

Administrative Role of Dentist in Antibiotics Against Antibiotic Resistance in Present Scenario!!! - A Narrative Review

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ABSTRACT

Antibiotic resistance is considered as one of the most significant world health problem. There is increase in use of antibiotics amongst people due to its ease of administration. Overuse of antibiotics can lead to increased risk of the growth of multi-resistance organisms. The fatal effects or reactions of overusing and misusing antibiotics are predominantly noticed in the field of healthcare. Abuse of antibiotics happens at the time of routine dental treatment due to lack of knowledge about prescribing antibiotics and appropriate prophylactic antibiotic use. Antibiotic abuse can be prevented by multidisciplinary coordination and cooperation between dentists, pharmacists and patients. Dentists can become part of the solution to the antibiotic resistance risks and deal with it conclusively. This review article discusses antibiotic resistance resulting from antibiotic abuse during various dental treatments, various factors contributing to it and measures required by the dentist for stopping antibiotic abuse.

Keywords: Antibiotics, Microbial resistance, World health organization, Therapeutics

INTRODUCTION

Antibiotics has its crucial role in modern medicine that has become less effective due to its improper use. Antibiotic resistance is considered as the worst scenario in the present time which is affecting the countries which has poor health care. India is one among the countries for its use of antibiotics in humans and known as “the antimicrobial resistance capital of the world” [1]. 3-11% of all antibiotic consumption are from dentistry [2]. This gives a marked contribution for uses of antibiotics and clinicians should be responsible for understanding the output of treatment decisions for treating patients away from the chair side. Various studies regarding consumption of antibiotics, showed that Indian clinicians or dentists have knowledge about antibiotic prescription, still faulty prescription of antibiotics was seen among clinicians [3]. It is essential to know the causes which are responsible for the biased overuse of antibiotics and steps to prevent situations of abusing antibiotics can be thought of and countries with highest increase in antibiotic consumption seen in **Figure 1**. Deaths attributable to antibiotic resistance are given in **Figure 2**.

REGULATIONS FOR PRESCRIBING ANTIBIOTICS BY VARIOUS COUNTRIES IN DENTISTRY

American regulations

According to ADA (American Dental Association) regulations, for patients, consumption of antibiotics for preventive measures should be avoided or lessen to those who are suffering from infective endocarditis, prosthetic joint and patients more prone to develop hematogenous infections near the area of the artificial joints [4]. So, comparing various regulations, clinicians can obtain information about specific approach in the prescription of antibiotics, even more risk categories, referring especially to cardiac diseases who were prone to endocarditis [4].

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Italian regulations

In Italy, according to the clinical regulations in Dentistry, reported by Health ministry in September 2017 [3], consumption of antibiotics is suggested for the following situations:

1. Pedopatients and their side effects due to antibiotics

2. Endodontic therapy and antibiotic prescription

3. Tooth replantation and antibiotics

4. Abscess cases and antibiotic management

5. Antimicrobial therapy in periodontal conditions [5].

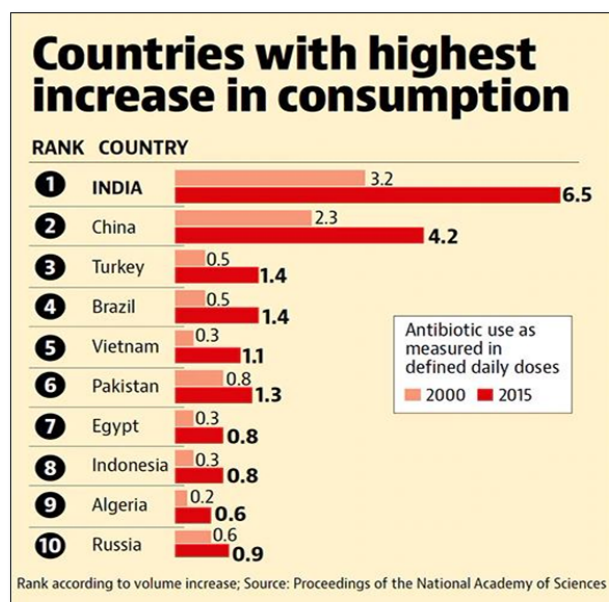


Figure 1. Countries with highest increase in antibiotic consumption.

