

Knowledge and Attitude Towards Antibiotics Prescription and Antimicrobial Resistance among Dental Surgeons in Saudi Arabia.

ABSTRACT

Aims: To assess knowledge and attitude towards antibiotics prescription and antimicrobial resistance among dentist in Saudi Arabia.

Study design: cross-sectional, survey-based study.

Place and Duration of Study: Sample: Saudi Arabia, between June 2020 and October 2021.

Methodology: This was a cross-sectional, survey-based study in Saudi Arabia. Data was collected using a predesigned self-administered online questionnaire. The survey was distributed to dentist and dental surgeons in Saudi Arabia. It included demographic data, Knowledge about antibiotics, Attitude towards antibiotics, prescription of antibiotics based on the clinical situation. Data were analyzed by the SPSS program, version 25 at a level of significance of 0.05.

Results: A total of 208 study participants completed the survey questionnaire. The results showed that the half of study participants females. Moreover, more than half of the study participants were bachelor's degree. Additionally, 21.2% of the study participants earned dental internship. However, the least proportion had the master's degree or higher (4.3%).91.8% of the study respondents were general dentist compared to 2.9% were oral surgeon and the least portion 1% was endodontist.

Conclusion: The inappropriate practice of antibiotics was prevalent and the young age, male sex, higher level of education and poor attitude towards appropriate use of antibiotics were identified as the determinants of inappropriate practices.

Keywords: Antibiotics Prescription, Antimicrobial Resistance, Dental Surgeons

1. INTRODUCTION

Dentists deal with different infections in the orofacial region.[1] Antibiotics are used in the management of these infections. Although they are not used for definitive treatment, their use can minimize infection periods and associated risks.[2] To manage oral and dental infections, dentists prescribe antibiotics therapeutically and prophylactically. The prescribing of antibiotics by the dentist has become an important aspect of the dental practice, because most orofacial infections originate from odontogenic infections. Dentists prescribe between 7% and 11% of all common antibiotics (Beta-lactams, macrolides, tetracyclines, clindamycin, metronidazole).[3]

The excess use of antibiotics poses great health risks that would escalate bacterial resistance. Resistant infections are now estimated to cost at least 50 000 lives each year in Europe and the USA alone. From this, one can speculate that the burden of antimicrobial resistance (AMR) would be much higher in resource-constrained countries in which the inappropriate use of antibiotics by healthcare professionals and consumers could be

Comment [SM-T5611]: Remove this: [

Comment [SM-T5612]: Remove full stop before citation. after citation comes punctuation mark and this applicable to all your write up

rampant. This in part is due to poor regulation, weak health systems, poor surveillance and knowledge, and higher infectious diseases. If left unimpeded, by 2050, deaths attributable to AMR are estimated to be 10 million per year globally. [4,5]

The kingdom of Saudi Arabia decided to reduce random antibiotic uses. And because there are few studies conducted at Saudi Arabia to assess knowledge and attitude towards antibiotics prescription and antimicrobial resistance among dentist in Saudi Arabia.

Comment [SM-T5613]: please, there is need for ctation, atleast two

MATERIAL AND METHODS

Study design

This is a cross-sectional survey that was done in Saudi Arabia among dentists and dental surgeons. The data was gathered using an online survey. Participants, recruiting, and sample process are the topics of this study. Our target population includes all male and female dentists in the Kingdom of Saudi Arabia throughout the study period, with a confidence level of 90% and a margin of error of 10%. Using the Qualtrics calculator, a sample size of 160 was calculated. Inclusion criteria: dentists working as dentists in the Kingdom of Saudi Arabia, either male or female.

Data collection

Data collection was done in the form of the participants' responses to the questions. The questionnaire included demographic features such as age, gender, and academic year. The participants were asked about Knowledge and Attitude Towards Antibiotics Prescription and Antimicrobial Resistance.

Statistical analyses and sample size calculation

Data was entered into the computer using the "Microsoft Office Excel Software" application for Windows (2016). After that, the data was transferred to the Statistical Package of the "Science Software (SPSS) program", "version 20 (IBM SPSS Statistics for Windows", "Version 20.0. Armonk", "NY: IBM Corp.)" for statistical analysis.

Ethical considerations

This study was approved by Mistry of Health Research Centre. Written consent was received from all participants, after the brief demonstration about the objectives of the study and also the contents of this Questionnaire. The raw data and identity of the patients were kept confidential which include personal information.

