

The Attitude and Pattern of Antibiotics prescription among Yemeni Dentists and their relation with the Emergence of Bacterial Resistance

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Research Article

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Abstract

Background: misuse of antibiotics among prescribers may accompany the increase in the emergence of bacterial resistance.

Purpose: The objective of this study is to evaluate the attitude and pattern of antibiotics prescription regarding the type, duration of antibiotics based on evidence-practice guidelines. Besides that, to assess the attitude of dentists toward antibiotic resistance.

Methods: A cross-sectional structured and validated questionnaire addressing demographic, educational, and professional data. It also measured their attitude regarding antibiotics prescription, prophylaxis, and their uses in special populations.

Analyses used descriptive statistics, and bivariate analysis to observe predictors of higher knowledge.

Results: The reported average of antibiotics prescriptions per week was 11.67 in the present study, which agrees with the study conducted in Lebanon but higher than the outcomes of other studies, especially in developed countries. There are no significant changes regards the gender of prescribers. Amoxicillin was the most popular antibiotic prescribed by dentists in the present work (36%). The prime determinant to select antibiotics is the availability of commercial items (40%). There is a misconception and low knowledge among participants about the duration and alternatives of the antibiotic used in pregnancy. Most dentists are aware of antibiotic resistance (85%).

Conclusion: the outcomes of the present study showed that there is an over-prescription of antibiotics among Yemeni dentists compared with other countries. This may correlate with the emergence of resistance and difficulty to treat just simple dental infections.

Introduction

Antibiotic is a term that refers to the chemical and medicines that can kill bacteria, initially was derived from soil microorganisms was and firstly discovered in 1929¹. It is used for affordability in the curative and prophylactic effects against bacteria that affect the dental and oral cavity². Orofacial infections caused by different species varied from gram-positive, to gram-negative as well as obligate anaerobic bacteria³. This is behind the growing up of prescribing antibiotics by dental practitioners. Recently most bacterial strains become resistant to the selected antibiotics especially if their prescription is not based on evidence-practice guidelines. Methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant *Staphylococcus aureus* (VRSA) are the most widely known example of extensive resistance. This is referred to the ability of bacteria or microbes to undergo genetic changes⁴ World Health Organization (WHO) warned about the development of antimicrobial resistance as a formidable threat to global health. Their awareness included that without an effective response, resistance to antimicrobial compounds might result in approximately 10 million deaths per year worldwide by 2050⁵. Additionally, the Center for Disease Control and Prevention (CDC) spearheaded efforts to optimize the inappropriate

use of antibiotics for either outpatient or settings in hospitals. It provides clinical guidelines for antibiotic stewardship programs to the different healthcare settings to reduce the emergence of resistance ⁶⁻⁹

However, culturally informed interventions can lead to greater rates of commitment, compliance, and better health outcomes, especially among health practitioners including dentists ¹⁰. Dentists are among the most empirical antibiotic prescribers according to literature (10%) of all antibiotics in U.S outpatient settings ¹¹. Therefore, the use of antibiotics as adjunctive therapy besides dental procedures is very important to measure particularly in the presence of comorbid diseases like diabetes mellitus, valvular disease, or any other complications ¹². Systemic antibiotics prescription as if the other medications have adverse drug reactions. The inappropriate use may raise the incidence of untoward effects varying from the emergence of resistance to and development of anaphylactic shock ^{13,14}.

Regarding the previous reasons, the objective of this study is to evaluate the pattern of antibiotic prescription among dentists in Yemen based on practice-evidence guidelines and to assess their knowledge attitude towards the emergence of resistance.

Materials And Methods

Study design and participants

The present study was designed as a prospective, cross-sectional descriptive study, questionnaires containing open-ended and close-ended items for data collection were used in this study. There was a total of 400 Yemeni dentists of both sexes from different educated levels were participated in the present study. The sample size was calculated by Epi Info 7 Dos version 3.5.1 software (Centers for Disease Control and Prevention, Clifton Road, Atlanta, USA). They were selected randomly from health sectors (hospitals, universities, clinics, and health centers according to the Ministry of Health and Populations in the different areas of the town. Inclusion criteria were any dental practitioner holding the Bachelor of Dental Surgery (BDS), Master of Dental Surgery (MDS), and Doctor of Philosophy of Dental Surgery (PDS) degree registered in the Dental Association and got a License to practice the profession from the Medical Council-Ministry of Higher Education, Sana'a City, the Capital of the Republic of Yemen. All participants were not willing to the previous criteria excluded.

