# Antibiotic dosages and abuse in dentistry

# Aditi Sharma<sup>1</sup>, Akshat Sachdeva<sup>2</sup>, Sumit Bhateja<sup>3,\*</sup>, Geetika Arora<sup>4</sup>

<sup>1,2</sup>Dental Surgeon, <sup>3,4</sup>Reader, <sup>3</sup>Dept. of Oral Medicine and Radiology, <sup>4</sup>Dept. of Public Health Dentistry, <sup>1,2,3</sup>Manav Rachna Dental College, Faridabad, Haryana, <sup>4</sup>Indraprastha Dental College, Ghaziabad, Uttar Pradesh, India

#### \*Corresponding Author: Email: bhateja.sumit@gmail.com

## Abstract

Dental health care professionals prescribe antimicrobial agents for conditions both therapeutically and prophylactically. These antimicrobials are given prophylactically before dental procedures, during treatments, after treatment or as the only form of treatment. Many patients going through the hardship of dental pain visit the dentist only to get a prescription for the same which is very often inclusive of an antimicrobial agent without getting any treatment done. In developing countries like India, where law regarding the prescription of antimicrobials is not very strong or is not strongly implemented, people just visit a neighborhood pharmaceutical store to purchase medicines over the counter for dental pain, which again includes antimicrobial agents. This cycle is repeated numerous times before the person finally decides to get definitive dental treatment done. The present article focuses on Antibiotic usages & abuses in dental practice.

Keywords: Antibiotic, Dentistry, Abuse.

#### Introduction

The Word "Antibiotic" ineluctably pops in our minds whenever an infection has to be dealt with. Dentists recommend medications for management of many oral conditions mainly orofacial infections. But this certitude cannot be regretted that there is a worldwide abuse of antibiotics in medical as well as dental profession.

Dentists commonly prescribe antibiotics for not only treating but also controlling dental infections. But there is a widespread abuse of antimicrobials in medical and dental profession. The indecorous use of antibiotics results in increased financial expenses, increased menace of adverse events related to the antibiotic used and most significantly development of antimicrobial resistance.

The abuse of antibiotics does not necessarily mean that they may be unnecessary, but side effects may be more fatal than the original concern. This is especially true regarding the field of dentistry, where infections are rarely serious. Despite these problems associated with antibiotic use, antibiotics are used as an essential weapon against infection; hence use of antibiotics requires the clinician to take the stance that positive indication must be present before antibiotic drugs are prescribed. The clinician should not assume that antibiotics must be given in all instances of infection.<sup>1</sup>

## **Classification of anti – microbial drugs**

Although there are many systems for classification, the most useful is based on chemical structure. Antibiotics within a structural class will generally have similar patterns of effectiveness, toxicity, and allergic potential.

The chief classes of antibiotics are:<sup>2</sup>

- 1. Beta-Lactams
- 2. Penicillins
- 3. Cephalosporins
- 4. Macrolides
- 5. Fluoroquinolones
- 6. Tetracyclines
- 7. Aminoglycosides

Most commonly used antibiotics are: Aminoglycosides, Penicillins, Fluoroquinolones, Cephalosporins, macrolides, and Tetracyclines. While each class consists of multiple drugs, each drug is peculiar in its own way.

#### Principles of drug usage

In a short span of time, antimicrobial governance has been given lot of influence not only at the patient but also at the community level. Antimicrobial governance is defined as "the optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance." Joseph and Rodvold<sup>3</sup> stated the 4 D's of antimicrobial therapy which are correct Drug, correct Dose, De-escalation to pathogen associated therapy and right Duration of therapy. An important consideration in commencing antimicrobial therapy is the evaluation of the infection and if the patient has a sufficient immune response to control the pathogenic bacteria. In cases of purulence, signs of inflammation, abscess or draining sinus tracts, the lesion/infection respond to local debridement measures in a healthy patient. In an otherwise healthy patient, infections that have not passed over the dento alveolar regions are liable to treatment without anti microbial remedy.4