3. RESULTS AND DISCUSSION

A total of 208 study participants completed the survey questionnaire. The results showed that the half of study participants females. Moreover, more than half of the study participants were bachelor's degree. Additionally, 21.2% of the study participants earned dental internship. However, the least proportion had the master's degree or higher (4.3%). 91.8% of the study respondents were general dentist compared to 2.9% were oral surgeon and the least portion 1% was endodontist. As it can be noted from the data analysis, half of the study participants had less than two years of experience. Likewise, around 50% of study participants had worked in OMFS. The results indicated that study participants work in a variety of setting such as primary health centre, hospital, private practice and specialised centre. 41.3% of the study participants reside in the middle region compared to 12% live in northern and southern area. Interestingly, the majority of the dentist seem to prefer working

Comment [SM-T5614]: please, let the be space

Comment [SM-T5615]: Sentence must not begin with number, it must be in word. change this 9.81% to word or recast it. It applied to the rest i.e where you begin sentence with figure

in ministry of health 63% compared to 20.7% 2ork in private setting. Table 1 presents the sociodemographic characteristics of the study participants.

Table 1: Sociodemographic Characteristics of Participants (n = 208)

Characteristics	Frequency	Percentage
Gender		
Male	104	50.0%
Female	104	50.0%
Education Level		
Dental student	14	6.7%
Dental internship	44	21.2%
Bachelor's degree	141	67.8%
Master's degree or Higher	9	4.3%
Are you a/an? *		
General dentist	191	91.8%
Oral surgeon	6	2.9%
Prosthodontist	4	1.9%
Pedodontics	5	2.4%
Endodontist	2	1.0%
Years in practice		
0-2	105	50.5%
3-5	55	26.4%
6-10	32	15.4%
11-20	16	7.7%
Have you worked in an OMFS department? (as student, attachment or resident)		
No	92	44.2%
Yes	105	50.5%
Not applicable	11	5.30%
Your Place of Work		
PHC	61	29.3%
Specialized Dental center	47	22.6%
Hospital	62	29.8%
Private practice	38	18.3%

In which region of KSA do you work* ?		
Middle region	86	41.3%
Eastern region	41	19.7%
Western region	30	14.4%
Southern region	25	12.0%
Northern region	26	12.5%
Your workplace is affiliated to* ?		
MOH	131	63.0%
NGHA	9	4.35
Ministry of defense	14	6.7%
Private	43	20.7%
Others	11	5.3%

Regards the study participants knowledge and attitudes towards antibiotic. The study findings revealed that 93.3% of dentists indicated that excessive use of antibiotic produces resistance. The majority of those who responded to this item felt that Antibiotic resistance is prompted by self-prescription. Moreover, when asked whether prescribe, medication for compromised patients, approximately 43.3% were not informed about this and the 33.2% believed they can prescribe antibiotic as other patient. Two thirds of those who answered questionnaire reported that antibiotic should not be prescribed for all types of dental infection.

Comment [SM-T5616]: please, look into this

In response to Question of asking the patient about the current use of medication, most of those surveyed indicated that the patients should be asked while they take health history. Interestingly, half of the study participants expressed they are not influenced by the patient preference to prescribe medication. A majority of participants (63.5%) indicated that dry socket can be reached after a week of teeth extraction compared to 22.6% who believe this outcome cannot be achieved. However, over half of the study participants thought patients can not treat dry socket at home individually compared with 26% who believed in patient ability to recover from the dry socket at home.

Almost two-thirds of the participants (61.1%) said that the amoxicillin is not good choice to extract teeth in health person. Likewise, 64.8% stated that antibiotic is good management choice to treat tooth infection. Additionally, 64.9% of the study respondents expressed their agreement in ability of the effectiveness of antibiotic to treat infected tooth canal. The participants responses suggested that work pressure does not influence them to prescribe antibiotic. Table 2 shows the results of analysis regarding knowledge and attitudes towards antibiotic.

Comment [SM-T5617]: healthy

Table 2: Study Participants Knowledge and attitude Section

Subscale	Yes	No	I do not know
Improper use of antibiotics can cause antibiotic resistance?	194 (93.3%)	8 (3.8%)	6 (2.9%)

Antibiotic resistance is prompted by self-prescription?	166 (79.8%)	23 (11.1%)	19 (9.1%)
Do you prescribe Antibiotics for Medically compromised patient after tooth Extraction?	69 (33.2%)	49 (23.6%)	90 (43.3%)
Antibiotics should be prescribed for all types of dental infections.	33 (15.9%)	157 (75.5%)	18 (8.7%)
We should ask if the patient is currently taking antibiotics during our consultation?	177 (85.1%)	23 (11.1%)	8 (3.8%)
Does pressure from patients influence in your decision regarding prescribing antibiotics?	39 (18.8%)	108 (51.9%)	61 (29.3%)
Can a patient get a Dry Socket in 7 days after the extraction?	132 (63.5%)	47 (22.6%)	29 (13.9%)
Can the patient treat the Dry Socket at home?	54 (26%)	122 (58.7%)	30 (14.4%)
Is Amoxicillin good after tooth extraction in healthy individuals?	58 (27.9)	127 (61.1%)	23 (11.1%)
Can antibiotics cure the tooth infection?	135 (64.9%)	56 (26.9%)	17 (8.2%)
Can antibiotics heal an infected root canal?	135 (64.9%)	56 (26.9%)	17 (8.2%)
Does the number of patients that you see at the clinic influence your decision to prescribe antibiotic	34 (16.3%)	119 (57.2%)	55 (26.4%)

