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RESEARCH ARTICLE

PRESCRIPTION PATTERN OF DRUGS AMONG GENERAL DENTISTS IN NORTH INDIA

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ABSTRACT

Background and Aim: Clinicians do prescribe antibiotics for either prophylactic or therapeutic reasons. Inappropriate prescribing of antibiotics by health care professionals is a worldwide concern. The decision of when and what to prescribe leaves room for misuse and therefore it is imperative to continuously monitor knowledge and pattern of prescription. In recent years, dentists have reported a shift from narrow-spectrum to broad-spectrum antibiotic prescriptions due to increasing antibiotic resistance. Irrational prescription of antibiotics by clinicians might lead to drug resistance. The aim of this present study is to investigate the prescribing patterns of the therapeutic and prophylactic use for antibiotics in various dental situations by dental practitioners.

Materials and Method: This study utilized a questionnaire which was designed to investigate the antibiotic prescribing patterns by dental practitioners in the North India region. A structured and pretested questionnaire was sent to 200 dental health care practitioners by post or physical delivery or by email.

Result: A total of 200 dentists responding to the questionnaire, more than 70% would prescribe antibiotics for localized fluctuant swelling and for problems for which antibiotics are not required according to good practice guidelines (acute pulpitis, chronic apical infection, periodontal abscess, chronic gingivitis, chronic periodontitis, pericoronitis and dry socket). Amoxicillin was the most frequently prescribed antibiotic for all clinical conditions but there was a wide variation in dosage, frequency and duration for all antibiotics used

Conclusion: The knowledge of dental health care practitioners in antibiotic use in this study was generally low so, this study concludes that there is a clear need for the development of prescribing guidelines, regular monitoring of antibiotic prescriptions by dental practitioners and educational initiatives to encourage the rational and appropriate use of the antibiotics

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INTRODUCTION

Antibiotics are commonly used in dental practice and the use of these drugs takes an important part in dental care (Poveda – Roda, 2007). In dentistry antibiotics are typically prescribed for, as therapy for dental, oral and maxillofacial infections and as prophylaxis against focal infections in patients at risk (endocarditis and joint prostheses) and as prophylaxis against local infection and systemic spread in oral surgery (Poveda Roda, 2007 and Palmer *et al*., 2000). 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 (Weber *et al.,* 2005). 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 (Al-Haroni *et al*., 2007). In recent years, dentists have reported a shift from narrow spectrum to broad-spectrum antibiotic prescriptions due to increasing antibiotic resistance (Huda *et al*., 2010). There are evidences which suggest that antibiotic prescriptions by dental practitioners for therapeutic purpose differ significantly and prophylactic antibiotics are prescribed inappropriately, both for surgical procedures and for patients at risk from endocarditis (Huda *et al*., 2010). In Kuwait, despite the fact that over 80% of dentists did not have any additional postgraduate training on antibiotic therapy, higher knowledge regarding adequate indications for antibiotic use was

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associated with longer professional experience (Salako, 2004). In a Norwegian study, it was found that 20% of the dentists did not know that amoxicillin is a penicillin-based drug. Currently in India there are no specific guidelines in for prophylactic or therapeutic prescribing of antibiotics in dentistry. In addition, there are no data describing the indications for which antibiotics are prescribed, whether these have any scientific basis, or whether the antibiotic agents, their dose, frequency and duration, are based on published guidelines or standards. We therefore conducted this study to evaluate the knowledge and attitude of dental practitioners of Northern India regarding their therapeutic use of antibiotics for patients with dentoalveolar infections.

MATERIALS AND METHODS

Study population

The study sample consisted of registered oral health care practitioners (n = 200) working in different parts of North India.

Survey tool (questionnaire)

A structured questionnaire was designed, pre-tested and then physically delivered or e- mail. To all the registered and practicing dental surgeons. The re-spondents were requested to mail back the filled questionnaires within 2 weeks of receipt. It recorded the age, sex, practitioners (general or specialist). Respondents answered anonymously and were requested to avoid use of any reference materials while answering the questionnaire. The questionnaire also explored the number of patients treated per week and for which clinical signs the practitioner would prescribe antibiotics for patients presenting with a dental infection.

The clinical signs chosen were: elevated temperature and evidence of systemic spread; localized fluctuant swelling; gross or diffuse swelling; restricted mouth opening; difficulty in swallowing; and closure of the eye due to swelling. Another part of the questionnaire investigated the use of antibiotics for common clinical conditions. If a positive response was given, the practitioners were asked to state the antibiotic they would prescribe, its dose, interval and duration, for patients who were not allergic to penicillin. The practitioner was also asked what antibiotic would choose if the patient was allergic to penicillin. The clinical conditions were acute pulpitis, acute periapical infection, chronic apical infection, periodontal abscess, acute ulcerative gingivitis, chronic gingivitis, chronic periodontitis, pericoronitis, dry socket, and cellulitis.