# Antibiotics useful in dental practice<sup>5</sup>

Antibiotics Used	Nature	Dosages	Side Effects
Amoxicillin	Bactericidal	500 mg/8 hours	Diarrhea, nausea,
		1000 mg/12 hours	hypersensitivity
			reactions
Cephalosporins	Bactericidal	250 – 500 mg/8 hours	Black tarry stools,
			chills, cough, pyrexia.
Amoxicillin+	Bactericidal	500-875 mg/8 hours;	Diarrhea, candidiasis,
Clavulanate		oral route	nausea,
		2000 mg/12 hours;	hypersensitivity
		oral route	reactions
		1000-2000mg/8 hours;	
		intravenous route	
Metronidazole	Bactericidal	500 – 750 mg/8 hours	Seizures, paresthesia
			of limbs, incompatible
			with alcohol ingestion
Tetracyclines	Bacteriostatic	500 mg/6 hours	increased sensitivity to
			sunlight, abdominal
			discomfort, loss of
			ravenousness
Clindamycin	Bacteriostatic	300 mg/8 hours; oral	Pseudomembranous
		route	colitis
		600  mg/8 hours;	
	D / 11/	intravenous route	
Gentamicin	Bactericidal/	240  mg/24  hours	Ototoxicity
(Aminoglycoside)	Bacteriostatic	500 /041	Nephrotoxicity
Azithromycin	Bacteriostatic	500  mg/24  hours	Diarrhea, loose stools,
	D	500 /101	irritation on skin
Ciprofloxacin	Bactericidal	500  mg/12  hours	Pyelonephritis,
D	D (	1.0.0.4 m <sup>2</sup> 11 <sup>2</sup> m H1/04	arthraigia, diarrnea
Penicillin	Bactericidal	1.2 - 2.4 million 10/24	Hypersensitivity
		nours; intramuscular	reactions, gastric
		Un to 24 million	anerations
		$U_{1/24}$ $U_{1/24}$ $U_{1/24}$	
		intravanous route	
		mu avenous route	

## **Antibiotic Abuse**

The evolution and widespread adoption of "antibiotics"—drugs that kill pathogenic bacteria and thereby diminish contamination—has helped millions of people live longer and healthier lives. But all this fiddling with nature has cost us a lot. The more we depend on antibiotics, the more bacterial resistance is being developed, which is now a days the biggest challenge to treat infections.

The last type of prescription is very common in developing countries where a big proportion of population cannot afford dental treatment in private dental setups and the government facilities for the same are limited and over – populated. Many patients going through the hardship of dental pain visit the dentist only to get a prescription for the same which is very often inclusive of an antimicrobial agent without getting any treatment done. In developing countries like India, where law regarding the prescription of antimicrobials is not very strong or is not strongly implemented, people just visit a neighborhood pharmaceutical store to purchase medicines over the counter for dental pain, which again includes antimicrobial agents. This cycle is repeated numerous times before the person finally decides to get definitive dental treatment done.<sup>6</sup> Given below are some risks that have been shown to be associated with overuse of antibiotics:<sup>7</sup>

- 1. Increase of antimicrobial resistance.
- 2. Increase of more potent diseases.
- 3. Increase of longevity of disease.
- 4. Increase in risk of complications.
- 5. Increase in mortality rate.
- 6. Increase in healthcare costs.
- 7. Increase of risk of adverse effects, some being lifethreatening.

Most commonly, antimicrobial abuse is observed amongst those patients who use prophylactic antimicrobials before dental procedures for the prevention of post-operative complications like dry socket or to prevent systemic complications.<sup>8</sup> Studies have elicited that the endodontic procedures involve the widespread prescription of inter appointment antimicrobials.<sup>9</sup>

It is not mandatory to prescribe antibiotics in all circumstances. Given below is a list of certain

conditions that we commonly face in our dental practice, with the treatment modalities and whether to prescribe antibiotics or not: $^{10,11}$ 

Condition	Treatment approach	Antibiotics needed
Uncomplicated endodontic	- Debridement of root canal	No
pathology		
Soft tissue inflammation of	- Debridement of root canal	No
endodontic origin	- Incision and drainage.	
Endodontic pathology confined to	-Trephination of bone to	No
the alveolar bone	alleviate pressure	
	and accelerate healing	
Periodontal abscess	- Scaling	No
	- Drainage of suppuration	
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		
Chronic periodontitis/ Gingivitis	Scaling and root planing	No
NUG without systemic	- Debridement	No
complications in	- Irrigation	
salubrious individuals	- Scaling and root planing	
NUG with systemic complications	-Debridement	Yes. Metronidazole is
or in	-irrigation	primary drug.
immunocompromised individual /	-Scaling and root planing	Penicillin group of drugs
niv	-Systemic Antibiotic	may be
Aggressive periodental diseases /	Debridgment	May be required in early
Refractory	- Debridement	cases of
neriodontal conditions	- Scaling and 100t plaining	generalized aggressive
periodolital conditions		periodontitis
Localized abscess	- Incision and Drainage	No
	- Removal of source of	110
	infection	
Facial space infections	- Incision and drainage	Yes
L	- Removal of pivot of	
	infection	
Complicated endodontic/	- Removal of source of	Yes
periodontic	infection	100
pathology with signs of systemic	- Incision and drainage	
spread of		
infection /involvement of facial		
spaces		
Systemically compromised	Removal of source of	Yes (use of bactericidal
individuals with	infection	drugs
immune defects		recommended)
Before uncomplicated/	-	No
complicated		
Extractions		
Before to perio/endo surgeries	-	No
Before Regenerative periodontal	-	May Be
therapy		
With membranes / grafting		Vac (use of heateriaidal
before implant surgery	-	r es (use of dactericidal
		recommended)