However, a designed and structured questionnaire of two sections was written in English and translated to the Arabic language to overcome the language barrier, first one consists of demographic information about dentists like age, sex, level of education and there was no personal information. The second section consists of fourteen professional questions including types and duration of prescribed antibiotics, the source of practice information as well as their knowledge and attitude towards the emergence of bacterial resistance. The questionnaire was revised and validated by the Department of Community Medicine-Faculty of Medicine and Health Sciences, University of Science and Technology, Sana'a, Yemen.

The study was conducted at the faculty of Pharmacy, University of Science and Technology, Clinical Pharmacy, and Pharmacy Practice Department. The data collection period was continued for 6 months from November 2019 to April 2020.

Statistical Analysis

The collected data obtained was firstly verified and coded before entry and analyzed by SPSS (SPSS Inc. Chicago, IL, USA) version 21 software. Categorical variables were described using (frequency, mean and standard deviation) and inferential statistics (a chi-square test and logistic regressions). Chi-square was used to explore the association between professional demographics and the participant's responses. The confidence interval of 95% and $p < 0.05$ were considered significant.

Results

First: the demographic characteristics

In this study, 400 dentists agreed to participate, thus resulting in a 100% response rate. Female dentists consisted 51.5% and male dentists consisted 48.5% with ages > 35 years and most of them were single (67%) with bachelor's dentistry degree (83%) graduated in Yemen (83.5%) with low years of expert (1–5) years as shown in figures (1, 2, 3, 4, 5 and 6)

Second: Analysis of the research objectives

-Regarding the knowledge of participants about prescribing antibiotics, the average knowledge was 57.5% as shown in Fig. 8. Moreover, Tables 1 and 2 show the smallest and largest number of patients referred to dental clinics and the number of systemic antibiotics prescribed per week. Table 3 shows low knowledge (43%) of participants about the best antibiotics prescribed to pregnant women, as well as the questions about the minimum number of days of antibiotics administration (95.8%) while showing high knowledge regarding the methods of antibiotics administration (95.7%)

However, the outcomes of the present study showed that the important sources of information for the most of participants are the internet (36.5%) as shown in Table 4. Additionally, the most antibiotic prescribed is amoxicillin (36.8%) as shown in table 5. Table 6 shows the good alternative antibiotic (36%) in the presence of penicillin-allergy.

Table (1): The number of patients per week

| Number of patients per week | N | Average | Standard deviation |
|--|-----|---------|--------------------|
| The smallest number of patients per week | 400 | 15.67 | 11.8 |
| The largest number of patients during a week | 400 | 25.85 | 18.9 |

Table (2): The number of antibiotic prescriptions per week

| The number of systemic antibiotics prescribed per week | N | Average | Standard deviation |
|--|-----|---------|--------------------|
| The lowest number of antibiotics per week | 400 | 7.02 | 6.14 |
| The largest number of antibiotics per week | 400 | 11.67 | 8.48 |

Table (3): Dentists 'knowledge about prescribing antibiotics

| N | Paragraphs on the axis of doctors' knowledge | Wrong answer | | Right answer | |
|---|--|--------------|-------|--------------|--------|
| | | N | % | N | % |
| 1 | What are the most common methods of administration | 19 | 4.3% | 381 | 95.7% |
| 2 | What is the minimum number of days to prescribe antibiotics | 383 | 95.8% | 19 | 4.2% |
| 3 | What is the most common determinant of prescribing antibiotics | 0 | 0.0% | 400 | 100.0% |
| 4 | What is the best antibiotic to prescribe to a pregnant woman | 228 | 57.0% | 172 | 43.0% |

Table (4): The percentage of basic sources of modern information for dentists

Table 4 shows that most of the participants (36.5%) depend on the internet as the main and basic source to get the modern information

| The primary source of modern information | N | % |
|--|-----|------|
| Published Practical Papers | 44 | 11 |
| Continuing dental education | 112 | 28 |
| Books | 98 | 24.5 |
| Internet | 146 | 36.5 |
| Total | 400 | 100 |

