ORIGINAL RESEARCH PAPER

Endodontics

KEY WORDS: Antibiotic Prescriptions, Antibiotics, Antibiotic Resistance, Endodontic infections, Loading dose.

PATTERN OF ANTIBIOTIC PRESCRIPTION BY INDIAN DENTAL PRACTITIONERS IN MANAGEMENT OF ENDODONTIC INFECTIONS: (A SURVEY)

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ABSTRACT

Introduction: Infections of Endodontic origin are poly-microbial involving a variety of microbes, therefore Antibiotics & Analgesics, are being prescribed by Dental practitioner's which has led to development of Antimicrobial resistance against a wide range of bacterial species, particularly those involved in infections of Endodontic origin. Studies in the past have shown antibiotics prescribing habits of dentists with the results depicting that over prescription can occurs.

Aim: The purpose of this study was to identify the pattern of antibiotic prescription by Indian dental practitioners in management of endodontic infections: (A Survey).

Material and Methods: A double sided questionnaire was made in Google document and the link generated and was sent to Indian dental practitioners via social networking sites (facebook, whatsapp etc. The practitioners included those working as private practitioners and those in dental colleges including Post graduate students and faculty.

Results: The overall response rate was 76.40%. Amoxicillin with Clavulanic acid was the drug of choice with 69.5% clinicians prescribing it to adult patients without drug allergy. The maximum duration for the prescription recorded was one month and the least was 2 days. Loading dose was given by only 21.1% of the total respondents. The maximum respondents (83%) prescribed antibiotics in condition with necrotic pulp with apical periodontitis; swelling present, moderate/severe pre-op symptoms. Avulsion was the condition in which maximum respondents prescribed antibiotics. In the situation in which the condition did not improved after 2-3 days, adding a second antibiotic was the treatment of choice by 87.7% respondents.

Conclusion: It can be concluded that Antibiotics are not the first line of treatment especially for Endodontic infections as majority of the endodontic infections are cured merely by the removal of the aetiology therefore Antibiotics should be used judiciously.

INTRODUCTION

Endodontic infections are poly-microbial, the causative agents includes various gram negative, gram positive, facultative/strict anaerobic bacteria, fungi and other microbes[1]. When the tooth remains infected over the period of time, necrosis of the pulp occurs and it loses its blood supply therefore it becomes a reservoir of infection, harbouring bacteria and other microbes as it isolated from the patient's immune response. Eventually bacteria and bacterial by-products will produce a peri-radicular inflammatory response and with the invasion of the microbes in the peri-radicular area infection will establish in the form of an abscess and cellulitis may also develop. This infection will spread and the inflammatory response will continue until and unless the source of the irritation is removed. Identifying the aetiology and its removal can lead to elimination of the sign and symptoms of the infectious disease and patient can return back to normal. But even then the antibiotics are the part of the dental practitioner's prescription regimen which is largely uncalled for and inappropriate. The situation is alarming as the dental professional contributes to 10 % of the total antibiotics prescriptions in the world even though most of which are unnecessary and not indicated[2]. The use of antibiotics has largely been restricted to some specific conditions therefore majority of the antibiotics prescription by the dentists are just a precautionary measure and not a necessity[3-10]. India is one of the Asian countries with the highest antibiotics consumption rate (Fig-1)[11].

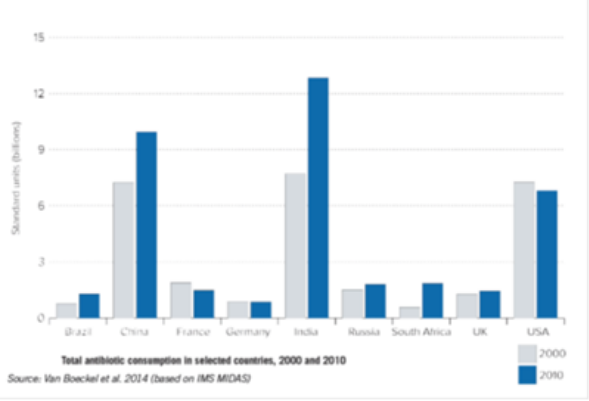
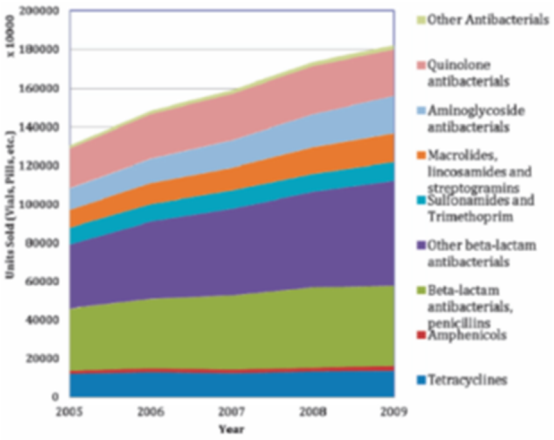