## **Future Steps**

Reducing inappropriate antibiotic use is only one part of the solution. The antibiotics we have must be conserved while we explore new rapid diagnostics and unorthodox antimicrobials. Effective hygiene and infection control must also be given equal priority. Both human and animal health sectors should be worked upon and taken into consideration so that the human health is bridged to the health of animals and the environment. This includes working with all health professionals, their concerned agencies, and their enforcement arms. This is known as the 'One Health' approach and it is the core master plan on antimicrobial resistance.<sup>12</sup>

What measures can we as dentists take to prescribe antibiotics efficiently? Our aim should be to promote a rational use of antibiotics and not only to lessen the amount of antibiotics while prescribing them to the patient. Educational campaigns have been regulated in many countries with the goal to transfigure healthcare professional as well as patient behavior in antibiotic consumption. Interventions include the dissemination of specifications, educational gatherings on appropriate prescribing of antibiotics, concourse on the diagnosis, prevention and management of infectious diseases, review of prescribing data for practices, local interviews by pharmacists, memorandums conveyed through television, radio and other means of mass media.<sup>7</sup>

We must find ingenious ways to reduce antimicrobial abuse. We being the future healthcare professionals should take a pledge to implement ethical practice and prescribe antibiotics in conditions when really necessary, and we should encourage patients to self-manage minor infections and deplete reliance on antimicrobials. As a society we need to acknowledge that antibiotics are rudimentary to how we practice modern medicine. We must value them as per the need.

## Conclusion

Most odontogenic contagions are manageable by elimination of the primary cause of infection. Felicitous antibiotic organization and rational prescription of antibiotics by dentists is the need of the hour in view of the epidemic concern of antimicrobial resistance. The basic foundation to fight against antibiotic abuse is "education" which should be imparted not only during the training phase but also while practicing in dental setups.

## References

- 1. Pharmacology by K.D. Tripati 5th edition.
- http://www.emedexpert.com/classes/antibiotics.shtml#3
  Joseph J, Rodvold KA. The role of carbapenems in the
- treatment of severe nosocomial respiratory tract infections. Expert Opin. Pharmacother. 2008; 9:561–75.
- Newman MG, Winkelhoff AJ van. Antibiotic and antimicrobial use in dental practice. Quintessence Pub Co.; 2001.

- Poveda-Roda R, Bagán JV, Sanchis-Bielsa JM, Carbonell-Pastor E. Antibiotic use in dental practice. A review. Med Oral Patol Oral Cir Bucal 2007;12:E186-92.
- 6. Cleveland JI, Kohn WC, Antimicrobial resistance and dental care: A CDC perspective. Dent Abstr. 1998;108–110.
- 7. http://journals.sagepub.com/doi/pdf/10.1177/204209861455 4919
- Dar-Odeh NS, Abu-Hammad OA, Al-Omiri MK, Khraisat AS, Shehabi AA. Antibiotic prescribing practices by dentists: A review. TherClin Risk Manag. 2010;6:301-6.
- Thomas DW, Satterthwarte J, Absi EG, et al. Antibiotic prescription for acute dental conditions in the primary care setting. British Dental Journal. 1996;181:401–4.
- Newman MG, Takei H, Klokkevold PR, Carranza FA. Carranza's Clinical Periodontology. Elsevier Health Sciences; 2011.
- Beliveau D, Magnusson I, Bidwell JA, Zapert EF, Aukhil I, Wallet SM, et al. Benefits of Early Systemic Antibiotics in Localized Aggressive Periodontitis. A Retrospective Study. J ClinPeriodontol 2012;39:1075–81.
- Department of Health UK five year antimicrobial resistance strategy 2013 to 2018. https://www.gov.uk/government/publications/uk-5-yearantimicrobial-resistance-strategy-2013-to-2018