Table (5): The percentage of the most common antibiotics

| The most common antibiotics | N | % |
|------------------------------------|----------|----------|
| Amoxicillin | 147 | 36.8 |
| Amoxiclav | 61 | 15.3 |
| Amoxicillin + Metronidazole | 88 | 22.0 |
| Ofloxacin + Ornidazole | 2 | 0.5 |
| Clindamycin | 22 | 5.5 |
| Spiramycin + Metronidazole | 80 | 20.0 |
| Total | 400 | 100.0 |

Table (6): The alternative antibiotics for penicillin-allergy patients

| Patients with penicillin allergy; What is the alternative antibiotic that is being dispensed | N | % |
|---|----------|----------|
| Erythromycin | 140 | 35 |
| Clindamycin | 107 | 26.8 |
| Azithromycin | 58 | 14.5 |
| Spiramycin + Metronidazole | 81 | 20.3 |
| Clarithromycin | 2 | 0.5 |
| Cephalosporin | 7 | 1.8 |
| Ciprofloxacin | 5 | 1.3 |
| Total | 400 | 100 |

-Most of the participants (85%) believe in antibiotic resistance as shown in table 7, but their opinion on the causes of resistance is varied, still incomplete the course of antibiotics by the patient is the major cause of the emergence of antibiotic resistance (42%) as shown in table 8.

Most of the participants (70%) are inquire whether the patient taking antibiotics before going to consultation as shown in table 9

Table (7): Dentist's beliefs about antibiotic resistance

| Do you think antibiotic resistance is a growing concern? | N | % |
|---|----------|----------|
| Yes | 340 | 85 |
| No | 60 | 15 |
| Total | 400 | 100 |

Table (8): Percentage of dentists' opinion about causes related to antibiotic resistance

| What do you think of the various causes associated with antibiotic resistance? | N | % |
|---|----------|----------|
| Wrong prescription | 81 | 20.3 |
| Substandard doses | 81 | 20.3 |
| Weak monitoring | 26 | 6.5 |
| Patients who have not completed the course of antibiotics | 168 | 42.0 |
| Bad diagnostic methods | 44 | 11.0 |
| Total | 400 | 100.0 |

Table (9) Shows the percentage of prescribers who inquire from the patient before moving to a consultation

| Do you inquire whether the patient is currently taking an antibiotic before going to the consultation? | N | % |
|---|----------|----------|
| Always | 283 | 70 |
| Sometimes | 82 | 20.5 |
| Never | 35 | 8.88 |
| Total | 400 | 100.0 |

-Regarding dentist's attitudes toward patients who are already taking antibiotics before consultations, most advise the patients to continue the antibiotic course (33%) as shown in table 10

Table (10): the percentage of dentist's attitudes toward patients who take antibiotics before the consultation

| The attitude of dentists towards a patient who is already taking antibiotics before the consultation | N | % |
|---|----------|----------|
| Continue the antibiotic course | 132 | 33 |
| The procedure is based on an antibiotic | 120 | 30 |
| Changing the antibiotic | 50 | 12.5 |
| The procedure depends on the time | 43 | 10.8 |
| Stop taking the antibiotic | 25 | 6.3 |
| Continue the antibiotic course with the addition of vitamins | 23 | 5.8 |
| Increase the dose | 7 | 1.8 |
| Total | 400 | 100 |

-Regarding the factors affecting the behavior of dispensing antibiotics, most of the participants (42.3) referred this to the diseases as shown in table 11

Table (11): the percentage of factors affecting the behavior of dispensing antibiotics

| What factor most affects antibiotic dispensing behavior | N | % |
|--|----------|----------|
| Previous experience in antibiotics | 123 | 30.8 |
| Diseases accompanying the patient | 169 | 42.3 |
| The socioeconomic status of the patient | 31 | 7.8 |
| The price of antibiotics | 34 | 8.5 |
| Availability of samples | 38 | 9.5 |
| Visits of the medical representative | 5 | 1.3 |
| Total | 400 | 100 |

