by teeth with acute apical pathosis, Cope., *et al*. [27]. and Keenan., *et al*. [28]. According to the ADA guidelines (2019) recommends against the use of antibiotics for plural and periapical infections. Further they recommend the dental treatment like pulpotomy, pulpectomy, drainage, Non-Surgical Root Canal Treatment for Localised acute apical abscess, Symptomatic irreversible pulpitis and Symptomatic apical periodontitis. If only the patient shows signs of systemic involvement like malaise and fever then only dentist should prescribe antibiotics [29]. The routine administration of prophylactic antibiotics is standard in cases in which a patient will have an artificial implant or foreign body implanted as part of the procedure, for bone grafting procedures, and other surgeries with extensive dissections and expectations for higher amounts of anticipated blood loss. Usage of sub therapeutic dosage for long duration can lead to the development of mutant strains. In addition, this can result in the destruction of normal flora in the gut and oral cavity [1]. A short course of antibiotic usage for 2-3days is advisable in children, as observed in this study, 68% of the participants prescribed antibiotics to children. To avoid antibiotic resistance, revised AAPD (American Academy of Pediatric Dentistry) guidelines (2014) encourage evaluating antibiotic effectiveness, and practitioners are urged to change or discontinue antibiotics after finding either ineffectiveness or cure before the finish of a 5- to 7-day course. AAPD Guidelines also recommends Penicillin or Cephalosporins for acute swellings of dental origin and adjunct therapy of metronidazole can be given [30].

Short courses have received increased attention in recent years. According to Rubenstein, short-course antibiotic therapy necessitates antibiotics with the following properties: rapid onset of action, lack of predisposition to induce resistant mutants, bactericidal activity, easy penetrability into tissues, resistance to adverse infection conditions and administration at an ideal dose.

Rapid courses are favoured over extended courses, especially when treating children, because children's cooperation with traditional courses is low [21]. In 2017 Schwartz., *et al*. recommended prescribing antibiotics for paediatric patients, preferring penicillin derivatives for first 3 days followed by Clindamycin or Augmentin if no improvement is seen [31].

Our study found that there is a substantial overuse of antibiotics for dental illnesses, including their improper therapeutic and preventive use as well as their inappropriate combination and broad spectrum usage, which is against WHO recommendations. Continuing Dental Education (CDE) Programmes need to be reinforced more into action on this issue. Reviewing of interventions to improve specific behaviour of prescription, Educational Outreach Programme, Auditing and feedback systems can be introduced into future practice to minimise exploiting of antibiotics. Targeted stewardship initiatives are desperately needed in this field.

Other studies' contradictory findings could be related to disparities in demography and a lack of knowledge of the rationale for antibiotic and anti-inflammatory use.

## Conclusions

Dentists' awareness and attitude about antibiotics need to be greatly improved, as nearly half of them reported being unsure about prescription antibiotics. The majority of dental professionals in dental institutes were uninformed of antibiotic prescribing guidelines and had to rely on expert or peer judgements.

Most of the study participants need to renew and enhance their knowledge regarding antibiotics overuse under control and avoid the spread of resistance and the emergence of superinfections, education and frequent updates are essential. Further research is needed to fully understand the impact of guideline- focused education on dental practitioners' prescription patterns.

## Appendices

- Participants Designation Intern Postgraduate Faculty
- Frequency of Prescribing Antibiotics in Dental Infections Everyday Once a Week Monthly Rarely
- Choice of Antibiotic prescribed by you Penicillin Amoxicillin Clindamycin Cephalixin Amoxicillin + clavulanic acid
- Frequently used route of antibiotic administration Oral Intravenous
- Do you prescribe antibiotics to patients under the age of 15 years Yes No
- Do you prescribe Antibiotics for Acute Infections Yes No
- Do you prescribe Antibiotic prior to surgical procedure Yes No
- Do you prescribe antibiotic for pain Yes No
- For how many days you usually prescribe Antibiotics Two days
- Three days Five days Seven days
- Do you ask for Medical History prior prescribing Antibiotics to Patients Yes No

## Additional Information

### Disclosures

- **Human subjects:** All authors have confirmed that this study did not involve human participants or tissue.
- **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue.
- **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following.
- **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work.
- **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
- **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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