

ANTIMICROBIAL STEWARDSHIP – AN ALARMING CALL IN DENTISTRY**¹DARSHANA BENNADI**

Dept. of Public Health Dentistry, Sree Siddhartha Dental College and Hospital, Agalkote, Tumkur 572107, India.

Email: darmadhu@yahoo.com

*Received: 29 Jan 2014, Revised and Accepted: 09 Mar 2014***ABSTRACT**

Dental practitioners regularly prescribe antibiotics for therapeutic or prophylactic purposes to manage oral and dental infections. However, inappropriate prescribing and excessive use of antibiotics have been identified as major factors in the emergence of antibiotic resistance. Antibiotics are adjunct not an alternative. Antibiotics are indicated when clinical signs of involvement are evident. The antibiotic stewardship in dentistry has created alarming call. This paper reviews antibiotic stewardship in dentistry along with protocols to follow.

Keywords: Antimicrobial stewardship, Antibiotics, Dentistry.

INTRODUCTION

Since the discovery of penicillin, the first antibiotic, by Alexander Fleming in 1928 and its subsequent introduction to clinical practice by Florey in 1940, antibiotics have been used extensively in dentistry. Dental practitioners regularly prescribe antibiotics for therapeutic or prophylactic purposes to manage oral and dental infections. However, inappropriate prescribing and excessive use of antibiotics have been identified as major factors in the emergence of antibiotic resistance, which is an ongoing challenge ever since the discovery of antimicrobial agents [1]. There are other issues too, such as possible adverse events and additional costs of prescribing. Consequently, surveillance of antimicrobial resistance, monitoring of antibiotic usage and attempts to improve prescribing attitudes have become crucial [2, 3].

The recent publicity surrounding antimicrobial resistance has justifiably renewed efforts to rationalize antibiotic prescribing for many conditions. The recent report on anti-microbial resistance by the Standing Medical Advisory Committee noted that dentists account for 7% of antimicrobial prescribing [4].

Yet, it is known fact that antibiotic therapy alone is largely ineffective for acute dental problems related to the dental pulp, and other dental infections such as abscesses, are more effectively treated by surgical means [5]. An additional concern is that some people seek treatment for dental problems from their general medical practitioner (GMP) rather than a dentist [6, 7, 8].

Antibiotics are not an alternative to dental intervention; they are adjunct [9,10]. Antibiotics are indicated when clinical signs of involvement are evident. The major use of antibiotic prophylaxis for dental procedures, are cases which cause bleeding in the oral cavity, has become a common practice among dentists [11]. Antibiotics are indicated in dental practice for treating immuno-compromised patients, evident signs of systemic infection and if the signs and symptoms of infection progress rapidly [12]. Therapeutic and prophylactic antibiotic prescribing practices are usually followed by dentists.

Antibiotics for odontogenic infections

A considerable percentage of dental pain originates from acute and chronic infections of pulpal origin, which necessitates operative intervention, [13] rather than antibiotics. Non-indicated clinical cases for antibiotic use include acute periapical infection, dry socket and pulpitis [14]. Chronic inflammatory periodontal conditions are also not indicated for antibiotics; systemic antimicrobials should only be used in acute periodontal conditions where drainage or debridement is impossible, where there is local spread of the infection or where systemic upset has occurred [15].

Data reported from different countries indicate differences in dentists' knowledge of clinical situations indicated for antibiotics.

Almost half or more of the dentists investigated in England [16], Kuwait [14] and Turkey [17] would prescribe for dry socket. Another non-indicated condition is localized swelling, which was also among the conditions for which antibiotics were prescribed in Norway [18], South Australia [19], Kuwait [14] and England [20]. On the other hand, the figures for England show that admissions for 'drainage of an abscess related to tooth has doubled from just under 800 in 1998 to almost 1600 in 2006 [21].

More common dental infections present in the form of pulpitis and periapical periodontitis, which require only operative measures like fillings, root canal therapy, or extraction if the tooth is not restorable. Unfortunately, dentists still prescribe antibiotics for this condition [14, 16, 17, 22-26]. A distressing finding was that a number of dentists prescribe antibiotics for viral infections like herpes simplex virus-1 infections [22].