The results of study participants towards attitudes towards antibiotic showed study participants demonstrated that the life threatening of dental abscess is proportionate with severity of the infection, as it is evident 69.7% agreed with this statement. Additionally, amoxicillin is the drug of the first choice in treating dental abscess (76%) whilst 22.1% preferred Augmentin as drug preference. However, approximately 43.3% and 42.8% reported that Clindamycin and Metronidazole as the second drug of choice, respectively. Approximately, two thirds of the participants indicated that the main signs of infection after tooth extraction is fever, Pain, exudation, Swelling of the gums and Bitter taste in the mouth. Interestingly, almost all of the study participants demonstrated that several strategies can be adopted to avoid dry socket (88.9%), including stop smoking, eat cold and hot food as well as oral hygiene. Severe pain is the cardinal sign of dry socket (79.8%) and less frequent sign is the numbness of the lip. 46.6% of the study participants revealed that the jaw hurt, after tooth extraction takes one 2-3 days after extraction and half of them believe that antibiotic stays one week in circulation after stop taking medicine, as appeared in Table 3.

Comment [SM-T5618]: small letter

Comment [SM-T5619]: small letter

Comment [SM-T56110]: small letter

Comment [SM-T56111]: small letter

Comment [SM-T56112]: small letter

Comment [SM-T56113]: small letter

Table 3: Study Participants Knowledge and attitude Section

Subscale	Frequency	Percent
Is dental abscess a life-threatening condition?		
Yes	26	12.5%
No	12	5.8%
Sometimes	25	12.0%
Depends on the severity of the infection	145	69.7%
What is your 1st choice of antibiotic?		
Augmentin	46	22.1%
Amoxicillin	158	76.0%
Metronidazole	4	1.9%
What is your 2nd choice antibiotic?		
Erythromycin	27	13.0%
Clindamycin	90	43.3%
Metronidazole	89	42.8%
Other	2	1.0%
What are the signs of infection, after tooth extraction?		
Fever, Pain, exudation	38	18.3%
Swelling of the gums	13	6.3%
Bitter taste in the mouth	2	1.0%
All of the above	154	74.0%
None of the above	1	0%5.
How to avoid Dry Socket ?		
Stop smoking	13	6.3%
Eat cold and soft food to avoid irritation	2	1.0%
Good oral hygiene	8	3.8%
All of the above	185	88.9%
What is the FIRST sign of a Dry Socket?		
severe pain	166	79.8%
extended bleeding from socket	17	8.2%
Numbness of the lip	4	1.9%
Visible Bone within the socket	21	10.1%
How long does the jaw hurt, after tooth extraction ?		
7 Days	68	32.7%
1 Day	24	11.5%
2-3 Days	97	46.6%
1 Month and above	19	9.1%

Comment [SM-T56114]: start it with capital

Comment [SM-T56115]: start it capital

How long does an antibiotic stay in the circulation, once the patient stops taking it* ?		
	109	52.4%
7 Days	24	11.5%
4 Weeks	69	33.2%
4-5 Days	6	2.9%
One Year		
How many patients you attend on a daily basis ?	85	40.9%
3-5	93	44.7%
5-10	30	14.4%
more than 10		
Which of the following is your emergency treatment approach for Acute periapical abscess case?		
		14.4%
Antibiotics without drainage	30	
Antibiotics with drainage	164	78.8%
Don't know can't say	14	6.7%
Which of following is your emergency treatment approach for oral infection with diffuse facial swelling ?		
	43	20.7%
Antibiotics only	152	73.1%
Antibiotics and analgesics (with drainage)	13	6.3%
I do not know		

Comment [SM-T56116]: start it with capital

Discussion

Antibiotics use can be associated with side effects from gastrointestinal disturbances to fatal anaphylactic shock and the emergence of drug resistance.[2] Inappropriate use of antibiotics contributes to the evolution of resistant strains and poses a substantial risk to the health and well-being of individuals and communities.[3] The misuse of antibiotics is not only considered as a major driver for the elevated frequency of antimicrobial resistance (AMR) but also as a public health issue.[4] Thus, more escalations in the AMR level due to the misuse of antibiotics will result in adverse and broad impacts on the individual's health and well-being.[5]

