

Current Trends in Prescription of Antibiotics among Dentists Working in Various Dental Colleges of Bangalore City, India- A Cross Sectional Study

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ABSTRACT

Objectives: To assess the prescription pattern of antibiotics for different oral pathologies among study subjects and various dental treatments in systemically compromised patients. **Materials & Methods:** A study was carried out, to find out the trend in antibiotic prescription among all the dentists working in various teaching dental colleges of Bangalore city. A Self-structured questionnaire was used for recording all required demographic data & the questionnaire was designed to collect information related to antibiotic prescribing patterns for different oral pathologies like *peri-apical* abscess & cellulitis. The data was collected, compiled & analysed using SPSS software. **Results:** A total of 202 dentists working in various dental colleges of Bangalore City participated in the study. Out of 202 participants who participated in the study 107 (53%) were females and 95 (47%) were males. One hundred and seventy-seven (87.7%) were MDS and 25 (12.3%) were BDS. Overall antibiotic prescribing practices were high among the study participants. Amoxicillin remains the standard choice (65%) Majority of the study participants would prescribe prophylactic antibiotics for medically compromised patients. Certain overuse of antibiotics was found among study participants for clinical conditions like dry socket (54.9%) and for certain non-clinical criteria. **Conclusion:** This study indicates that the prescription of antibiotics among the study participants was high. overuse of antibiotics for a few conditions was practiced among the study subjects. Appropriate guidelines for antibiotic use and misuse should be stipulated to combat drug resistance, and regular Continuing Dental Education programmes should be conducted to update the use of antibiotics and on newer generations of antimicrobials.

KEYWORDS: Antibiotics, Dentists, Prescription

INTRODUCTION

Antibiotics are chemical substances that are capable of destroying and inhibiting the growth of specific microorganisms, such as infectious bacteria and fungi. There are different antibiotics, which are broadly classified based on their mechanism of action (i.e. if on the cell membrane, cell wall, or metabolism), chemical structure, spectrum of activity (i.e. if targeting gram-negative or gram-positive bacteria), or by mode of administration (e.g. oral, intravenous, or topical).¹

In the field of health care, antibiotics have emerged as a boon to mankind and this advancement has led to a better quality of life, reduction of morbidity and mortality. Dental infections are *poly-microbial* in nature. Hence, antibiotics and analgesics account for the majority of drugs prescribed by dentists.²

Majority of the orofacial infections are odontogenic in nature which require both systemic and local management. Systemic management is mostly by antibiotics, and hence these antibiotics are pharma-cotherapeutic adjuncts prescribed by Dentists. One of the problems faced due to over-prescription of these drugs are resistance developed by certain species of bacteria. In some individuals prescription of these drugs result in adverse effects ranging from nausea to fatal anaphylactic shock and resistance.⁴⁻⁶

The main reason behind antibiotic resistance is due to over prescription by the health care personnel's, improper use by patients and also due to the resistance developed by the bacteria.^{4,5} This is supported by the evidence collected to show the significant relationship between increase of antibiotic resistance and utilization with higher resistance levels in bacteria isolated from areas of

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high antibiotic utilization.⁵

Acute and chronic infections of the pulp and periradicular tissues are the main causes of tooth pain that can be cured by appropriate restorative care⁷ rather than administration of antibiotics. Antibiotics are contraindicated in clinical cases such as acute periapical infections, dry socket, pulpitis⁸ and chronic inflammatory periodontal conditions. Systemic antimicrobials should only be used in acute periodontal conditions where drainage or debridement is impossible and where there is a local spread of the infection or where the systemic upset has occurred.⁹

Prophylactic antibiotics taken prior to a number of dental procedures have shown to reduce the likelihood of postoperative complications like infection, dry socket, or any serious complications like infective endocarditis. Evidence on the action of antibiotics in preventing infection in surgical wounds of the oral cavity is almost non-existent.