Clinical situations that require antibiotic therapy on empirical basis are limited, and they include oral infection accompanied by elevated body temperature and evidence of systemic spread like lymphadenopathy and trismus [27]. Facial cellulitis that may or may not be associated with dysphagia [14], is a serious disease that should be treated by antibiotics promptly because of the possibility of infection spread via lymph and blood circulation, with development of septicemia. Another aspect of antibiotic over-prescribing is prescribing based on non-clinical factors. Patient's expectation of an antibiotic prescription, convenience, and demand necessitated by the social background of the patients are considered unscientific reasons for antibiotic prescription [28].

Penicillin is the drug of choice in treating odontogenic infections as it is prone to gram positive aerobes and intraoral anaerobes, organisms found in alveolar abscess, periodontal abscess and necrotic pulps [29]. Followed by penicillin V, [22,2,24] metronidazole, [16, 30] and amoxicillin and clavulanate [31].

Antibiotics for non-odontogenic infections

The non-odontogenic infections require a prolonged treatment. They include infections such as tuberculosis, syphilis, leprosy and non-specific infections of bone [29].

Frequency of prescribing is usually mentioned in the known resources for antibiotic prescribing [32], whereas duration of treatment recommended in therapeutic guidelines is most commonly based on expert opinion [33].

Rubenstein explains that short-course antibiotic therapy requires that antibiotics have certain characteristics, such as: rapid onset of action, bactericidal activity, lack of propensity to induce resistant mutants, easy penetrability into tissues, activity against non-dividing bacteria, not being affected by adverse infection conditions (low pH, anaerobic, presence of pus, etc.), administration at an optimal dose, and optimal dosing regimen [33]. A two-dose, 3-gm regimen of

amoxicillin has been shown to be effective in certain situations [27]. On the other hand, oral antibiotic use for 2 or 3 days has been advocated for the treatment of acute dento-alveolar infections, and in doses recommended by the British National Formulary (BNF) [13]. Indeed, in some studies, patients improved after 2 or 3 days of antibiotic therapy [34, 35, 36, 37].

Short courses are preferred to long courses particularly when treating children, since children's compliance with conventional courses is poor [38]. A false conception about the use of antibiotics is that antibiotics should be used for a certain number of days to 'kill the resistant strains' as the vast majority of strains acquire

resistance via transposable elements that are preferentially transferred when antibiotics are used in sub-therapeutic doses or for long durations [39].

Prophylactic

Recommended Antibiotic Prophylaxis for the Prevention of Infective Endocarditis and Hematogenous Total Joint Infection

Table 1 show recommended Antibiotic Prophylaxis and Table 2 shows Bacteremic Dental Procedures. Recommendations are based on the current guidelines of the American Heart Association (AHA) and the American Academy of Orthopaedic Surgeons (AAOS) [40].

Table 1: Antibiotic prophylaxis recommendations [40]

Situation	Agent	Regimen*
Standard general prophylaxis	Amoxicillin, Cephalexin**, or Cephadrine	2.0 g orally 30 – 60 minutes before procedure
Unable to take oral medications	Ampicillin Cefazolin	2.0 g IM or IV 30 – 60 minutes before procedure 1.0 g IM or IV 30 – 60 minutes before procedure
Penicillin-allergic	Clindamycin	600 mg orally 30 – 60 minutes before procedure
Penicillin-allergic and unable to take oral medications	Clindamycin	600 mg IV 30 – 60 minutes before procedure

*No follow-up dose recommended

**Cephalosporins should not be used in individuals with immediate type hypersensitivity reaction (urticaria, angioedema or anaphylaxis) to penicillins

For children, please consult their physician

Table 2: Bacteremic dental procedures [40]