Fig 1 Total antibiotic consumption in selected countries 2000 and 2010.

Antibiotics of various groups sold in India (Fig 2)[12].

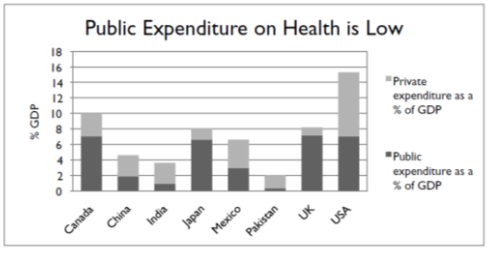


(Fig-2) Units of Antibiotics sold in India, by type.

the reason for the prescription is usually due to lack of knowledge (i.e Not knowing the standard protocols, indications and the contraindications), patients demand and unhygienic practice (improper sterilization of the working instruments and the working area) in most part of the country (Fig-3)[13].

(Fig-3) Prescribing determinants of Antibiotics

The biggest challenge that the developing nation like India is going to face in the future is the antibiotic resistance because the infectious disease burden is high and the expenditure of healthcare is low (Fig-4)[14].



(Fig-4) Public/Private spending's on healthcare in India and other countries.

The deadly loop of resistance to antibiotics is already at high level in certain parts of the world including Indian. But the problem has remained largely unnoticed as very few studies have been published and nationwide surveillance has not carried out. In India it was detected when New Delhi Metallo β-lactamase-1 (NDM-1), was reported in 2009[15].

Therefore in view of the rapidly developing condition of antibiotic resistance in India due to inappropriate and unwanted prescription patterns, a survey was designed to identify pattern of antibiotic prescription by Indian dental practitioners in management of endodontic infections.

METHODOLOGY

A one page double sided questionnaire was sent to active Indian Dental Practitioners. A form was made on the Google drive and the link was sent on Gmail, Facebook and WhatsApp to Indian Dental Practitioners ranging from Dental graduates and Masters with different specialities having variable experience in clinical practise.

Questionnaire: **ANTIBIOTIC SURVEY**

Gender Male ☐ **Female** ☐

Years in practice _____

Age 25-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐

Academic qualification BDS ☐ MDS ☐ **Speciality** _____

1. Which antibiotic do you prescribe most often for an adult patient with no medical allergies?

- Amoxicillin
- Amoxicillin +Clavulanic acid
- Cephalosporin (Cefadroxil, Cephalexin, Cefaclor)
- Clindamycin
- Azithromycin
- Metronidazole
- Ciprofloxacin
- Ofloxacin
- Ofloxacin +Ornidazole

2. For how many days do you prescribe antibiotics? _____

3. Do you sometimes use a loading dose when prescribing antibiotics? Y ☐ **N** ☐

4. In which of the following situations would you prescribe antibiotics?Check all that apply.

-Irreversible pulpitis ,moderate/severe pre-op symptoms ☐

-Irreversible pulpitis with acute apical periodontitis moderate/severe pre-op symptoms ☐

-Necrotic pulp with acute apical periodontitisno swelling,moderate/severe pre-op symptoms ☐

-Necrotic pulp with chronic apical periodontitis;sinus tract present, no/mild pre-op symptoms ☐

-Necrotic pulp with acute apical periodontitis;swelling present ,moderate/severe pre-op symptoms ☐

5.In which of the following situations do you routinely prescribe antibiotics? Check all that apply.

-Avulsions ☐

-Incision and drainage(I&D) of a localized intraoral swelling, no extraoral swelling ☐

-I &D of a diffuse intraoral swelling, no extraoral swelling ☐

-I & D of diffuse intraoral swelling, extraoral swelling present ☐

-Post- op pain after instrumentation or obturation ☐

-Retreatments ☐

-Retreatments ☐

-Perforations ☐

-Endodontic surgeries ☐

6.What is treatment strategy for cases in which improvement is not seen after 2-3 days with first choice antibiotic therapy?