The Indian subcontinent is known to be a hot bed for resistant microbes and many factors are responsible for this situation. Irrational prescription of antibiotics by health care practitioners, prescription for viral infections without advising a culture and sensitivity report, use of higher generation of antibiotics, increased pressure to prescribe newer antibiotics, self-medication, non-compliance of full course of antibiotics by patients, availability of antibiotics over the counter (OTC), poor quality of drugs coupled with primitive infection control in hospitals and weak or deficient sanitation are major reasons for poor health standard in India.^{10,11} Additionally weak surveillance systems and non-availability of antibiotic policy at the national level contribute to the present situation but now India is all set to see its first antibiotic policy being passed by the central government very soon which is a positive step towards tackling resistance due to antibiotics.¹²

The misuse of antibiotics in dentistry mainly involves prescription in unnecessary situations where a healthy patient is given antibiotics to prevent infections which is less likely to occur. Also the desire to make their patients well and prevent unpleasant complications can stimulate the prescription of antibiotics.¹³ With increasing prescription of antibiotics & increasing bacterial resistance, newer drug combinations are being introduced which are included in the prescription. Dentists are opting for other antibiotics apart from the standard ones due to increased resistance to older antibiotics and better action with fewer side effects of the newer antibiotics.

Keeping in mind, the recent advances in antimicrobial therapy & the increased prescription of drugs, this study aims to chart current trends in antibiotics prescription among dentists working in various dental colleges of Bangalore city.

MATERIALS AND METHODS

A cross sectional study was done among all dentists, working in various dental colleges of Bangalore city, to

determine the antibiotic prescribing practices among dentists in Bangalore city. The Data collection was done for 3 months (April 1st to June 30th, 2014). All the dentists, working in various dental colleges of Bangalore city will be included in the study. There are a total of 16 dental colleges in Bangalore city. The ethical clearance for the study was obtained from the ethical review board of the institution prior to the study.

Inclusion Criteria: Dentists who are affiliated with teaching institutions of Bangalore city, who consent to be a part of this study.

Exclusion Criteria: Dentists working in colleges of Bangalore city who do not wish to participate in the study.

METHOD OF DATA COLLECTION:

- In Bangalore city, there are 16 Dental colleges in which around 610 dentists are working in these colleges.
- The investigator had visited all the 16 Dental colleges for the purpose of data collection.
- The permission to conduct the study in each college was obtained from respective principal/Dean. The purpose of the study was explained to the staff members in each department and only those who satisfied the inclusion and exclusion criteria were given the questionnaire.
- The investigator distributed the questionnaire to the faculties and collected the filled questionnaire at the end of the day or the next day. A total of 385 dentists were present in all the colleges at the time of study. A total 245 dentists gave consent and to them the Questionnaire was distributed. Out of these 230 were filled and returned among which 202 questionnaires were completely filled. All the completely filled 202 questionnaires were considered for the analysis.

DETAILS OF THE QUESTIONNAIRE:

A self-structured both open ended and close ended questionnaire was used for recording all required demographic data like name, age, gender, year of graduation, etc. The questionnaire was designed to collect information related to the antibiotic prescribing pattern for different oral pathologies like the periapical abscess, cellulitis, etc. The questionnaire was pretested by the dental faculty of various dental specialties to assess the validity, reliability and internal consistency of the questionnaire. Kappa statistics were done for the questions which revealed a value of 0.83.

Description of the questionnaire:

The questionnaire consisted of two components the first component consisted of seven questions related to demographic information, qualification and specialty which they were working. The second part was further divided into following five parts:

- a) Antibiotics prescription for various symptoms
- b) Antibiotics prescription for various clinical diagnosis
- c) Antibiotics prescription for various endodontic conditions

- d) Antibiotics of choice for various clinical conditions (open ended)
 e) Antibiotic prescription in case of systemic diseases which require Dental treatments.

The data collected was compiled and analysed using SPSS software version 19.0.

RESULTS

A total of 245 questionnaires were distributed to all the Dentists working in various dental colleges of Bangalore city out of which 202 questionnaires returned completely filled and were eligible for statistical analysis.

Gender (N) (%)		Qualification (N) (%)	
Male	95(47%)	BDS	22(12%)
Female	107(53%)	MDS	180 (88%)
Total	202 (100%)	Total	202(100%)

Table 1. Distribution of study participants based on gender and qualification

Out of all study participants, 73(36.1%) of them attended a CDE program on antibiotics and 114(56.4%) of them had a private practice.