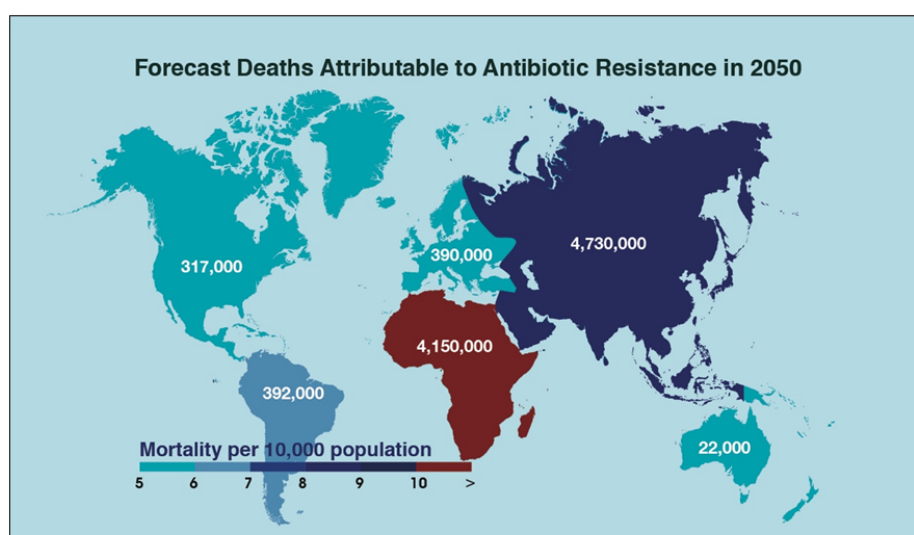


Figure 2. Death attributable to antibiotic resistance in 2050.

European regulations

According to the European regulations [4], antibiotics can be used in:

- Medically compromised patients at abscess conditions.

- Severe odontogenic infections.

- Replantation of avulsion of teeth.

- Treatment requiring injury of oral soft tissues [4].

Antibiotics in endodontics

Irreversible pulpitis cases, endodontic Specialists forty percentage have the habit to prescribe antibiotics [6]. Amoxicillin is the first choice of prescribing during endodontic treatment [7]. Clindamycin and erythromycin are to be substitute in terms of allergy [8]. Antibiotics is unnecessary in irreversible pulpitis, necrotic pulps and apical abscesses which have not already become infected [9]. Systemic antibiotics prescribed in endodontics should be limited to specific cases so as to avoid their over prescription. It is used as a supportive prescription in the routine treatment of apical periodontitis such that the spread of infection can be prevented but only in acute apical abscesses with systemic involvement and in progressive and persistent infections [8]. Although penicillin, possibly combined with metronidazole to cover anaerobic strains, is still effective in most cases, amoxicillin (alone or together with clavulanic acid) is recommended because of better

absorption and lower risk of side effects. In case of confirmed penicillin allergy, lincosamides, such as clindamycin, are the drug of choice [9].

Antibiotics in oral infections and oral surgery

Less evidence shown that the purpose of use of an antibiotic can reduce the risk of systemic infection following tooth extraction [10,11]. Patients undergoing extraction can experience a reduction of pain in the following seven days after surgery, by the use of systemic antibiotics which subside dry socket. Other type of procedures, such as frenulectomy or minor oral surgery, indications and regulations are the same as systemic surgery prophylaxis. In implant surgery, use of systemic antibiotics to prevent preoperative and postoperative infection has been evidenced in studies [12]. **Figure 3** represents antibiotics used in oral infections.

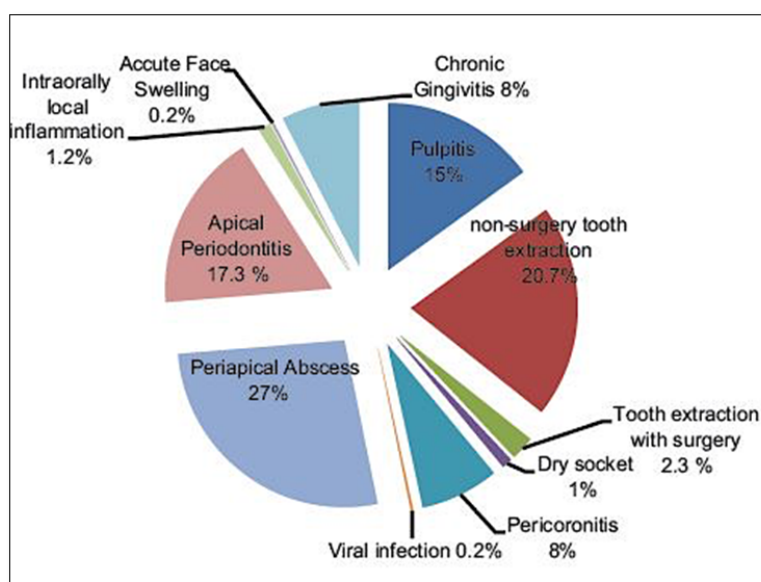


Figure 3. Antibiotics used in oral infections.