Antibiotic Prophylaxis Recommended 1
Dental procedures that involve manipulation of gingival tissue or the periapical region of the teeth or perforation of the oral mucosa
Scaling and root planing of teeth
Periodontal procedures
♣ Curetting tissue
♣ Periodontal probing
♣ Periodontal surgery
♣ Sub gingival placement of antibiotic fibers and strips
Tooth extraction
Suture removal
Biopsies
Prophylactic cleaning of teeth or implants where bleeding is anticipated
Dental implant placement and replantation of avulsed teeth
Endodontic instrumentation or surgery only beyond the apex
Placement of orthodontic bands
Intra-ligamentary and intra-osseous local anaesthetic injections

A wide range of microbes are reported to have developed resistance to all known antibiotics. Wide-spread antimicrobial resistance (AMR) threatens to push us back into the preantibiotic era and it should therefore be a wake-up call for all healthcare personnel, including dentists. Realizing the seriousness of the situation and to increase awareness regarding AMR, the World Health Organization declared that the theme for World Health Day, 2011, should focus on combating drug resistance [41].

Development of resistance to drugs by microbes is a natural phenomenon but is enhanced by the irrational use of antimicrobials. A few strains that are naturally resistant and those with acquired resistance emerge as the dominant forms as a result of the selective pressure exerted due to exposure to antimicrobials [42]. Investigations have revealed that many oral microbes such as *Streptococcus* spp., *Prevotella* spp., *Fusobacteria* spp., *Haemophilus* spp., *Veillonella* spp., *Porphyromonas gingivalis*, *Aggregatibacter actinomycetem comitans*, and *Actinomyces* have developed resistance to many antibiotics [43, 26, 44]. Resistance is reported against all the

beta-lactum antibiotics (including penicillin derivatives and cephalosporins), clindamycin, ciprofloxacin, erythromycin, and tetracycline [44, 45]. Beta-lactamase inhibitors like amoxicillin/clavulanate potassium are still effective against most of the pathogenic oral microorganisms and metronidazole continues to be effective against many oral anaerobes. These antimicrobials should be prescribed only in selected cases, preferably after confirmation with culture and sensitivity tests, to prevent emergence of AMR to these drugs also [44,45, 46].

Antimicrobial stewardship in the Hospital/ clinical level: [47]

- Staff education (on appropriate prescribing and antibiotic resistance)
- Ward rounds (advice on treatment duration, changing empirical to directed therapy, appropriate dosing, and when to switch from intravenous to oral antibiotics)
- Electronic prescribing (enhancing approval and decision support systems)

- Provision of local antibiotic susceptibility data.

Antimicrobial stewardship in the community: [47]

Clearly antimicrobial stewardship needs to be extended to where the greatest use occurs. Three principal strategies should be followed in place in the community. These are antibiotic restriction, prescriber and patient education and post-prescribing feedback.

• Restricting antibiotics via the Pharmaceutical Benefits Scheme

• Prescriber and patient education programs

✓ Interventions combining doctor, patient and public education are the most successful at reducing inappropriate antibiotic prescribing.

✓ Online learning modules on antibiotic prescribing individual academic detailing for general practitioners and pharmacists

✓ Group discussions and case studies for the whole primary care team, symptomatic management pads offer alternatives to antibiotics.

• Prescribing feedback

Prescribing rates sent to individual general practitioners allowing comparison with local and national averages tools provided for practices to perform clinical audits on antibiotic use

CONCLUSION

Dentists can make a difference by the judicious use of antimicrobials - prescribing the correct drug, in the standard dosage and regimen - only when systemic spread of infection is evident. Asking for culture and sensitivity tests should be a priority. This practice of prudent use of antimicrobials is termed as 'antimicrobial stewardship' and it is the need of the hour [48]. A record of the antibiotics that have been prescribed has to be maintained, and signs of resistance among patients must be looked for and identified. A standard infection control protocol has to be maintained at all levels. Patients should also be motivated to comply with prescriptions, and over-the-counter sale of antibiotics should be banned [41, 43]. All these efforts will reduce the risk of AMR and prevent the transformation of microorganisms into deadly strains.

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