Study participants were questioned about the clinical symptoms for which the respondents would prescribe antibiotics. The trend observed was that majority 87.1% would prescribe antibiotics for patients who presented with elevated body temperature. On the other hand less than 50% of the study participants would prescribe antibiotics for the non- clinical criteria like patient expectation for prescription, convenience of the Dentist, patient's social background, uncertain diagnosis and when specific treatment have to be delayed (Table -2).

Clinical symptom	n(%)
Elevated temperature and systemic spread	176(87.1%)
Localized fluctuant swelling	115(56.9%)
Gross/diffuse swelling	171(84.7%)
Restricted mouth opening	74(36.6%)
Difficulty in swallowing	89(44.1%)
Closure of the eye due to swelling	148(73.3%)
Patient expectation for prescription	17(8.4%)
Convenience of the Dentist	10(5%)
Patients social background	20(9.9%)
Uncertain diagnosis	40(19.8%)
Specific treatment has to be delayed	100(49.5%)
Prevention of post- operative complications	158(78.2%)

Table 2. Distribution of study participants based on antibiotics prescription for various clinical symptoms

Table 3 shows the prescription patterns of antibiotics for various clinical diagnoses. Out of various endodontic conditions requiring antibiotics, 43.6% of them would

have prescribed antibiotics for acute pulpitis, 72.2% for acute periapical infection, 59.4% for chronic periapical infections. 47.5% of subjects would have prescribed antibiotics for chronic periodontitis, 76.7% for pericoronitis and 91.6% for cellulitis. Among the other conditions, 78.7% of subjects would have prescribed antibiotics for R.C.T in infected tooth, 84.7% for extraction of tooth with abscess, 72.8% for impaction and 57.9% for dry socket. Least number of subjects i.e. 58 (28.7 %), would have prescribed for fracture of teeth.

Clinical Diagnosis	n (%)
Acute pulpitis	88(43.6%)
Acute periapical infection	156(72.2%)
Chronic periapical infection	120(59.4%)
Chronic periodontitis	96(47.5%)
Pericoronitis	155(76.7%)
Periodontal abscess	178(88.1%)
Cellulitis	185(91.6%)
RCT in infected tooth	159(78.7%)
Extraction of tooth with abscess	171(84.7%)
Impaction	147(72.8%)
Dry socket	117(57.9%)
Fracture of teeth	58 (28.7%)

Table 3. Distribution of study participants based on prescription of antibiotics for various clinical diagnoses

Further the study participants were questioned regarding the details of antibiotics prescription for medically compromised patients during scaling, tooth removal, and root canal treatment. For type I IDDM 77% of them would prescribe antibiotic before scaling, followed by 42.2% for tooth removal and 78% during root canal treatment whereas in type II NIDDM 57% would prescribe followed by 41.1% for tooth removal and 72.1% for root canal treatment. In moderate hypertension 47.5% prescribed followed by 19.6% for tooth removal and 44.4% for root canal treatment. In patients with infective endocarditis 75.2% would prescribe antibiotic before scaling 85.4% for tooth removal and 93.2% for root canal treatment. In patients with heart valve prosthesis, 87% of the study participants preferred antibiotic during scaling followed by 84% for tooth removal and 90.7% for root canal treatment. For kidney transplant patients 83.4% preferred antibiotic for scaling 76.8% for tooth removal and 90.1% for root canal treatment. In case of liver failure 76.2% preferred antibiotic before scaling 56.1% for tooth removal and 76.4% for root canal treatment. (Table-4)

Out of the five open ended questions that were asked to the respondents, majority(65%) preferred prescribing amoxicillin for an adult patient with no medical history and with periapical infection followed by Ciprofloxacin (8.9%) and Cephalosporin (5%). Few study participants

Systemic condition	Scaling		Tooth removal		RCT	
	Yes	No	Yes	No	Yes	No
Type I IDDM	77%	23%	42.2%	57.8%	78%	22%
Type II IDDM	57%	44%	41.1%	58.9%	72.4%	27.6%
Moderate Hypertension	47.3%	52.5%	19.6%	80.4%	44.4%	55.6%
MI	40.4%	59.6%	55.6%	44.4%	76.3%	23.8%
Infective Endocarditis	75.2%	24.8%	85.4%	14.6%	93.2%	6.8%
Heart valve prosthesis	87%	13%	84%	16%	90.7%	9.3%
Kidney transplant	83.4%	16.6%	76.8%	23.2%	90.1%	9.9%
Liver failure	76.2%	23.8%	56.1%	43.9%	76.4%	23.6%

