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The Pattern in the Utilization of the First-Choice Antibiotic among Dentists in the Republic of Kosovo: A Prospective Study

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Abstract

Objective Antibiotics are prescribed by dentists during dental treatments, depending on the diagnosis and severity of the disease. Appropriate indicators of the benefit of systematic and regular use of antibiotics in dentistry are limited, because a large number of dental and periodontal problems can be treated either by surgical intervention or by maintaining good oral hygiene. Improper use of antibiotics leads to antimicrobial resistance. In Kosovo, this problem is very evident and more studies are required to identify antibiotic prescribing patterns by health care workers. In this context, this study aims to investigate the issue of antibiotic use in dentistry.

Materials and Methods This prospective study was conducted for 6 months and followed the dental practice of 80 dentists. Data were collected from 795 patient forms.

Results After analysis, results showed that amoxicillin with clavulanic acid and amoxicillin alone were the most commonly prescribed antibiotics, each accounting for 35%. The most common indications for antibiotic prescription were dental and periodontal abscesses (24.9%), while 20.7% of antibiotics were prescribed for post-extraction healing, pericoronitis (15%), chronic periodontitis (12.8%), and dry socket (11.5%).

Conclusion These results suggest that the problem of inappropriate antibiotic prescribing is not only overprescribing but also the selection of inappropriate agents, especially amoxicillin with clavulanic acid, instead of amoxicillin alone.

Keywords
- antibiotics
- prescribing
- dentist
- dental care
- Kosovo

Introduction

The major role of antibiotics is to control infectious diseases and reduce their impact on public health. Antibiotics represent one of the most important classes of drugs in clinical practice today and are the most prescribed class of drugs in dentistry, with their use increasing annually worldwide.[1,2] In dentistry, antibiotic therapy is recommended as an adjunct to mechanical dental treatment to control acute infections and for prophylaxis in high-risk patients,[3–5] with amoxicillin as the first-line antibiotic. Antibiotics alone, without drainage, are ineffective in preventing the spread of infection.

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Empiric use of cephalosporins, amoxicillin with clavulanic acid (co-amoxiclav), clarithromycin, and clindamycin offers no benefit to most dental patients, and should be used only when there is no response to first-line medications.[6,7]

Inappropriate antibiotic prescribing is a universal public health problem worldwide, especially in developing countries (but not limited to them), leading to antibiotic resistance. However, the development of bacterial resistance as a result of unnecessary antibiotic prescribing is a problem that was recognized many decades ago. Indeed, the World Health Organization (WHO) has been sounding the alarm since May 2015 based on global reports of the emergence of new strains of bacteria resistant to the last line of defense of antibiotics.[4,8]

Antibiotic resistance in Kosovo is a major public health concern. Therefore, understanding antibiotic prescribing patterns is critical to addressing the problem. The main challenges related to antimicrobial resistance (AMR) in Kosovo are limited financial and human resources, over-the-counter sales of antibiotics, and lack of clinical guidelines approved by the Ministry of Health. In 2018, the Minister of Health signed a new National Action Plan for Antimicrobial Resistance for a period of 3 years. This action plan has five strategic objectives and 47 activities. Specific objectives of the Antimicrobial Resistance Action Plan are to strengthen intersectoral coordination, increase awareness, educate and train the public and health care workers, improve monitoring capacity, optimize the use of antibiotics in human and veterinary medicine, reduce infections, and promote research and international cooperation.[9]

Antibiotic prescribing by dentists has a significant impact on the rate of overall antibiotic use, and efforts have been made to establish a surveillance system for monitoring and control. Unfortunately, there are few comprehensive studies on antibiotic prescribing behavior among both dentists and patients, especially in Kosovo. The aim of this study was to identify the first-line dental antibiotic option and for which indication therapy it was prescribed.

Materials and Methods

Methodology

This prospective study was based on data collection on the antibiotic of first choice in the treatment of odontogenic infections in dental practices of the Hospital and University Clinical Service of Kosovo. Data were collected using a structured questionnaire to determine dentists' first choice and indications for antibiotic therapy. Data collection was conducted from October 1, 2020 to March 31, 2021.

