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SELF AND PRESCRIBED ANTIBIOTIC MEDICATION – A REVIEW UPDATE ON ATTITUDE OF DENTAL PATIENTS AND DENTAL PRACTITIONERS

Dental Science

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ABSTRACT

Antimicrobial resistance is a major challenge in healthcare professions including dentistry. Study reports reveal that throat pain, running nose, tooth ache, and diarrhea are the common symptoms for which people frequently self-medicate. Dentists prescribe antibiotics for dental infections as a therapeutic approach but there is a significant variation among dental practitioners in prescribing antibiotics for different clinical conditions, frequency, dosage, and duration. Also, the availability of antibiotics without prescription is coated as a major reason for the antibiotic misuse in developing countries. The consumption of antibiotics in an inappropriate way leads to the generation of resistant microbes known as superbugs. Emergence of drug resistant infection is the consequential threat worldwide that increases the rate of death due to uncontrollable microbial infections. People living in developing countries, notably lower socio-economic groups are in a vulnerable state if they develop infectious diseases. The financial constraints forcefully put them in an out of the bound zone from prolonged hospitalization and get cured of resistant infections. Hence this superbug issue should be handled with priority and this article aims to report the literature evidence of antibiotic misuse in dental practice and the potential precautions to be considered for overcoming the problem.

KEYWORDS

Antibiotics, Infection, Resistance, Dentistry

INTRODUCTION

"Antibiotic resistance – one of the greatest threats to human health."
- World Health Organization, 2009

Antibiotics exploitation symbolizes the most preventable universal crisis in health care settings. Reports say that approximately six million deaths occur globally every year due to antibiotic-resistant bacterial infections and it is expectedly estimated ten million by 2050.[1] World health Organization (WHO) studies specific to different regions indicate that the antibiotic resistance bacteria (A property of some bacteria which makes some antibiotics ineffective against them when they are used to treat infection) are growing faster in the developing countries.[2] The value dedicated to prescribe drugs in the modern health care practice has been substantially reduced. Loading antibiotics represent a leading cause of preventable adverse events in hospital settings. Dentistry is one of the health care divisions accountable for substantial antibiotic abuse.[3] It is time to take a feasible and defensible approach to prescribe antibiotics which are crucial for the dental as well as medical practitioners. This review work highlights the antibiotic abuse in dentistry and the potential factors associated with it.

TRAINING IN DENTAL SCHOOLS

There is a uncertainty about prescribing antibiotics in Indian dental practice[4] and the reason is the nature of training provided in dental schools. Student dentists seldom receive any committed training about the medications they might most commonly use during independent practice.[5, 6] Following the pre-clinical pharmacology course, it is essential to introduce the applied aspect of pharmacokinetics and pharmacodynamics in pharmacotherapy during clinical training through active teaching-learning strategies.[7] Lacking the confidence to prescribe an individualized prescription by considering patients condition and needs, is universally prevalent among dental students.[5]

Guided Practice For Prescribing Antibiotics In Dental Practice

A national policy on prescribing pharmacotherapy for patients with dental infection need to be developed, documented, and implemented with immediate effort. Excluding medically compromised and immune suppressed dental patients,[8] [Table 1] antibiotics use should be strictly restricted to absolute requisite conditions like patients developing systemic signs and symptoms of infection,[9,10] rapid spreading infections like facial cellulitis, and resistant infections such as acute necrotizing ulcerative gingivitis (ANUG). In such essential circumstances, Amoxicillin 500mg every 8 hr should be considered as a first-line choice[11] and amoxicillin in conjunction with metronidazole in abscesses and cellulitis conditions.[11] But invariably these two drugs are prescribed for all odontogenic infections[12] that do not require medical management. Up to now, a total of 224 amoxicillin-resistant bacteria were isolated from oral cavity which is to be added with amoxicillin resistant microbes present in dental plaque.[9, 10] Hence we are in an hour to consider about antimicrobial resistant (AMR) threat as a professional priority. Inappropriate prescriptions and inadequate infection control in dental practice facilitate the generation of drug resistant bacteria (superbugs) to a significant level.[13]The misuse of antibiotics happens at three different levels.

