

Dental students' knowledge for prescribing antibiotics used for treatment of periodontitis

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Abstract

Background and objective: Although antibiotics along with analgesics are commonly prescribed medications by the dentists, little is known about the knowledge and understanding of dental practitioners concerning its use in every day clinical practice. Prescription errors are very common and this may be due to medical students are not adequately instructed. This study was done to investigate dental students' knowledge of prescribing antibiotics to see if they are competent to prescribe rationally at the point of graduation.

Methods: A questionnaire was devised to investigate the dental students' knowledge for prescribing antibiotics. Students at their final year of graduation (2010) included in this study. A structured questionnaire was filled at the College of Dentistry/HMU.

Results: Most of the antibiotics prescribed were at the correct doses and dosage form but there was variability in the frequency of dosing and duration of therapy. Four different antibiotics were prescribed in this study, these were amoxicillin (74.63%), metronidazole (5.97%), tetracycline (2.99%) and erythromycin (1.49%).

Conclusion: A continuous education on the rationale use of antibiotics in dental infections is required and this would be better when integrated with its application in the clinical practice. Prescribing guidelines are required to improve the prescribing patterns of antibiotics by dental students so they will be competent to prescribe correctly and responsibly at the point of graduation.

Keywords: prescription errors, antibiotic prescribing, periodontitis.

Introduction

Dentists prescribe medications for the management of a number of oral conditions mainly orofacial infections¹. Although antibiotics along with analgesics, are the most commonly prescribed medications by the dentists, little is known about the knowledge and understanding of dental practitioners concerning its use in every day clinical practice². Prescription errors are very common, especially with newly graduated doctors. The basic problem which contributes to the irrational prescribing is that the medical students are not adequately instructed³. Antibiotic use may be associated with serious complications that have encouraged studies investigating antibiotic prescribing practices of dentists¹. Recent surveys reported that dentists have a

tendency towards over prescribing or using lower dosage of antibiotics, using broad spectrum and lack of knowledge of the incidence of adverse reactions⁴. Other surveys showed that dentists have less knowledge about antibiotic prescribing⁵. Dentists in Norway prefer to prescribe narrow-spectrum antibiotic and their prescribing is conservative⁶. This study is restricted for antibiotics prescribed for periodontitis. Periodontitis is a chronic inflammatory periodontal disease caused by infection of the supporting tissues around the teeth. The infection begins with colonization and growth of a small group of predominantly Gram-negative anaerobic bacteria and spirochetes⁷. So the microbial etiology of inflammatory periodontal disease provides the rationale for the use

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of antimicrobial medications⁸. With the use of antibiotics for the treatment of periodontal disease, the dentist is encouraged to know the pathogenic microbial content of the subgingival microbiota and the specific antimicrobial susceptibility pattern of suspected pathogens in order to avoid prescribing antibiotics against pathogen that are resistant to treatment, prescription of inappropriate antimicrobial agents which may lead to over growth of pathogens (suprainfection) and poor clinical response⁸. Dentists' prescription practices and knowledge are not always optimal and studies in different countries conducted to assess the prescription knowledge of dentists revealed lack of uniformity in prescription and sometimes the appropriate rational for prescribing⁹⁻¹¹. This study was carried out to assess the level of knowledge of dental students at their final year of graduation regarding prescription of antibiotics for periodontitis, with the focus on their knowledge for prescription components that includes name of antibiotic, dosage form, dose strength, frequency of dosing and reasons for their preference in prescribing the antibiotic was also included in this study.

Methods

A questionnaire was devised to investigate the dental students' knowledge for prescribing of antibiotics for periodontitis. Only the dental students at their final year of graduation (2010) included in this study. In this cross-sectional study, 67 students were interviewed with a structured questionnaire, which was filled in the department of periodontics at the College of Dentistry / Hawler Medical University. The questionnaire included the prescription of the locally used antiseptic and systemic antibiotics. A prescription component should include name of antibiotic, dosage form, dose strength and the frequency of dosing; inquires about concentration and daily frequency of chlorhexidine use was also included. The other part of the questionnaire was to write the reasons for

prescribing the antibiotic. Correct and incorrect answers were defined according to the 5th year students' dependent course book, (Carranz's clinical periodontology) and to information available in the current available literatures. The questionnaires were analysed and the responses to each question expressed percent of frequencies.