Target Population

The target population consists of dentists practicing in their specialty and working within the Hospital and University Clinical Service of Kosovo (HUSCK). The investigators in this study observed the selected physicians individually during the study period. To obtain statistically reliable results, the sample size was calculated to a minimum of 48 participants to obtain the required number of participating physicians. Excluding the usual questionnaire response rate (50%) and the usual percentage of incomplete forms of 15%, the final number of participants and valid forms was 80. The investigator visited the practice every 2 weeks and collected the material. Dentists who participated in the survey did so anonymously, voluntarily, and without compensation. A total of 80 dentists were randomly invited to participate in this study; a questionnaire was distributed to them. After they gave their consent, the questionnaires were filled out with the requested data and returned. The study was approved by the Ethics Committee of the School of Dental Medicine, University of Zagreb, Croatia, Europe (Ethical protocol number/approval No. 05-PA-30-VII-5/2019), and by the Ethics Committee of the Hospital and University Clinical Service of Kosovo (HUCSK)—decision number 830/2. The study was conducted in accordance with the Declaration of Helsinki.

Questionnaire

Based on similar studies,[10] a questionnaire was created, which was divided into two parts. The first part of the questionnaire collected general information about the field of study, profession, participation in continuing education, year of graduation, and length of time in the profession. The second part, the Antibiotic Prescribing Data Collection Form, consisted of specific questions that included data on antibiotic prescribing for each patient, including data on patient age and sex, antibiotic prescribed, loading dose, dosing protocol, frequency, duration, condition, and reasons for prescribing therapy. Dentists could select 1 of 10 options for the condition for which the antibiotic was prescribed and 1 of 8 options describing the reason for the selection. The second section was structured as a table in which respondents entered data on a daily basis.

Statistical Analysis of Data

For statistical analysis, data were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Data were downloaded, organized, checked for errors, and analyzed. All data were analyzed using descriptive statistics. Excel was used to derive frequency and percentage analyses and to process the primary data. Valid percentage and cumulative percentage are used in data prescription. The valid percentage is the percentage when missing data are excluded from calculations. The cumulative percentage is calculated by dividing the cumulative frequency by the total number of observations (n) and then multiplying by 100 (the latter value always equal 100%). Frequency tables and graphs were created showing the respective percentages and frequencies for each question analyzed.

Results

All 80 invited dentists responded to the survey. All questionnaires collected were valid for statistical analysis. Regarding the sample of dentists and their specialties, most of the study participants were general dentists and oral surgery specialists, whereas the smallest proportion consisted of

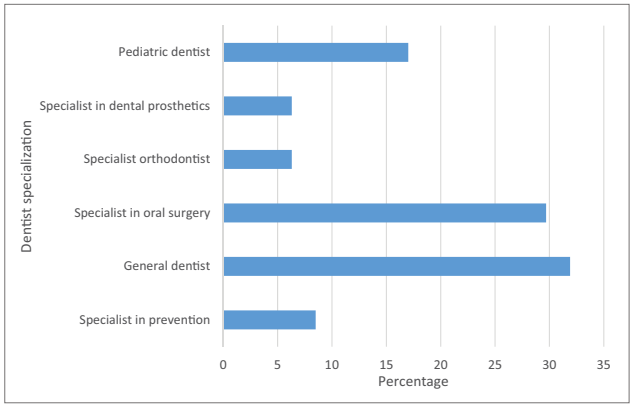

Fig. 1 Practice-related characteristics of the participating dentists.

orthodontists and prosthodontists (►**Fig. 1**.). Their professional qualifications began between 1980 and 2010, and the distribution is shown in ►**Fig. 2**. About half of the participants (47.5%) had undergone postgraduate training or participated in continuing education of any kind in the past 2 years, The average age of patients prescribed antibiotics was 40 years, with a gender distribution of 52.1% women and 47.9% men.