Change antibiotics

Add a second antibiotic

other _____

Comments

Thanks for your collaboration

RESULTS

Of the 1780 surveys mailed, around 1360 responded, (the overall response rate was 76.40%) out of which 50 were excluded due to improperly completed or partially completed surveys. The Gender, Age and Qualification distribution was recorded for the respondents (Table 1, Table 2 and Table 3).

(Table-1) Gender

Gender	No of respondents	Percentage of respondents
Male	792	(60.5%)
Female	518	(39.5%)

(Table-2) Age

Age(years)	Percentage of respondents
25-35	59.2%
36-45	33.1%
46-55	7.3%
56-65	0.5%

(Table-3) Academic qualification

Academic qualification	Percentage of respondents
BDS	(43%)
MDS	(57%)

Note that in some instances the percentages may not add up to 100%, because some questions allowed multiple responses and the sample size (n) for each question may be different due to improperly completed or partially completed surveys.

The results showed that Amoxicillin with Clavulanic acid was the drug of choice with 69.5% clinicians prescribing it to adult patients without drug allergy and least prescriptions were of ciprofloxacin and ofloxacin with 38.1% prescriptions (Table 4).

(Table-4) For how many days you prescribe Antibiotics

Antibiotics	Percentage of respondents
Amoxicillin	(66%)
Amoxicillin +Clavulanic acid	(69.5%)
Cephalosporin (Cefadroxil, Cephalexin, Cefaclor)	(38.9%)
Clindamycin	(41.2%)
Azithromycin	(39.1%)
Metronidazole	(65%)
Ciprofloxacin	(38.1%)
Ofloxacin	(38.1%)
Ofloxacin +Ornidazole	(41.8%)

The maximum duration for the prescription recorded was one month and the least was 2 days. Loading dose was given by only 21.1% of the total respondents while 78.9% did not use the loading dose (Table 5).

(Table-5) Do you sometimes use a loading dose when prescribing antibiotics?

Yes	273	(21.1%)
No	1023	(78.9%)

The maximum respondents (83%) prescribed antibiotics in condition with necrotic pulp with apical periodontitis; swelling present, moderate/severe pre-op symptoms and the least (63.7%) prescribed antibiotic in condition with necrotic pulp with chronic apical periodontitis, no swelling, no/mild pre-op symptoms. Avulsion was the condition in which maximum respondents prescribed antibiotics and least prescribing condition was retreatment with 55.3% respondents (Table 6 and Table 7).

(Table-6) In which of the following situations would you prescribe antibiotics, check all that apply?

Questions	Percentage of respondents
Irreversible pulpitis ,moderate/ Severe pre-op symptoms	(65.7%)
Irreversible pulpitis with acute apical periodontitis moderate/ severe pre-op symptoms	(70.8%)
Necrotic pulp with chronic Apical periodontitis; no swelling, no/mild pre-op symptoms	(63.7%)
Necrotic pulp with acute apical periodontitis no swelling, moderate /severe pre-op symptoms	(67.9%)
Necrotic pulp with chronic apical periodontitis, sinus tract present / no or mild pre-operative symptoms	(73.6%)
Necrotic pulp with acute apicalperiodontitis; swelling present , moderate /severe pre-op symptoms	(83%)

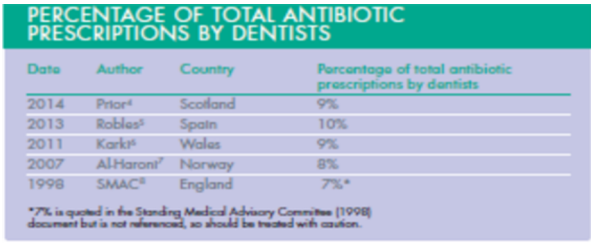
(Table-7) In which of the following situations do you routinely prescribe antibiotics? Check all that apply?