Results

Of the 68 final year dental students, only one student did not participate in the study, the remaining 67 students all took part in this study and were reviewed for their knowledge in prescribing of antibiotics for adults with periodontal disease, a questionnaire was prepared and given for each student. A total of 4 different antibiotics were prescribed in this study. The most commonly prescribed systemic antibiotics were amoxicillin no.50 (74.63%), metronidazole no.4 (5.97%), tetracycline no.2 (2.99%), erythromycin no.1 (1.49%), and seven (10.44 %) of the 67 students did not know to prescribe any antibiotic for periodontitis and three students (4.48%) prescribed a combination of the two antibiotics amoxicillin and metronidazole, Figure 1.

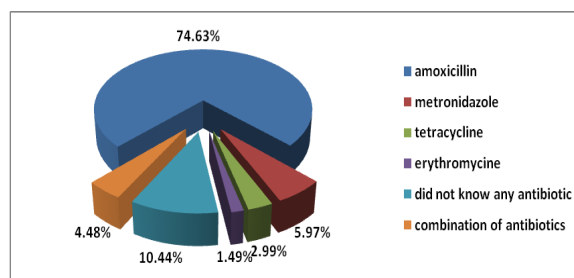


Figure 1: Single and combined antibiotic therapy prescribed by dental students.

Results for prescribing antibiotics including the dosage form, dose strength and frequency of dosing are shown in Table 1. Regarding the results for the duration of antibiotic therapy for periodontitis, all the systemic antibiotics were prescribed for a duration ranging from three days up to one

month as shown in Table 2. Regarding the prescription of local antiseptic chlorhexidine gargle, it was prescribed for periodontal diseases by only 57 students (85%) of 67 students with varied concentrations and daily frequency, (49%) prescribed 0.2 %, (3.5 %) prescribed 0.5% strength, and (24.50 %) prescribed the 0.12 %

strength .The rest of the students (23 %) did not know the strength of chlorhexidine gargle that can be used for periodontitis. Students prescribed chlorhexidine with different frequency of dosing and (19 %) students did not know the frequency of chlorhexidine Figure 2.

Table 1: Dose, dosage form and frequency of dosing of antibiotics prescribed by dental students

Antibiotic therapy	Dosage form	Dose	Frequency of dosing
Amoxicillin	Correct(cap)	82%	Correct 76%
	Incorrect	8%	Did not know 24%
	I don't know	10%	
Metronidazole	Correct(tab)	100%	Correct 100%
Tetracycline	Correct(cap)	50%	Correct 50%
	Incorrect	50%	Incorrect 50%
Erythromycin	Correct(cap)	100%	Incorrect 100%

Table 2: Duration of antibiotic treatment for periodontitis

Antibiotics	Duration of treatment						Total %
	3days N(%)	4-5 days N(%)	7days N(%)	8-14 days N(%)	1month N(%)	Until patient recover N(%)	
Amoxicillin	16 (32%)	6 (12%)	16 (32%)	8 (16%)	1 (2%)	3 (6%)	100%
Metronidazole			4 (100%)				100%
Tetracycline	1 (50%)			1 (50%)			100%
Erythromycin			1 (100%)				100%
Combination therapy	2 (66.7%)		1 (33.3%)				100%

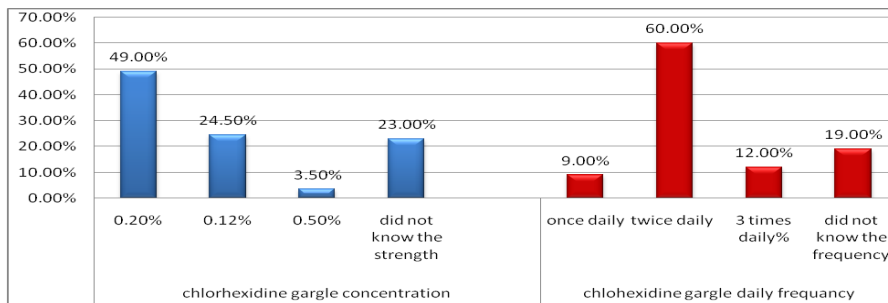


Figure 2: Concentration and daily frequency of chlorhexidine prescription .