For the second part of the questionnaire, the antibiotic prescriptions of 795 patients during the 6-month period were recorded, analyzed, and summarized in ►**Table 1**. Regarding the type of antibiotic, amoxicillin and co-amoxiclav were the antibiotics of first choice for the majority of respondents in patients without penicillin allergy (35.1% each), as shown in ►**Table 1**.

Regarding dosage, 96.6% of prescribed antibiotics were prescribed in correct dosage and frequency based on the analyzed data, eliminating the possibility of dosage errors. Regarding the duration of medication, most respondents, exactly 86.9%, were prescribed antibiotics for 7 days, while 7.2% had a duration of 5 days. The reasons for prescribing antibiotics by diagnosis are shown in ►**Table 2**. In the vast majority of cases, that is, 99.6%, the reason for prescribing antibiotics was a clear clinical indication, while only in 0.4% of the cases the reason was an expectation on the part of the patient.

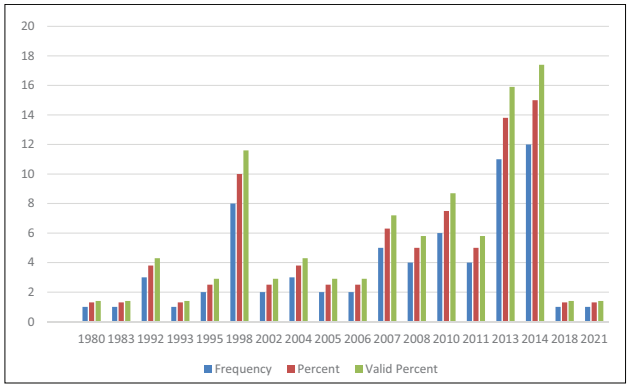

Fig. 2 Year of qualification of the participating dentists.

Table 1 First-choice antibiotic preference of the participant dentists

Name of medication	Cumulative frequency	Cumulative percentage
Amikacin	1.1	0.1
Amoxicillin	279.1	35.3
Amoxicillin + metronidazole	2.3	35.5
Amoxiclav	289.1	71.1
Ampicillin	1.1	71.2
Azithromycin	9.2	72.4
Cefalexin	162.4	92.8
Cefazolin	2.3	93.1
Cefotaxime	1.1	93.2
Ceftriaxone	3.4	93.7
Cephalexin	2.3	94.0
Cloxacillin	1.1	94.1
Dicloxacillin	1.1	94.2
Erythromycin	38.9	99.1
Total	795.0	

Discussion

In this study, an attempt was made to find an objective pattern for antibiotic prescribing by dental professionals in Kosovo, in both an internal and a regional context.

The prospectively collected data from 80 dentists showed that the most common first-line antibiotics in this study were co-amoxiclav and amoxicillin, in almost equal proportions. These data show an improvement in the antibiotic of first choice compared with previous studies in Kosovo, where the antibiotic of first choice was co-amoxiclav, regardless of the institutions where the studies were conducted.[11–13] This improvement in prescribing patterns at HUSCK could be due

Table 2 Diagnoses for which antibiotics were prescribed

Indication	Percentage	Cumulative percentage
Dental and perio-abscess	24.9	25.5
Postextraction recovery process	20.7	91.4
Pericoronitis	15	51.9
Chronic periodontitis	12.8	64.7
Pain from an unknown etiology	5.9	70.6
Trauma	4.9	100.0
Preoperative condition	3.7	95.1
Acute ulceronecrotic gingivitis	0.6	0.6

to the fact that dentists working in a university/hospital setting are more confident in their treatment decisions and adhere to guidelines.[14] The most recent survey conducted in Kosovo based on official data of patients from secondary and tertiary health care facilities showed that antibiotic use varied according to the county/city surveyed.[15] Thus, this improvement in the pattern could also be related to the fact that the HUSK institution is located in a large city in Kosovo, where the highest quality of medical care is provided. This difference needs to be clarified by further studies.