Table 1: Conditions that require antibiotic prophylaxis for adult dental treatment

S.No	Condition	High risk group
1.	Infective endocarditis	Patients with a) Prosthetic cardiac valve and device b) Congenital cyanotic cardiac conditions c) Cardiac transplant d) Earlier episode of infective endocarditis e) Rheumatic heart disease
2.	Immune deficiency	Primary immunodeficiency a) Severe combined immune deficiency disease b) Common variable immunodeficiency c) X-linked agammaglobulinemia d) Complement defeciencies e) Wiskott-Aldrich syndrome f) DiGeorge syndrome g) Leukocyte adhesion defects h) Burton's disease I) Selective deficiency of IgA
		Secondary immunodeficiency a) Rheumatoid arthritis b) Lupus erythematosus c) Multiple sclerosis d) Crohn's disease (Inflammatory bowel disease) e) Psoriasis f) Malignancy g) HIV infection CD4T lymphocyte count < 200 h) Tuberculosis I) Neutropenia

		Immune suppressive therapy a) Corticosteroids b) Janus kinase inhibitors c) Calcineurin inhibitors d) IMDH inhibitors e) Monoclonal antibodies f) Biologics
3	Bone marrow transplant recipient	• Pretransplantation period • Preengraftment period (0-30 days after transplantation • Postengraftment period(30- 100 days after transplantation • Post transplantation period, > 100 days if patient is still on immunosuppressive medication
4	Orthopaedic conditions	Total joint replacement (within first two years)
5	Asplenic patients	
6	Solid organ transplantation	
7	Patients with intravascular assess device	Patients undergoing • Chemotherapy –Broviac (or) Hickman lines • Hemodialysis and plasmaphoresis – Uldall catheters

Responsibilities of Dental practitioners

For the successful treatment of odontogenic infections, elimination of the cause is the appropriate method. But invariably following many dental procedures other than conservative restorations, oral prophylaxis, and orthodontic management, dentists prescribe antibiotics[14] for unjustified reasons except providing placebo protection for patients through their belief on antibiotics for well-being[15] or simply to protect themselves from the prejudice that patients may develop postoperative infections. Many dental practitioners also resist carrying out their procedures including simple extractions and scaling when their patients are on prophylactic antiplatelet drugs (Aspirin 75 mg/day) for diabetes and hypertension. They follow the rule of stopping the antiplatelet drug for five days before dental extraction and add antibiotics along with analgesics in the mean period. In endodontic management, many practitioners prescribe antibiotics, when it is not possible to open the access on the same day of patient's report.[16] Moreover; some practitioners prescribe antibiotics during canal preparation, especially in pulpal necrosis condition. When the pulp is necrotic, there will be only a few viable organisms that can be handled by immune reaction once starting the cleaning and irrigation process of the canal; moreover, antimicrobials cannot penetrate the pulp cavity and destroy the bacteria in necrotic condition.[12] Such kind of practices directly increases the antibiotic load and should be strictly restricted.

Irrational antibiotic prescription by dentists can be shortlisted to three major approaches.

1. Using antibiotics for pulpal and periapical infections, and localized abscess.
2. Antibiotics for healthy individuals to prevent surgical site (extraction and incision biopsy) infections.
3. Failure to avoid prescribing new antibiotics for 9-14 days, if the patient is already on broad spectrum antibiotic prophylaxis.

Prescription for oral infection many times is a combination of antibiotics and nonsteroidal anti-inflammatory drugs (NSAIDs). The interaction between these drugs may diminish the bioavailability of antibiotics and lead to poor control on bacterial eradication,[17] but invariably ignored in many situations.

Though it is proven that, 30-80% of all strains of *Porphyromonas* and *Prevotella intermedia* are resistant to amoxicillin,[18] the dentists frequently prescribe their standard combination of amoxicillin and metronidazole for periodontal infection.[19] Extended spectrum antibiotics like cephalosporin and azithromycin should be strictly considered following culture sensitivity test but hardly ever practiced by dentists.[20] The practice of prescribing systemic antibiotics for viral infections (herpes, mumps) with the intention of preventing superadded infection and systemic illness should be added to the list. The outcome of this preventive misconception is the generation of infection resistant bacteria and antibiotic resistance crisis which challenges the treatment of systemic infectious diseases.[21]

Ambiguity in dosage when selecting antibiotics for oral infection is a primary concern in the development of superbugs.[22] The oral microbes are predominantly anaerobes, falling in a narrow band of antibiotic sensitivity. The use of broad spectrum and greater potency antibacterials makes no difference[23] and hence undeniably restricted in dental practice. The method of antibiotic substitution in chronic infectious conditions (e.g. bacterial sialadenitis), or prolonged treatment procedures (multiple dental extractions, implant dentistry) should also be strictly restricted.