Data Analysis

A knowledge score was constructed for each question asked regarding signs in which the practitioner would prescribe antibiotics. Each of these questions were graded as 0 (if incorrect) versus 1 (if correct). For questions regarding use of antibiotics in common clinical conditions, knowledge of respondents was evaluated based on evidence-based guidelines and standards in selected published literature.

RESULTS

A Total of the 200 dental practitioners to whom the questionnaires were sent, 60% male, 40% female. All practitioners were registered under dental council of India.

Prescribing habits

Table 1 show the clinical signs for which the practitioners would prescribe antibiotics. Over 90% would prescribe for patients with elevated body temperature, gross or diffuse facial swelling and closure of the eye due to swelling.

Table 1. Prescribing of antibiotics by dental practitioners for selected clinical signs and patient expectations (*n* = 20)

Elevated temperature and evidence of systemic spread	185
Diffuse swelling	181
Localized fluctuant swelling	178
Eye closure because of swelling	168
Eye closure because of swelling	124
Difficulty in swallowing	108

Prescribing for specific conditions

The no. of practitioners prescribing for specific conditions are shown in Table 2. The results showed that the majority of dentists would prescribe for acute periapical infection (87.5%), cellulitis (82.5%) and acute ulcerated gingivitis (82.0%). The practitioner's preferred choice of antibiotics for specific conditions that actually need antibiotic treatment, assuming no allergy to penicillin. Amoxicillin was the antibiotic most frequently prescribed. The dose, frequency and duration of treatment with each antibiotic prescribed differed among the practitioners. Of the 200 practitioners who would prescribe amoxicillin for acute periapical infection, the great majority (80%) chose a 500 mg dose 3× daily for a period of 6–7 days. Few dentists (11%) chose the lower dose of 250 mg and only 9% preferred a shorter duration of 2–3 days (Table 3).

For acute ulcerative gingivitis, most 72.5% practitioners prescribed amoxicillin out of which 73.5% chose a 500 mg dose 3× daily for a period of 6–7 days; only 13.5 % chose a shorter duration of 2–3 days and 13.5% even chose a duration of 4 weeks(table 4.a). of 30 practitioners who chose metronidazole to treat acute ulcerative gingivitis, 70.0% chose a 250mg dose 3× daily for 6–7 days, 20% incorrectly chose 4 × daily intervals for this drug and only about 10% would treat for 2–3 days (Table 4.b). Practitioners who chose tetracycline for the treatment of this condition used a variety of different dosages, durations and intervals (Table 4.c).

For the treatment of cellulitis, a majority of the practitioners 70% prescribed amoxicillin out of which 71% chose a 500 mg dose 3× daily for 6–7 days and 29% chose an even higher duration of treatment (4 weeks) (Table 5.a). Practitioners who chose penicillin V to treat this condition chose a 500 mg dose 4× daily for 6-7 days (60%), while 40% preferred 4 weeks of treatment (Table 5.b). A considerable proportion of the practitioners surveyed preferred an injection of penicillin to treat this condition; however, there was considerable disagreement regarding the dosage and the number of

injections. For patients allergic to penicillin, erythromycin was the most common antibiotic prescribed by the respondents (80.0%), followed by clindamycin (20%).

Table 2. Practitioners prescribing for specific conditions

Acute periapical infection	175
Cellulitis	165
Acute ulcerative gingivitis	164
Pericoronitis	160
Periodontal abscess	154
Acute pulpitis	153
Chronic apical infection	140
Chronic periodontitis	102
Chronic gingivitis	100
Dry socket	70

Table 3. Acute periapical infection - (n = 200) for amoxillicilin

500 mg dose 3× daily (6–7 days)	lower dose of 250 mg (6-7 days)	shorter duration of 2–3 days
160	22	18

Table 4.a Acute ulcerative gingivitis (n = 150) for Amoxicillin

500 mg dose 3(6–7) days;	shorter duration of 2–3 days	duration of 4 week
110	20	20

Table 4.b. Acute ulcerative gingivitis (n =30) for Metronidazole

250mg dose 3× daily for 6–7 days,	250mg 3* (2–3 days)	250 mg duration of 4 week
21	3	7