Antimicrobial Therapy in Periodontology

Topical and systemic antibiotics have been used in the treatment of periodontitis. The most widely used are: amoxicillin, azithromycin, clarithromycin, doxycycline, metronidazole, moxifloxacin, ornidazole and clavulanate [10]. In cases of aggressive periodontitis there is presence of high levels of sub gingival actinomyceteocomitans, porphyromonas gingivalis, where adjunctive antibiotics may be required to suppress these pathogens, which has potential to invade the periodontal tissues [12]. The periodontal abscess is a lesion with extensive periodontal breakdown occurring during a short period of time with localized accumulation of pus [14]. This condition may cause systemic involvement and the lesion generally has a large bacterial mass with a high prevalence of well-recognized periodontal pathogens. The periodontal abscess may occur in

untreated periodontitis patients or in treated patients in maintenance therapy. The role of systemic antibiotics in the treatment of the periodontal abscess is controversial. Some studies shown use of systemic antibiotics in combination with mechanical debridement or drainage [11-14]. Advising systemic antibiotics only if a clear systemic involvement is present such as lymphadenopathy, fever or malaise or when the infection is not well localized. Mechanical debridement and drainage through the periodontal pocket without antibiotics are usually effective in the management of the periodontal abscess. Necrotizing gingivitis and necrotizing periodontitis infections that emit clinical signs of necrosis and ulceration of the gingival margin and interdental papilla. When there are systemic effects such as fever or malaise metronidazole, given to supress the gram-negative anaerobes, should be prescribed in parallel with mechanical debridement [14]. There is high evidence to rule out

antibiotic-resistant species in subgingival plaque and saliva tests from chronic periodontitis patients treated by scaling and root planning followed by orally administered amoxicillin or metronidazole [15]. Due to continuous use there will be antimicrobial resistance of subgingival species following antibiotic administration [15].

Antibiotics and prosthodontics

The latest modality for treating partial and completely edentulous patients is dental implants. During the placement of the implant whether it is an immediate-loaded or a delayed loaded implant antibiotic prescription is necessary. Implant failure is commonly associated with certain types of bacteria like streptococci, anaerobic Gram-positive cocci and anaerobic Gram-negative rods. Treating with antibiotics in surgery is only indicated in patients who are at risk of infectious endocarditis, with reduced host-response, when surgery is performed in infected sites; where extensive surgeries are time taking; and when large foreign materials are implanted. Usage of antibiotics is the development of antibiotic-resistant bacteria is important concern [16-20].

The accepted principles for the use of prophylactic antibiotic are:

- The procedure that has significant rise of postoperative infection
- Appropriate antibiotic should be selected
- Appropriate tissue concentration at time of surgery is necessary
- Use of shortest effective antibiotic.

Antibiotics in orthodontics

In the orthodontic procedures, placement of orthodontic band to cause effect on gingival margin it can cause bacteremia. Amoxicillin/clavulanate as a prophylaxis for prophylactic use in orthodontic mini implant surgery [20-31]. Recent studies reveal that antibiotics has no effect on micro implant placement and the only use is to reduce postoperative inflammation of soft tissue injury during the time of implant surgery [32].

Antimicrobials in pediatric dentistry

In pediatric dentistry, the regulations of different countries brief that for odontogenic infections in temporary or permanent dentition, local treatment should be firstly recommended, instead of systemic one [30].

- Preventive approach to treatment of odontogenic infections [23];
- Prevention of local infection associated with dental procedures

- The spread of oral micro-organisms to susceptible sites can be stopped by antibiotics prophylaxis to spread elsewhere in the body [23].

Superbugs and dentistry

Staphylococcus aureus found from the mouth and methicillin-resistant staphylococcus aureus is seen in denture wearing patients. Osteomyelitis, oral mucositis, infections of jaw cysts and parotitis [24] methicillin resistant staphylococcus aureus is frequently seen in dentistry to stop such organism from causing superinfections from microbial resistance. It is important to take necessary steps from the depletion of further progress into superbugs [18-24].