Question	Percentage of respondents
Avulsions	(81.5%)
Incision and drainage(I&D) of a localized intraoral swelling,no extraoral swelling present	(67.7%)
I &D of a diffuse intraoralswelling, no extraoral swelling present	(59.6%)
I & D of diffuse intraoral swelling, extraoral swelling present	(71.6%)
Post- op pain after instrumentation or obturation	(58.1%)
Retreatments	(55.3%)
Perforations	(57.5%)
Endodontic surgeries	(70.9%)

In the situation in which the condition did not improved after 2-3 days, adding a second antibiotic was the treatment of choice by 87.7% respondents followed by changing the antibiotics by 59.5% respondents. So the overall results are suggestive of the large number of antibiotic prescription being done in conditions in which they are not even indicated. Therefore this is needed to be checked to prevent the development of antibiotic resistance.

DISCUSSION

A revolution came into the field of healthcare ever since the discovery of Antibiotic by Sir Alexander Fleming in 1928, as many untreatable infectious diseases are now curable by the use of these Wonder Drugs called the Antibiotics also known as the Super Bug or the Miracle drugs/ Magic Bullets. The prescription pattern of these drugs has increased multiple folds in the developing countries (Fig-5)[16].



(Fig-5) Percentage of total Antibiotics prescriptions by Dentists.

Within a span of four years (2005- 2009) the units of antibiotics sold increased by about 40% (Fig-6)[17].

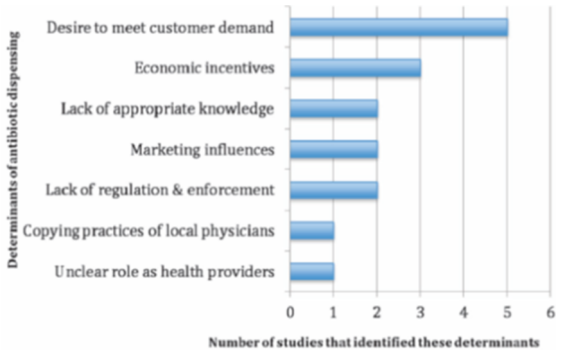
Year	2005	2006	2007	2008	2009
Antibiotic purchases in crore rupees (INR)	3,763	4,484	5,075	5,886	6,414

Notes: One crore equals 100 lakhs, equals 10 million

Source: Personal communication of IMS Health Information and Consulting Services-India data from Burzin Bharuch (Pfizer) to Ramanan Laxminarayan on July 30, 2009.

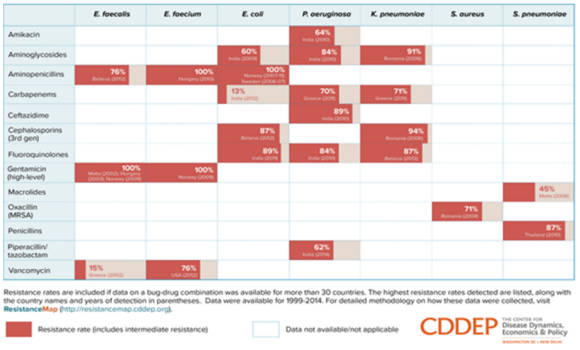
(Fig-6) Outpatient antibiotic purchase from retail outlet in India

The overuse persistence can be due to the following reasons. (1) Lack of microbiology facilities nearby or the patients unwillingness to undergo tests. (2) Doctors prescribing antibiotics to any patient with fever, assuming it as a sign of bacterial infection (3) Patient's expectations (4) Incentives from pharmacist by drug sales (5) Public lack of knowledge (Fig-7)[17].



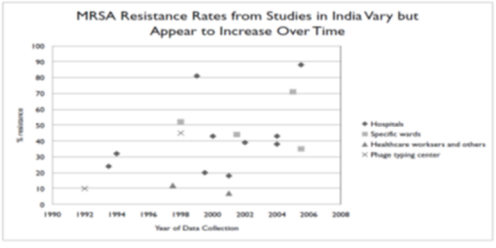
(Fig-7) Dispensing determinants of Antibiotics.

The immune system of the patients is responsible for providing the cure; antibiotic acts only as an adjunct. Antibiotic can only function when the patient's immune system is viable otherwise they will fail to provide the desired effect. Over Antibiotic resistance is already at high level in certain parts of India (Fig-8)[18].



(Fig-8) Where and when have the highest Antibiotic resistance rates been detected.