Discussion

The use of antibiotics is increased among prescribers in the last few years. Dentists are among the prescribers that have differences in their knowledge of clinical situations indicated for antibiotics. According to previous studies, antibiotic is not needed for acute periapical infection, dry socket, and pulpitis¹⁵. Almost half or more of the dentists investigated in Kuwait¹⁵, England¹⁶, Turkey¹⁷, the USA¹⁸, and Belgium¹⁹ would prescribe antibiotics for dry sockets. Current guidelines recommended systemic antibiotics management for conditions of acute periodontal conditions where drainage or debridement is impossible, where there is a local spread of the infection or where systemic upset has occurred²⁰. However, the prophylaxis uses of antibiotics depend on the guideline for using them in patients with

prosthetic joints or at risk of infective endocarditis inappropriate antibiotics prescribed by general dentists²¹. The present study is designed to evaluate the attitude and pattern of antibiotic prescription among Yemeni dentists and their relation to the emergence of bacterial resistance. The questions in the present study were based on the studies done in other countries¹⁵⁻¹⁹. The overall average of antibiotics prescription per week was 11.67 in the present study which agrees with other studies conducted in Lebanon, 2018²², but is still high compared with other studies done in Australia, Belgium, and the United Kingdom^{19, 23, 24}

There is no significant difference between the prescribers regarding gender and sex in the present study which agrees with the study conducted in Riyadh, 2013²⁵, but is inconsistent with the study done in Sudan, 2019²⁶.

Inadequate duration of the therapy, overdosing of the antibiotics and inappropriate alternatives for pregnant women have resulted in damaging the host response, easily emergence of resistance development as well as hazardous for fetus development²⁷. The outcomes of the present study showed low knowledge of dentists about prescribing antibiotics in the inspection sheet, especially about the minimum number of days to prescribe antibiotics as well as the best antibiotic prescribes to a pregnant woman. The reason may refer to the low curricula level particularly in pharmacology topics and in education, the level of the prescribers (BSc), and their experience years 1–5 and they depend on the internet as the main source of information. These results are consistent with other studies conducted in Riyadh (Saudi Arabia, 2013)²⁵.

Generally, in the present study amoxicillin was the most popular antibiotic prescribed by dentists in practice as broad-spectrum penicillin. This result is conducted with other studies^{24- 26}, followed by metronidazole in combination with other antibiotics that cover anaerobic bacteria²⁸. The least antibiotics prescribed by our prescribers was Ofloxacin + Ornidazole by 0.5%, which agrees with other studies that were conducted in other countries^{29, 30}. The use of erythromycin is considered a good choice in a dental practice as an alternative in presence of a patient allergy to penicillin as found in the outcomes of this study. Another study disagrees with this finding as they mentioned that the use of erythromycin declines in dental practice due to the emergence of bacterial resistance.²²

According to World Health Organization (WHO), antibiotic resistance is a 'global threat' impacting global health, food security, and development and is as important as a change in climate³¹. It can affect people of all ages and in different countries especially in developing countries as there is no health insurance, poor health services as well a lack of awareness campaigns about the misuse of antibiotics³². In the present study, most of the participants believe that antibiotic resistance is of increasing concern, according to other studies^{26, 30, 33, 34}. The unfinished antibiotic course is still the major cause of the emergence of resistance, for this reason, the Ministry of Health should conduct awareness campaigns about the misuse of antibiotics

Conclusion

The outcomes of the present study showed that there is an over-prescription of antibiotics among Yemeni dentists compared with other countries. This practice may end with the emergence of resistance and difficulty to treat just simple infections. Prescribing practices of dentists can be improved by increasing awareness among dental practitioners of the recommended guidelines as well as the need for undergraduate and postgraduate up-to-date courses orientation on antibiotics use.

Declarations

Acknowledgment

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Disclosure

The authors report no conflicts of interest in this work

Ethics approval and consent

Ethical permission [No. EAC/UST 184] was approved by the Ethics Committee at the University of Science and Technology-Sana'a. It was declared to all dentists that participated in this study that all information was kept confidential and used only for research purposes