GLOBAL ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEM (GLASS)

This mainly provoke global surveillance and research on antimicrobial resistance (AMR) and help to inform decision-making and to initiate national, regional and global actions by world health organization [24]. **Figure 4** represents GLASS across the globe.

MEASURES REQUIRED FOR REDUCING ANTIBIOTIC ABUSE

1. **Ethical antibiotic prescribing regulations:** antibiotic regulations should be accurately issued by the government. In this concern, guiding principles for antimicrobial therapy is published by the Government of South Australia which is referred to as MIND ME [22, 23]; which is an acronym for “antimicrobial creed”. The antibiotics prescribed by the clinicians in India for the patients appropriately will be ensured with the help of Analogous clinical regulations. This 5-year NAP (2017-2021) gives an idea about the priorities and implementation strategies for decreasing the cases of antimicrobial resistance in India [30]. The government can support in adopting computerized decision making or guiding systems which will be necessary for the use of antibiotics by advising or providing treatment recommendations to clinicians while prescribing antibiotics. Implementing this system in practice has been associated with reduced use of broad-spectrum antibiotics, improved appropriate antibiotic selection and dosing, minimal prescribing errors, antibiotic cost, and reduced antibiotic resistance [30].
2. **Antimicrobial stewardship program:** These programs are conducted to improve the appropriate use of antimicrobials by supporting to choose the accurate and optimal antimicrobial drug regimen, its dose, duration of the therapy, and choosing the route of administration of the drug. Antimicrobial Stewardship Program has been well improved in the medical field, but not in the field of dentistry [22, 23]. These programs should be given support and well promoted and must include the

evidence based training for dentists about an appropriate usage antibiotic drug, its dose, dosing interval and duration of intake to make them more confident in antibiotic use and

prescribing them [22-25]. **Figure 5** represents national wide surveillance of antimicrobial resistance in India.

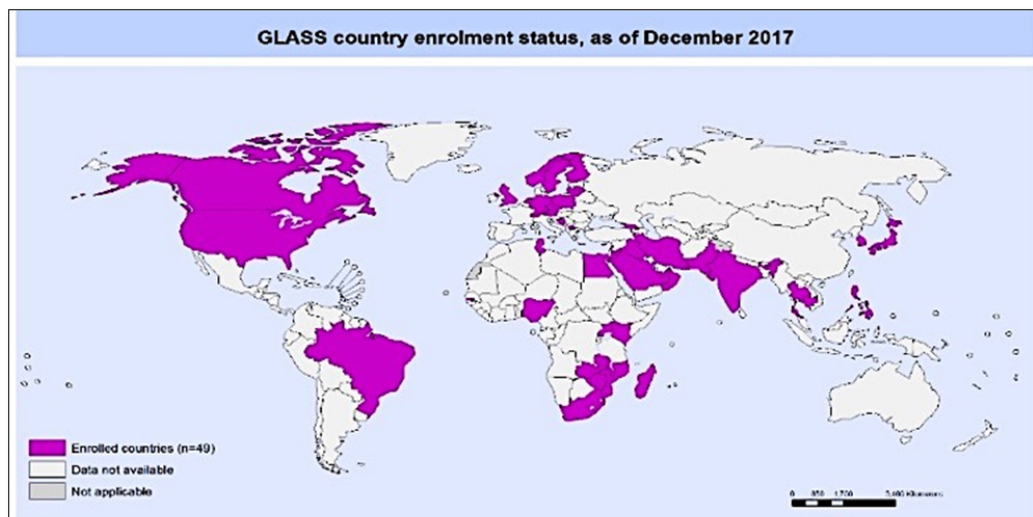


Figure 4. GLASS across the globe.