According to studies on the efficacy of antibiotics in dental infectious diseases, amoxicillin is mentioned as the first choice in various guidelines for the treatment of odontogenic infections.[16,17] The spectrum of action is crucial for understanding the difference between these two antibiotics, amoxicillin being an extended-spectrum antibiotic, whereas co-amoxiclav being a broad-spectrum antibiotic. One of the most important principles for the prudent use of antibiotics is to choose a drug with a narrower spectrum as the first choice to avoid the development of possible antibiotic resistance.[18] Improper use of antimicrobials is the most important cause of the emergence of resistant microorganisms (AMR). One of the biggest challenges in combating AMR is identifying the true burden of resistance, especially in places where surveillance is minimal, such as Kosovo. Although the development of bacterial resistance does not have a simple quantitative relationship, the reduction in antibiotic resistance can only occur after a significant reduction in antibiotic use.[19,20] To reduce or improve antibiotic prescribing patterns in dentistry, it is important to establish the baseline, including diagnosis, reasons for prescribing, dosage, and duration of therapy in the target group of practitioners.

The indications for which antibiotics were prescribed showed a possible pattern of overprescribing, according to our results. Although 99.6% of participants stated that the reason for prescribing antibiotics was a clear clinical indication, the results could not confirm that statement. Compared with a similar study in Croatia, a country in the neighborhood of Kosovo and once part of the same country as Kosovo, antibiotics in Kosovo were prescribed twice as often after tooth extraction, 10 times as often for dry socket treatment, and 3 times as often for the treatment of pericoronitis.[21] The indications for antibiotic prescribing in dentistry are strict and narrow. For odontogenic infections, these include acute apical abscesses with systemic involvement, rapid onset of severe infection, spreading infection, osteomyelitis, replantation of avulsed permanent teeth, and soft-tissue trauma requiring treatment or use in patients who are medically compromised. For periodontal infections, systemic antimicrobials can be used as adjunctive therapy to scaling and root planning. Antibiotic treatment may also be indicated for localized deep sites with persistent or recurrent disease, when periodontal infection needs to be quickly suppressed in early-onset disease or in patients with uncontrolled diabetes.[16,17] Thus, prescribing antibiotics only for pain, as was the case in 5.9% of our results, is a misuse of antibiotics. National strategies, education, and policy implementation should address access and prudent use of antibiotics by implementing antimicrobial stewardship programs at the community or hospital level.[22,23]

Indiscriminate use of antibiotics in Kosovo is a problem that affects dentistry as well as the entire field of medicine.[24] In Kosovo, there is still no systematic monitoring of antibiotic use in primary dental care, which is a major problem in rationalizing antibiotic use in dental practice. Several studies on the use/self-medication of antibiotics by citizens, the prescribing behavior of physicians, and the practice of pharmacies dispensing antibiotics without a prescription have already shown that antibiotic prescribing patterns in Kosovo are far from optimal.[25,26] The widespread practice of purchasing antibiotics without a prescription is also a common problem in Kosovo.[26] Therefore, there is an urgent need for further research to determine the objective use of antibiotics in Kosovo in all areas of application in order to collect unbiased data that can be used to improve the national strategy, the National Action Plan for Antimicrobial Resistance.[9] There is also a need for legal provisions for dispensing antimicrobials through pharmacies without prescription and online.[27,28]

The limitations of the study are the lack of information on prescribing patterns from general and private dental practices, which would provide better insight into overall antibiotic use from general dental practices. Second, the participants in this study are from a tertiary health care institution, which means that they generally have some specialization and some type of continuing education. The last limitation is that the authors did not follow up the patients who were not prescribed antibiotics, so the information about the proportion of antibiotic prescription among the observed participants remains unknown.

Conclusion

This prospective study, which followed the 6-month pattern of antibiotic use, provided evidence of inappropriate practice among dentists. These findings suggest that the problem of inappropriate antibiotic prescribing is not only overall unnecessary prescribing but also the selection of inappropriate agents, especially co-amoxiclav, instead of amoxicillin alone. The future approach will require public participation in developing educational interventions that are relevant to the public.

Conflict of Interest
None declared.

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