Table 4. Distribution of study participants based on prescription of antibiotics for various dental treatments in systemic conditions

have reported that there is no need for antibiotic prescription(21.1%).(Figure-1). When study subjects were asked about their choice of antibiotic for a adult patient with periodontal infection, majority(59.4%) chose metronidazole, followed by doxycycline(40.6%)

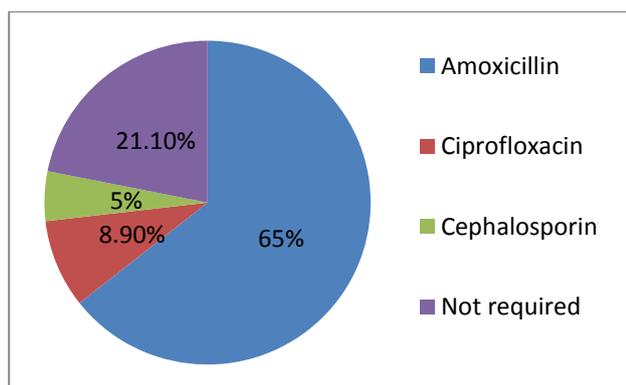


Figure 1 Distribution of study participants based on prescription of antibiotics for an adult patient with no medical history and periapical infection

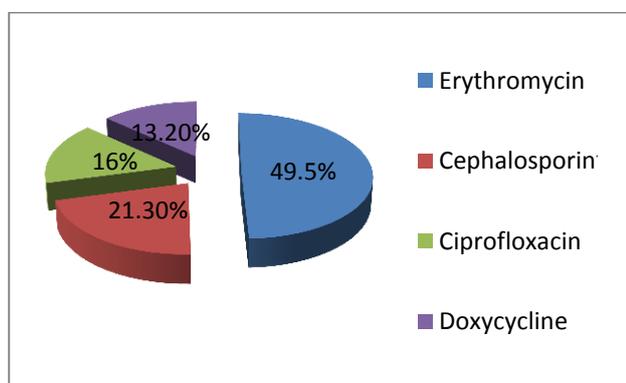


Figure 2. Distribution of study participants based on prescription of antibiotics for an adult patient with allergy to Penicillin.

Regarding the antibiotic of choice prescribed for dry socket 54% of them answered that they would prescribe

amoxicillin whereas 46% of them responded that there is no need of antibiotic prescription for dry socket and regarding the antibiotic of choice prescribed for an adult patient with allergy to Penicillin majority of them prescribed Erythromycin (49.5%) followed by Cephalosporin (21.3%) ciprofloxacin (16%) and doxycycline (13.2%). (Figure-2)

DISCUSSION

This study investigated the trends in antibiotic prescription among dentists working in various dental colleges of Bangalore city, India. A total of 202 Dentists working in various Dental colleges participated in the study with a response rate of 82.4% which was acceptable. Among the study participants 56% of them had a private practice.

Drug utilization studies provide information about the pattern and quality of use, the determinants of drug use and the outcomes of use. The main aim is to facilitate the rational use of medicines in populations. Antimicrobials play the role of being adjuncts in the management of orofacial infections. Although they are not a substitute for definitive treatment, their judicious use can shorten infection periods and minimize associated risks, such as the spread of infection to adjacent anatomical spaces or systemic involvement. There is much confusion about the prescription of antimicrobials in the past few decades especially with the advent of higher generation antibiotics.¹⁵ WHO recommends that the average number of drugs per prescription should be less than two.²²

Dental Prescriptions account for approximately 7-11% of all antibiotic prescriptions in the world. Although, the percentage is less when compared to medical practitioners, antibiotics are one among frequently prescribed drugs which significantly contributes to national and or global patient consumption of antibiotics.

Continuing Dental Education program (CDE) offers an important resource for dental healthcare professionals, looking to refresh or upgrade their clinical skills and knowledge, attending these dental education programmes helps in updating the knowledge on the use and misuse of antibiotics which in turn will have effect on the prescribing practices. The proportion of the participants who have attended Continued Dental Education program on antibiotics was 36% which was more than that in a study conducted by salako et al¹⁷ (18%). In the present study, participants had a good opportunity to attend CDE programs on antibiotic prescription, but lacked the motivation to do so. It was also found that the CDE programmes conducted during last years were not antibiotics oriented.