Table 4.c. Acute ulcerative gingivitis (n =20) for Tetracycline

Other	**20**

Table 5.a. Cellulitis (n =140) for Amoxicillin

500 mg dose 3× (6–7) days	250 mg duration of 4 weeks.
100	40

Table 5.b Cellulitis (n =30) for Penicillin v

500 mg dose 4×(6-7 days),	*250 mg preferred 4 weeks of treatment*
18	*12*

Table 5.c Cellulitis (n =21) for Penicillin

Other	09

DISCUSSION

Many factors have been reported to influence antibiotic prescription pattern among dental health care practitioners. These range from culture, patient preferences, treatment methods, prevalence of disease, available resources, payment systems, education background, and the existence and application of clinical guidelines. Within the last few decades antimicrobial resistance has become a worldwide problem and constitutes a major threat to public health. The unsystematic prescribing of antibiotics by health care professionals is a major factor to be considered. Evidence of the inappropriate use of antibiotics in dentistry has increased and this could lead to the problem of antimicrobial resistance (Salako, 2004; Palmer *et al*., 2003 and Al-Haroni, 2006). This fact and the increase in the number of antibiotic prescriptions written by dentists each year shows the importance of examining the role of dentists in prescribing antibiotics in everyday practice. The present study showed evidence of poor prescribing of antibiotics by dentists in North India. The indications for antibiotics in acute dentoalveolar infections have been defined as: signs of spreading infection, patient malaise, temperature elevation and lymphadenitis (Palmer *et al*., 2000 and Salako, 2004). Generally the survey showed that dental practitioners are aware of these indications and mostly used antibiotics wisely for acute infections. However, more than 89% would prescribe antibiotics for localized fluctuant swelling. Therefore, a considerable proportion of practitioners prescribed antibiotics for all swellings where local treatment would have been sufficient. This was a higher finding to studies performed in Kuwait (Salako *et al*., 2004), and Yemen, (Al-Haroni, 2006) where 55% and 68% of the practitioners respectively prescribed antibiotics for local swelling. Chronic apical infections rarely need antibiotics unless there is evidence of gross local spread; extraction or root canal therapy are the definitive treatment options. In this survey about 70% of the practitioners would prescribe antibiotics for chronic apical infections, similar to the studies in Kuwait (Salako, 2004) and England (Palmer, 2000). Adjunctive antibiotics should be prescribed only for a very limited group of patients—e.g. those with specific clinical features or aggressive forms of periodontal disease—in order to prevent antibiotic resistance due to periodontal therapy.

Nevertheless about 50% and 51% respectively of our dental practitioners surveyed would prescribe antibiotics routinely for chronic gingivitis and chronic periodontitis. These results were very much higher than to those obtained from dental practitioners in Kuwait (Salako *et al*., 2004). A very lower percentage (3% and 13% respectively) of dental practitioners in England would prescribe antibiotics in the above conditions. The proportion of practitioners who would routinely prescribe antibiotics for specific conditions varied a great deal among the presenting diseases. More than 70% of those surveyed would correctly prescribe antibiotics for cellulitis and acute periapical infections, while only 63% would prescribe antibiotics for acute ulcerative gingivitis, which is recommended as part of the initial therapy (Palmer *et al*., 2003). The majority of uncomplicated infected swellings of dental origin can be successfully treated by removing the source of infection by drainage of abscesses, removal of infected pulp contents or tooth extraction. Antibiotics are not effective in the management of pain associated with irreversible pulpitis (Palmer, 2003).

However, 76.5% of our dental practitioners surveyed believed in the use of antibiotics in patients presenting with acute pulpitis. This was again higher to the study performed in Yemen (Al-Haroni *et al*., 2006) and Kuwait (Salako, 2004) in which 32% and 20% of dentists respectively would prescribe antibiotics for this condition. A very lower percentage (13%) of dental practitioners in England prescribed antibiotics for this acute pulpitis (Palmer, 2000). Pericoronitis, periodontal abscesses and dry sockets are treated by local measures, and antibiotics are only indicated for large spreading infections or

systemic involvement (Palmer *et al*., 2003 and Faculty of Dental Surgery, 1997). The use of systemic antibiotics in the treatment of periodontal disease is controversial. It is acceptable not to use antibiotics routinely for the treatment of adult periodontal disease. Mechanical debridement methods, including drainage of pus for acute periodontal abscesses, should be considered the first-line treatment for most periodontal diseases. Systemic antimicrobials should be considered as adjuncts to such methods, and never used alone in this chronic disease, as they can predispose to abscess formation. Adjunctive systemic antimicrobials may be considered in acute disease where debridement or drainage of pus is difficult, or there is local spread or systemic upset. There is also evidence that systemic antibiotics can be used in juvenile periodontitis (Palmer *et al*., 2003).