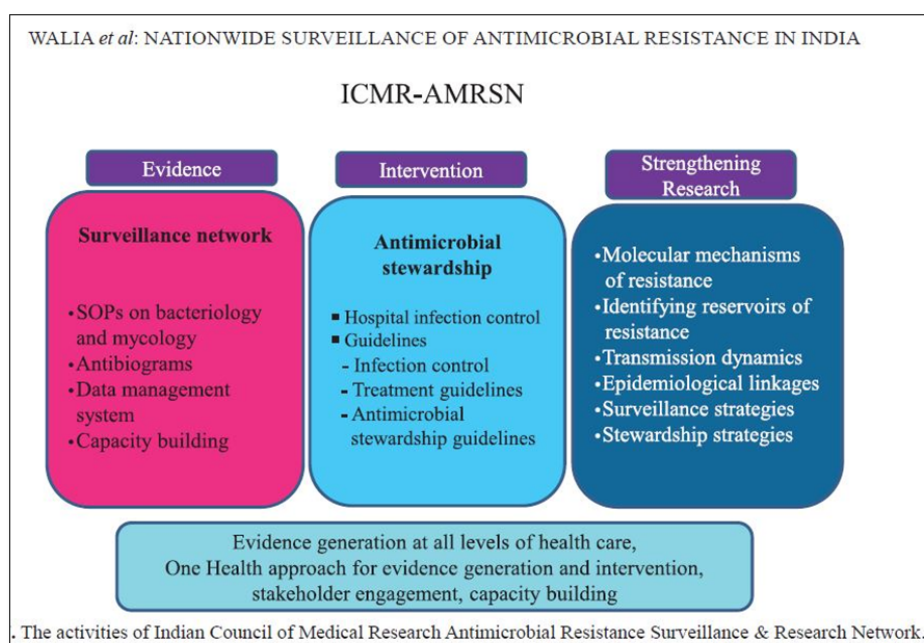


Figure 5. National wide surveillance of antimicrobial resistance in India.

3. Addressing “over the counter” sale of antibiotics

In most of the developing countries like India, there is regulation on the retail selling of drugs or pharmaceuticals. Antibiotics are often easily available and reachable to people without a physician’s prescription [20] and this non-prescription use of antibiotics have a major role and contribution in elevating the condition of antibiotic resistance among people. It varies from 19% to 90% in

countries outside the U.S. and Europe [20]. The rule of “prescription only medicines” should be in practice according to international guidelines and should be strictly reinforced [20].

PREVENTION

Dentists can limit the inappropriate and inaccurate use of antibiotics in dentistry by following the enlisted pointers:

1. Use of antibiotics should be minimized

The conservative way of use of antibiotics is advised and indicated to lower the risk of developing resistance to current antibiotic regimens [25]. They should be administered or prescribed only if indicated. Assure evidence-based antibiotic references are readily accessible during patient visits. Shorter courses of antibiotic intake also improve patient compliance which gives an added benefit on reducing antibiotic resistance [25].

2. Be aware while prescribing antibiotics

Dentists should avoid prescribing antibiotics based on no evidence-based historical practices, patient demand, convenience, or pressure from colleagues, to delay the appointment, or to retain the patient [26].

3. Making our patients understand about antibiotics

A precautionary discussion with the patient is indispensable to change the overprescribing phenomenon. We must make patients know in and out regarding the planned duration of therapy. We must educate our patients to take antibiotics exactly as prescribed, not to take antibiotics prescribed only for them, and not to save antibiotics for future illness. Many dentists may not be highly concerned about their antibiotic prescribing habits since many patients expect to get an antibiotic for issues patients perceive as bacterial [27].

Patients should be taught to avoid pressuring the dentist for an antibiotic prescription. Briefing patients about anticipated post endodontic pain and specifying analgesics to manage it will not only increase the faith of patients in their dentists, but also increase patients' pain threshold and change their attitude toward placebo role antibiotic plays in managing dental pain [28].

4. Sharing knowledge to make our referring dentists about antibiotics

Prescription of antibiotics and knowledge about it must require team effort. Awareness regarding antimicrobial resistance must be through campaign among the dentists. General dentists are only a part of the remedy as well [26]. Discussing antibiotic use and prescribing protocols with referring dentists as a part of prevention of over prescription of antibiotics. Further, the senior dentists, when supervising the work of junior dentists, need to be cautious in examining the antibiotic prescribing patterns during the management of dental cases [26].

CONCLUSION

Dental practitioners have an active role to participate in the prevention of drug-resistant microorganisms. over-prescription may lead to a defect in normal microbial flora. An increase in the incidence of microbial resistance needs the importance of pharmaceutical vigilance. Health care associations and pharmaceutical companies should frame certain guideline how to use the drug and preventing all

microbial resistance by educating healthcare professionals. The importance of infection control in oral surgery should not be underestimated. Dentist should be encouraged to develop and adhere to local prescribing protocols restricting to prescription to cases where there is a definite clinical indication for prescribing antibiotic therapy. Further continuation of researches and development in newer agents against resistance and definite awareness with proper education and guidelines will resolve bacterial spread and resistance can be resolved.

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