A fairly large number of dental practionners believe in prescription of empirical antibiotics to minimize the symptoms and on being enquired, the study subjects stated that they would prescribe antibiotics for elevated temperature with systemic spread (87.1%) and gross diffused swelling (84.7%) though this condition doesn't

require antibiotic coverage. Drainage of the abscess with extraction of the offending tooth would be sufficient but however depending on the patients' health and systemic conditions one would decide prescription of antibiotics similar results were obtained by Salako et al¹⁷(89.3%).

Dysphagia and difficulty in mouth opening are the signs that are generally seen in facial cellulitis and therefore necessitates suitable antibiotic therapy on empirical basis²⁶ however 36% of our study participants would prescribe antibiotics for restricted mouth opening and 44% of them would prescribe antibiotics for difficulty in swallowing. Similar results were obtained by Salako et al,²¹(36%) and (59%) respectively.

It is of interest and equally gratifying to note that majority of our study participants would not prescribe antibiotics for unscientific reasons like patients expectation of an antibiotic prescription(8.4%), similar results were obtained by Salako et al¹⁷ (4.2%), and a contradicting study conducted by Sameer.E et al¹⁶ revealed 28% of the specialists prescribing antibiotic for convenience of the patient.

On the other hand only 5% of our study population would prescribe antibiotic for their own convenience and 9.9% would prescribe by seeing patient's social background which is similar to results obtained by Salako et al¹⁷ (7.7%) and (14.3%) respectively.

About 50% of our study participants prescribed antibiotics to delay the start of specific treatment which is usually not required unless there is a presence of systemic condition which would delay the start of treatment.

Despite of abundant literature suggesting that antibiotics are not required to prevent post-operative complications and antibiotics might not be useful as a substitute for good surgical and aseptic operative techniques surprisingly about 78% of the study participants would prescribe antibiotics to prevent post-operative complications. Similar results were obtained by S R Goud et al¹⁸(76%). Strikingly 84% of the study population would prescribe antibiotic for the above condition in the study conducted by Salako et al¹⁷. This shows a slight overuse of antibiotic among our study participants.

Antibiotics are not indicated for acute pulpitis however 43% of our study participants would prescribe antibiotics for acute pulpitis contrary to study conducted by Mohammed Reza et al¹⁴(80%).

More than 70% of the study participants would prescribe antibiotics for pericoronitis and impaction which reveals a slight overuse of antibiotics in these conditions as pericoronitis is an inflammatory condition and analgesic would be sufficient to reduce the pain whereas surgical extractions done in an aseptic condition would not require an antibiotic. Similar findings were found in the study conducted by SR Goud et al¹⁸ (77%).

Out of the endodontic conditions necessitating antibiotic therapy 83% of the study participants prescribe

antibiotics for necrotic pulp with acute apical periodontitis swelling present moderate pre-operative symptoms similar results were obtained by Pavan kumar et al¹³(92.1%), Yingling et al¹⁹, Rodriguez et al²⁰ (87-92%). However endodontic conditions like irreversible pulpitis, irreversible pulpitis with acute apical periodontitis could be managed by intervention methods such as root canal therapy. Approximately 46% & 58% of the study participants prescribed antibiotics for these conditions respectively this finding is slightly lesser than that obtained in study done by Pavakumar et al¹³(60&65%). For other endodontic conditions like necrotic pulp with acute apical periodontitis without swelling, 52% of the study participants would prescribe antibiotics this finding is comparable with the studies by Rodriguez- et al²⁰ (52.9%) and Yingling et al¹⁹ (53.9%). For necrotic pulp with chronic apical periodontitis no swelling moderate/severe symptoms 43% of study participants would prescribe antibiotics these findings were similar Pavankumar et al¹³. Overall antibiotic prescription for endodontic conditions were high among the study participants.