Initial treatment of pericoronitis is usually aimed at debridement of the periodontal pocket by irrigation or by mechanical means, disinfection of the pocket with an irrigation solution such as hydrogen peroxide or chlorhexidine, and surgical management by extraction of the opposing maxillary third molar, and occasionally, of the offending mandibular third molar. Severe cases of pericoronitis with systemic symptoms may warrant antibiotic therapy (Miloro, 2002). Such exceptional situations were not covered in our questionnaire, and unfortunately more than 70% of our dental practitioners surveyed would prescribe antibiotics routinely for periodontal abscess and pericoronitis. In the study performed in England and Yemen more than 80% of the practitioners, would prescribe for these two conditions, the percentage of our practitioners prescribing antibiotics for dry socket was 35%, much lower compared with the studies performed in Kuwait, Yemen and England (> 50%) (Salako *et al*., 2004; Salako *et al*., 2006 and Palmer, 2000). Amoxicillin was the most frequently prescribed antibiotic for acute dentoalveolar infections requiring antibiotics, which is similar to other studies (Palmer *et al*., 2000; Salako, 2004; Al-Haroni, 2006). This was followed by penicillin V for acute periapical infections, metronidazole for acute ulcerative gingivitis and penicillin injection for cellulitis (Salako *et al*., 2004) (Table 3). Based on a review of the evidence and good practice for prescribing therapeutic antibiotics in dentistry, amoxicillin 250 mg 3× daily for a maximum of 5 days and metronidazole 200 mg 3× daily for 3 days have been recommended as first and second choice treatments respectively. For patients allergic to penicillin erythromycin 250 mg 4× daily or 500 mg 2× daily up to 4 days have been recommended (Salako, 2004).

In agreement with previous studies, there was a considerable variation from the recommended frequencies, doses and duration of antibiotic therapy (Roy, 2000 and Thomas *et al*., 1996). There is increasing evidence that short courses of antibiotics together with local surgical measures are adequate for treating dentoalveolar infections (Slots *et al*., 1996; Martin *et al*., 1997). Prolonged courses of antibiotics, which were recommended by most of the practitioners in our survey for periods up to 10 days, could be harmful, due to the fact that the dose and duration of therapy are key factors in developing antibiotic resistance (Askarian *et al*., 2007). The fact that a considerable number of our practitioners surveyed chose a duration of treatment of up to 4 weeks is of great concern (Askarian *et al*., 2007). Acute orofacial infections have a rapid onset and relatively short duration of 2 to 7 days, particularly if the offending cause is treated and/or eliminated. If clinical experience and the nature of the infection demonstrate that its predicted course may be 3 days, then 3 days of antibiotic therapy is enough (Salako *et al*., 2004; Askarian, 2007). When clinical evidence indicates that the infection is expected to resolve or is resolved, the antibiotic therapy should be terminated (Askarian, 2007).

Unfortunately the optimal duration of antibiotic therapy for many dental infections has never been defined by randomized controlled trials. Current guidelines are based on expert opinion, which is considered to be the lowest level of evidence (Palmer, 2000 and Palmer, 2003). There is an urgent need for randomized controlled trials with the objective of providing a scientific basis for best practice recommendations. Until such data exist, the antibiotics should be applied for a short duration. It is believed that large doses of amoxicillin (500 mg), which was prescribed by a majority of our practitioners, are not necessary in acute dentoalveolar infections, as the absorption of this antibiotic in standard 250 mg amounts is good enough to be therapeutically effective. The dose of metronidazole prescribed by our dental practitioners was 250 mg (in contrast with the recommended dose of 200 mg (Palmer, 2000 and Palmer, 2003). Our findings indicate that the scientific basis for prescribing antimicrobial agents was neglected by the majority of the respondents. Most of those surveyed used antibiotics routinely for conditions where local treatment would be sufficient. This is not surprising as similar findings were reported among other health professionals by dental practitioners in other countries (Palmer, 2000; Salako *et al*., 2004 and Al-Haroni *et al*., 2006). It is clear that our dental practitioners need expert advice on when and what to prescribe, for how long and in what dosage. Qualitative research is required to see if we can find out directly from practitioners why this problem of inappropriate antibiotic prescribing is so intractable, as well as the practitioners' attitude towards changing their prescribing behavior.

Conclusion

Audit of clinical antibiotic prescribing in dentistry has been reported to improve general dental practitioners' attitudes to prescribing antimicrobials, reducing the number of prescriptions following the introduction of guidelines. It is important to inform the dental community about the accepted current antibiotic prescription guidelines and the related evidence-based clinical practice and this paper adds to the evidence needed for designing national guidelines for our dental practitioners. There is also a need to improve undergraduate education and to increase postgraduate courses and other educational activities on antibiotic prescribing, especially since there was no difference in prescribing between those practitioners who had completed a continuing education programme and those who had not. This study lends support to the hypothesis that antibiotics are being inappropriately prescribed by the dental profession in northern region of india. Introducing guidelines and re-auditing after a few years would be an important step in implementing rational antibiotic use.

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