Regarding the reasons for prescribing a particular antibiotic for periodontal disease (60 %) of the students gave pharmacological reasons for their prescribing of amoxicillin as their first choice antibiotic and these reasons were (36% broad spectrum, 6% effective ,8% less side effects, 10% both effective and have less side effects) while only (4%) of students give non

pharmacological reasons which is being available, 18 % give no scientific (or incorrect) reason for their prescribing of antibiotic and the reaming 18% did not know a reason for the prescribed antibiotic, Figure 3. For those prescribed metronidazole, tetracycline and erythromycin also gave different reasons of being effective or available or they write incorrect reasons, Table 3.

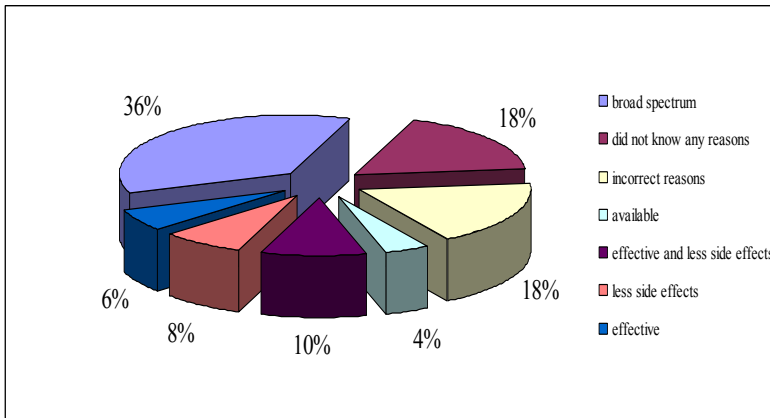


Figure 3: Reasons claimed for prescribing amoxicillin antibiotics for periodontal disease.

Table 3: Reasons for selecting antibiotics for periodontal disease.

Antibiotics	Reasons for prescribing antibiotics				Total%
	Pharmacological (effective)	Non pharmacological (e.g. availability)	Incorrect reasons	Did not know any reason	
Amoxicillin	60%	4%	18%	18%	100%
Metronidazole	50%		25%	25%	100%
Tetracycline	50%		50%		100%
Erythromycine	100%				100%

Discussion

Antibiotic prescription is clearly a complex multi factorial issue. Prescribers must have a through understanding of the clinical indications for antibiotic prescription both therapeutic and prophylactic. They also need an understanding of the risks of adverse reactions and of the development of resistant strains¹². Chlorhexidine is the most widely used antiseptic product in

dentistry; it exhibits a broad – spectrum efficacy, substantivity to tooth surfaces and mucosa, and dental plaque- inhibiting properties¹³. Reduction of periodontal pathogen can be markedly enhanced by locally delivered antiseptics¹⁴. This study showed that three quarters of students prescribed chlorhexidine mouth wash at 0.12 % and 0.2 % concentration which is considered

effective for prevention of plaque and the prevention and treatment of gingivitis^{15, 16}. Prescribing chlorhexidine solution at 0.5 % concentration was considered incorrect because this concentration used preoperatively for skin disinfection and hand washing¹⁶. Chlorhexidine mouth wash was prescribed with variable daily frequencies but most of students prescribed it 2 – 3 times daily which is considered effective in reducing plaque accumulation and gingivitis^{15, 16}. Patients with periodontal disease might benefit from rinsing with 10-15ml of 0.12 % of chlorhexidine solution for 30 seconds twice daily¹⁴. Antibiotics commonly used in periodontics either singly or in combination, include amoxicillin, metronidazole, clindamycin, ciprofloxacin and tetracyclines¹³. This study showed that broad spectrum amoxicillin was the most commonly prescribed as a single antibiotics therapy for periodontal disease and to less extent was metronidazole, tetracycline and erythromycin (75 %, 6%, 3%, 2 % respectively). Comparing studies done in other countries showed that in England¹⁷ Jordan and Scotland^(2,11) amoxicillin and metronidazole were the most commonly prescribed antibiotics by dental practitioners. In Belgium, Mainjot et al (2002) found that broad spectrum antibiotics (amoxicillin, amoxicillin – clavulanate and clindamycin) were most commonly prescribed in Belgian dental practice¹⁸. However, dentists in Norway prefer to prescribe a narrow – spectrum antibiotics (phenoxymethyl penicillin)⁶. Penicillin is still gold standard in treating dental infections; among the group of penicillin amoxicillin, amoxicillin – clavulanate and penicillin V have been advocated for the treatment for odontic infections. The choice of amoxicillin – clavulanate offer an effective coverage of oral bacteria with its characteristic of attaining high levels in sulcus fluid. However, two main problems associated with the administration of amoxicillin are allergic reactions and its high susceptibility to bacterial – B – lactamases which will inactivate the antibiotics. The B– lactamases are relatively common in