Amoxicillin remained the standard choice of 65% of the study participants for a patient with no medical history and periapical infection this finding was similar in studies conducted by Salako et al²⁰ (87%), SR Goud et al²¹(50%), Ajith kumar et al¹⁵. The rationale for the choice of amoxicillin could have been its wide spectrum with low incidence of resistance pharmacokinetic profile tolerance and dosage.²³ Pavan kumar et al¹³(30%) reported a combination of metronidazole and amoxicillin as the most frequently prescribed drug, however, this is because of wide spectrum of action of amoxicillin with minimum adverse effects.

When choice of antibiotic in patients who are allergic to penicillin was asked majority (49.5%) of them would prescribe erythromycin followed by cephalosporin's (21.3%), ciprofloxacin (16%) and doxycycline (13.2%). Similar results were obtained by K Pavan kumar et al.¹³ where, 54.6% of them prescribed erythromycin as an alternative choice to penicillin. This may be due to a similar spectrum of activity of erythromycin with less adverse effects.

When their study participants were asked for their choice of antibiotic prescribed in periodontal infection, 59.4% of our study participants would prescribe metronidazole and 40.6% of them would prescribe doxycycline. This shows that two drugs are equally effective in periodontal infections. Metronidazole, a 5- nitroimidazole compound specifically targets anaerobic microorganisms cytotoxic metabolites of metronidazole directly interact with the bacterial DNA and possibly other macromolecules, resulting in cell death²⁴

Similarly, dry socket which does not require antimicrobial therapy, received affirmative signals from

more than half of the respondents 54% of the respondents would prescribe amoxicillin for dry socket followed by 46% of the stating that no antibiotic is required for this

condition. Surprisingly similar daunting trends were also reported in approximately half or more of the dentists from UK, Kuwait, Turkey, and Iran.¹⁶

The American Academy of Pediatric Dentistry (AAPD) recognizes that numerous medical conditions predispose patients to bacteremia-induced infections. Because it is not possible to predict when a susceptible patient will develop an infection, prophylactic antibiotics are recommended when these patients undergo procedures that are at risk for producing bacteremia. This guideline is intended to help practitioners make decisions regarding antibiotic prophylaxis for dental patients at risk.

In this regard we also investigated the use of prophylactic antibiotics in medically compromised cases such as Type I IDDM, Type II IDDM, hypertension, infective endocarditis, heart valve prosthesis, myocardial infarction, kidney transplant and liver failure. A large proportion of the participants prescribed antibiotics to perform tooth removal and root canal treatment for these patients. This may be due to the immune compromised status of the patients pertaining to underlying systemic conditions. However Dentists must be careful in prescribing antibiotics for liver and kidney failure patients as most of the drugs metabolize in these organs appropriate consent should be taken from the physician while prescribing antibiotics for these patients

Antibiotic prescription is a complex multifactorial issue. Dentist should consider all the factors before prescribing an antibiotic. Overall, antibiotic prescribing patterns among our study participants were quite high with certain misuse of antibiotics for few conditions

Creating awareness among dentists is of utmost importance and educational initiatives to promote rational use of antibiotics in dentistry can be organised at the local, national and at international level.

CONCLUSION

- The present study was a descriptive, cross sectional questionnaire survey.
- The present study targeted the entire population of dental surgeons among various dental colleges in Bangalore city, thus the study outcomes reflect current trends in the prescription of antibiotics among the study population.
- A total of 202 dentists working in various dental colleges of Bangalore City participated in the study.
- Out of 202 participants who participated in the study 107 (53%) were females and 95 (47%) were males. 177 (87.7%) were MDS and 25 (12.3%) were BDS.
- Overall antibiotic prescribing practices were high among the study participants. Amoxicillin remains the standard choice (65%)
- Majority of the study participants would prescribe prophylactic antibiotics for medically compromised patients

- Certain overuse of antibiotics was found among study participants for clinical conditions like dry socket (54.9%) and for certain non-clinical criteria.

RECOMMENDATIONS

- Appropriate guidelines for antibiotic use and misuse should be stipulated to combat drug resistance.
- Regular Continuing Dental Education programmes should be conducted to update the use of antibiotics and on newer generations of anti microbials.
- Bring about strict rules regarding for preventing the availability of antibiotics not to make antibiotics available/issued without an authentic prescription.

LIMITATIONS

Major limitation of our study was that we considered only the dentists working in various dental colleges of Bangalore city and could not consider the private practitioners in Bangalore city.

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