To treat dental infections, dentists should be skillful to judiciously select the antibiotics with knowledge about the susceptibility of specific bacteria in a suitable dose to support the worldwide movement towards minimizing the expression of antibiotic-resistant microbial strains. Being spent decades in dental practice, we ensure that dentists' knowledge about antibiotics is only from their undergraduate pre-clinical curriculum where there is no scope for in- depth knowledge about resistance.

SELF-MEDICATION WITH ANTIBIOTICS

In India, next to fever, headache, sore throat and the common cold, the toothache is the condition for which people use to take self-medications or the one recommended by the pharmacist.[24] Self-medication is very common in all developing countries due to the availability of over the counter drugs (OTC) and lack of appropriate vigilance on nonprescribed pharmaceutical trade by the health ministry. Schedule H1 drugs implemented in India by 2014, March includes only 24 antibiotics and more or less all listed medicines are available on OTC across the country in spite of H1 list enforcement.[25] India is ranking the world's largest consumer of antibiotics with 10.7 units per person.[26] Though the role of dental antibiotics is minimal in this aspect, the high rate of infectious disease burden in India makes the situation vulnerable and alarming to take appropriate control measures by Indian Dental Association and Dental Council of India.

Abrupt withdrawal following the relief of pain is an ongoing challenge in the generation of antibiotic resistant micro-organisms. Some people also resist undergoing dental treatment when they experience pain and swelling, and they demand medication from their dentist or self-medicate. Even today, one of the vital myth among Indian villagers is "dental extraction will affect vision," and they try antibiotics for "killing" dental microbes (insects and worms) with the help of a pharmacist. On the other extreme, the habit of using mouth rinse (chlorhexidine, triclosan) as a daily oral hygiene product by urban residents also increase the susceptibility for the emergence of resistant strains of *S. aureus* and *S. sanguis*.[27]

The likely reasons for dental patients' affinity towards antibiotics are:

1. The fact about the microbial role of dental caries ("germs") is well understood, and this makes them trust antibiotics for remedy.
2. To prevent the spread of causative microbe from the infected tooth to next.
3. To destroy the bacteria before dental treatment.

DENTAL PRESCRIPTION BY MEDICAL PRACTITIONERS

A considerable percentage of dental patients seek their family physicians help for dental pain. Severity of dental pain associated with sleeping position during night time and almost nonexistent of 24-hour dental clinics make them utilize the service emergency offered by general physicians. The majority of general medical practitioners recommends a combination of antibiotics and analgesic medication for pain relief and follows the old concept of prescribing broad spectrum antibiotics for seven days or until three days after symptoms have resolved in contrary to short-term course widely followed by dentists.[29] Over-prescription is misused by patients in future occasions to simply get rid of the pain as long as possible without visiting their dentist which is directly influenced by the cost of dental treatment. Concerns need to be expressed in this regard to make essential and emergency dental care at free of cost for deprived patients.

CONCLUSION

It is significant to indicate that the misuse of antibiotics for dental pain is alarmingly increasing throughout the developing countries including India and the wish to control this hostile action should be seriously considered by both the government and dental practitioners.

With the background of our literature reference, we summarize the following measures to minimize antibiotic resistance due to dental cause.

The role of government and professional organizations:

1. Provision for dental care in all rural and primary health centers.
2. Strict prohibition for OTC antibiotics.
3. A national screening program for dental caries and periodontal diseases to formulate a national plan for population-based treatment guidelines.
4. National and state-level dental regulatory bodies should insist on antibiotic sensitivity testing and antimicrobial dispensing protocol.

The dentists should

1. Acquire updated knowledge on antibiotic usage and restrict the use of extended-spectrum antibiotics to reduce the growth of multidrug-resistant organisms.
2. Be competent in handling dental patients under various medications and systemic health problems.

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