NDM-1 is an enzyme produced by the gene bla NDM-1, was first detected in a Swedish patient who had undergone surgery in a New Delhi hospital19. The gene was carried out on plasmid and could be transferred between different bacterial species in this case between Klebsiella pneumonia and Escherichia coli and most importantly conferred broad spectrum resistance to most antibiotics including Carbapenems (Fig-9)[20].



Source: Data from all studies described in the section on MRSA in India, excluding those that did not specify when data was collected.

(Fig-9) MRSA resistance rates in India.

Antibiotics resistance against fluoroquinolones which are relatively newer antibiotic is also see to be on a rise in India[21]. Bacteria can enter the root canal system via various routes like exposed pulp or dentinal tubules or cracks in the enamel, it may also alternatively gain access through the avenues like leaking restorations and apical ramifications, lateral or furcation canals. Bacteria can cause inflammation and/ or infection in the root canal system leading to conditions such as pulpitis, apical periodontitis, draining sinus tract or localized swelling which can resolved by means of RCT (Root canal Treatment) without antibiotics. The antibiotics are carried by the vascular system but in cases of necrosis the circulation within the pulp is compromised due to the presence of inflammation or infection therefore its ability to reach bacterial site in therapeutic concentrations will be reduced. Success of healing depends on thorough debridement via chemo-mechanical preparation i.e. by use of reamers, files for biomechanical preparation and using irrigation solutions and medicament for chemical disinfections of the root canal space followed by, three dimensional obturation of the prepared space and placing the final restorations. Often the infectious process moves beyond the tooth apices and penetrates the bone and the soft tissue creating an intraoral swelling, which can be drained through the tooth by access opening, soft tissue incision or through a sinus tract. Until and unless the purulence is eliminated the immune system cannot function optimally even if the antibiotics are used. Drainage promotes healing, relieves pressure, improves circulation and eliminates bacteria. To justify the need for antibiotics, an infection must either be persistent or systemic[22]. Antibiotic treatment is not indicated in those cases in which pain alone or localized swelling is present. Majority of the dental pain can be managed by using NSAIDs, still antibiotics are being prescribed by large number of dentist in those conditions in which it is not even indicated (Fig-10)[16].

Date	Author	Country	Antibiotics prescribed for irreversible pulpitis or acute apical periodontitis (%)
2014	Garg[21]	India	72%
2012	Goud[22]	India	40%
2010	Segura-Egea[23]	Spain	86%
2009	Mainjol[24]	Belgium	63%
2000	Palmer[25]	UK	13%

(Fig-10) Percentage of Antibiotics prescribed for irreversible pulpitis or acute apical periodontics.

The Questionnaire in our study was based on previous surveys developed in Spain. The overall response rate of 76.40% can be considered to be acceptable for the success of return for survey. The average length of antibiotic prescription in this study was 7± 1days, which is in accordance with the results reported previously by Rodriguez- Nunez et al[23].

Antibiotic therapy is indicated if an endodontic infection is persistent or systemic and is associated with conditions like fever, swelling, lymphadenopathy, trismus or malaise. Endodontic infections typically have a rapid onset and short durations, 2-7 days or less, particularly if the etiology is treated or eliminated. For most endodontic infections, a 6-7 days course is usually sufficient. The drug dosage should be terminated when there is sufficient evidence that the infection is resolving and the host immune system has taken control of the infectious process, but inappropriate antibiotic prescribing practises were reported by respondent dentist in the study, thus the percentage of the respondent who routinely prescribe antibiotics in the Endodontic infections for more than 7 days should reassess their prescribing habits.

CONCLUSION

Within the conditions of the study it can be concluded that the Antibiotics are not the first line of treatment especially for the Endodontic infections as majority of the endodontic infections are cured merely by the removal of the aetiology which is usually the dental caries and periodontal infections. Antibiotics should be used judiciously and its overuse should be checked at every level by every means at both ends that is at the patients end by means of dental educations and doing ethical practise at the dentists end.
The policy makers should also take into consideration the gravity of this serious problem which can cause life of our beloved merely

because of negligence, so we need to act urgently before we reach a point of no return. Over the counter sale of Antibiotics should be banned from immediate effect atleast to slow down this deadly loop of antibiotic resistance. Educating the practitioners (Dental and Medical) for better use of the drug, as it is seen that practitioners who are doing more patients are using more antibiotics in their routine practise then those who had less work load.

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