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Figures

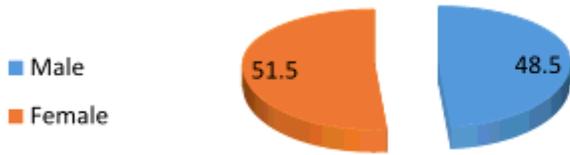


Figure 1

The gender of the study participants

Figure 2

The ages of the study participants

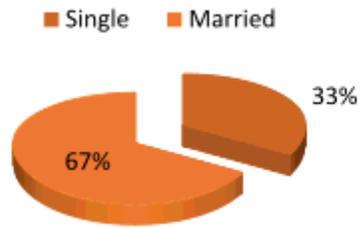


Figure 3

The marital status of the study participants

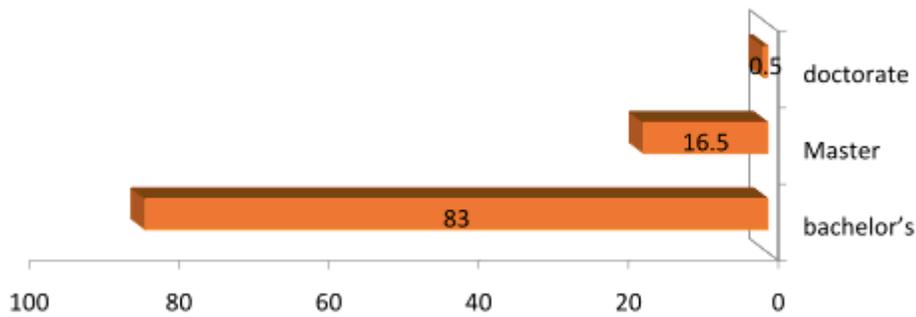


Figure 4

The academic level of the study participant

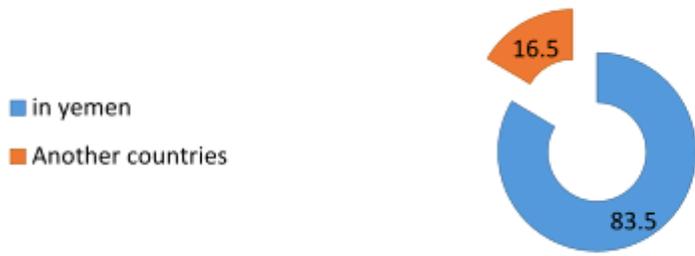


Figure 5

Basic dental qualification

Figure 6

The study participants 'years of experience

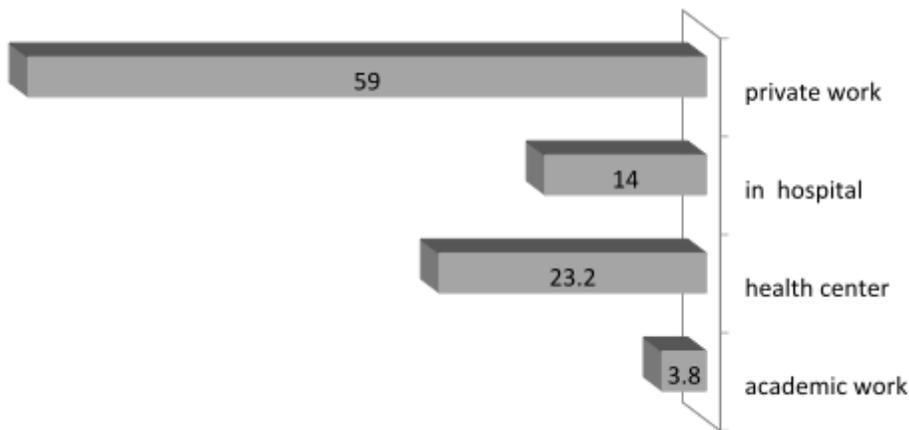


Figure 7

Illustrates the type of practice for the study participants

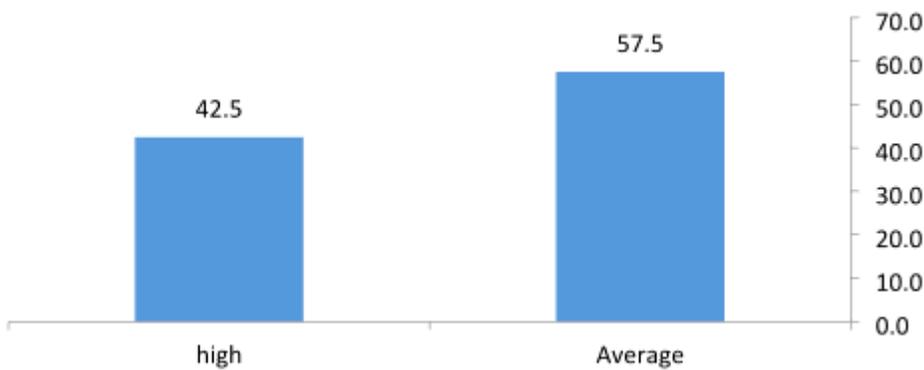


Figure 8

Shows the percentage of dentists' knowledge about prescribing antibiotics

Supplementary Files

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