periodontal pockets and correlate positively with age of patient and depth of pocket, reducing overall drug efficacy¹⁹. Metronidazole is the second most prescribed antibiotic in the present study and was most prescribed by dentists else where^{2,11,17}, and should be the dentists' first choice when treating anaerobic infections. It may arrest disease progression in periodontitis patient with *p. gingivalis* and for *p. intermedia* infections¹⁹. Metronidazole is used empirically in combination with one or more antibiotics²⁰. Tetracyclines may be indicated in periodontal infections in which *Actinomyces Comitans* is the prominent pathogen⁸. Erythromycin belongs to macrolide antibiotics. It is only recommended for patients allergic to penicillin¹⁷. In this study only small percent (4%) prescribed combination of antibiotics for periodontal disease which included amoxicillin plus metronidazole. This combination provides a relatively predictable eradication of *Actinomyces Comitans* and marked suppression of *P. gingivalis* in aggressive forms of adolescent periodontitis⁸. Similar to our result, Palmer et al found that in England about 5.6% of prescription were for combinations of antibiotics, the most frequent combination being amoxicillin and metronidazole, while DPF (Dental Practitioners' Formulary) in England recommends phenoxymethylpenicillin (or erythromycin) with metronidazole as combination therapy¹⁷. In USA the combination therapy used in periodontal disease is metronidazole and amoxicillin or metronidazole and ciprofloxacin²¹. A combination of antimicrobials instead of a single agent may be considered, especially in the case of periodontal infection due to multiple pathogens with different antimicrobial susceptibility; in such a situation a combination of drugs is chosen to cover all the important pathogens⁸. Single or combined drug therapies have become more important in dental practice, but whenever possible, single drug therapies should be prescribed to reduce the incidence of side effects, emergence of resistant bacteria and cost of therapy²².

The choice of antibiotics that a dental practitioner makes, because the range of options is limited, is less likely to be inappropriate. It may therefore be the dose, duration, or frequency of antibiotic prescription that is inappropriate²⁰. This study showed that most of the antibiotics were prescribed at the correct doses and dosage form but there was variability in the frequency of dosing and duration of therapy for the prescribed antibiotics, and still there is about 20% of students did not know to prescribe any antibiotics for patients with periodontal disease. Two different studies in Jordan and England showed that GPs prescribe antibiotics for acute dental infections with a wide variety of dosage, frequency and duration^{2,17}. Salako et al (2004) showed that dentists in Kuwait preferred to prescribe a lower dosage of an antibiotic over a longer period⁹. In recent years, more attention has been given to short courses. Rubenstein (2007) explains that therapy with short-course antibiotics requires that the antibiotic should have certain characteristics, such as: rapid onset of action, easy penetrability into tissue, bactericidal activity, administration at an optimal dose and optimal dosing regimen²³. Prolonged courses of antibiotics destroy the commensal flora²⁴. Antibiotics should be prescribed at the correct dose, frequency and duration that minimal inhibitory concentration is exceeded and side effects and selection of resistant bacteria are prevented¹⁷. Regarding the reasons for prescribing a particular systemic antibiotic, the results showed that it was mostly based on pharmacological factors (e.g. antibacterial spectrum of antibiotic), as a first option in case of choosing between different antibiotics, rather than non-pharmacological factors (e.g. cost and availability of the antibiotic). However, most of students were incomplete in their answer regarding their preferred choice of antibiotics they prescribed, this may be due to lack of knowledge for the antibiotics regarding to spectrum of antibacterial activity. Studies have suggested that prescription is

influenced by undergraduate and post graduate education, publication and advertising, and non-clinical factors such as the cost and availability^{2, 25, 26}.

Conclusion

Making decision in antibiotic therapy prescriptions requires continuous education in the rationale use of antibiotics in dental infections and it may help to be integrated with its application in the clinical practice at the teaching clinics of the dentistry College during the academic years.

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