The amoxicillin and amoxicillin which combined with metronidazole were the most commonly prescribed antibiotics. However, several factors may contribute to this difference, including dentists' qualifications (undergraduate or postgraduate), dentists, clinical experiences and situations, the duration of symptoms, fear of spreading infection, advance care plans, use of diagnostic resources and patient expectations.[5] Future research direction may focus on evaluating the prescription of antibiotics in both regular and emergency dental services, including evaluating the possible factors contributing to the prescription of dental antibiotics, such as dentists qualifications and experiences, dentists workload, and time of the day in which antibiotics were prescribed.[5-7]

Over the past decade, antibiotic resistance has been increased annually in the United States, there is 23,000 deaths and 2 million illnesses attributed to antibiotic-resistant strains.[1] In Saudi Arabia over the last decade there is increased in the rate of carbapenem-resistant GNB in comparison with the rates of the 1990s. A new Saudi study shows that *Streptococcus pneumoniae* are resistance to penicillin G in 33%, and resistance to erythromycin in 26%.[9] The Faculty of General Dental Practice in the United Kingdom (FGDP UK) and the Scottish Dental Clinical Effectiveness Program (SDCEP) clinical guidelines stated that in healthy individuals antibiotics are not recommended in dealing with non-spreading infections of teeth and alveolar bone.[10]

Comment [SM-T56117]: change it to pass tense

Comment [SM-T56118]: correct the sentences

Comment [SM-T56119]: italicize it

Monitoring trends in antibiotic prescriptions by dentists may reveal previously unrecognized opportunities to control prescribing and might identify areas of concern in service or where there is a potential for improvement and optimize antibiotic treatments and stem the emergence and spread of resistance.[11]

To minimize the problem of antibiotic resistance, healthcare workers can play a key role through communication. Appropriate usage of antibiotics by patients can be conveyed by healthcare providers through effective communication. Horne reiterated this fact by stressing the importance of patient-healthcare provider interaction and communication. This interaction can help promote optimal adherence to antibiotic usage by patients. Yet results from this study revealed that, some respondents across gender, age, profession and educational status reported that; doctors and pharmacy staffs do not take time to communicate to them on how antibiotics should be used. [12-14]

Comment [SM-T56120]: s is omitted

Furthermore, one contributor to misuse of antibiotics is the lack of understanding of which conditions can or cannot be treated with antibiotics and the lack of such knowledge can lead to the development of resistance. [14,15]

This is among the few globally reported nationwide population-based surveys that measure knowledge, attitude and practice of antibiotics and ABR. The study employed rigorous data quality and management approaches and had a high percentage of response. One of the main limitations of this study was that the results were self-reported, and thus, findings might be underestimated or overestimated. This could introduce information or recall bias.

4. CONCLUSION

The inappropriate practice of antibiotics was prevalent and the young age, male sex, higher level of education and poor attitude towards appropriate use of antibiotics were identified as the determinants of inappropriate practices. Continuous awareness raising programs on the rational use of antibiotics and familiarizing the public with the commonly used antibiotics are recommended.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

1. Ramadan AM, Al Rikaby OA, Abu-Hammad OA, Dar-Odeh NS. Knowledge and attitudes towards antibiotic prescribing among dentists in Sudan. *Pesqui Bras Odontopediatria Clin Integr*. 2019;19(1):1–10.
2. Al-Huwayrini L, Al-Furiji S, Al-Dhurgham R, Al-Shawaf M, Al-Muhaiza M. Knowledge of antibiotics among dentists in Riyadh private clinics. *Saudi Dent J [Internet]*. 2013;25(3):119–24.
3. World Health Organization. *Antimicrobial Resistance: Global Report on Surveillance*. World Health Organization; 2014.
4. Davies J, Davies D. Origins and evolution of antibiotic resistance. *Microbiol Mol Biol Rev*. 2010;74(3):417–433. doi:10.1128/MMBR.00016-10
5. van Buul LW, van der Steen JT, Doncker SM, et al. Factors influencing antibiotic prescribing in long-term care facilities: a qualitative in-depth study. *BMC Geriatr*. 2014;14:136–147. doi:10.1186/1471-2318-14-136
6. Vardhan T, Lakhshmi N, Haritha B. Exploring the pattern of antibiotic prescription by dentists: a questionnaire-based study. *J NTR Univ Health Sci*. 2017;6(3):149–153. doi:10.4103/jdntruhs.jdntruhs_30_17.
7. AboAlSamh A, Alhussain A, Alanazi N, Alahmari R, Shaheen N, Adlan A. Dental students' knowledge and attitudes towards antibiotic prescribing guidelines in Riyadh, Saudi Arabia. *Pharmacy (Basel)*. 2018;6(2):e42–e48. doi:10.3390/pharmacy6020042.
8. Koyuncuoglu CZ, Aydin M, Kirmizi NI, et al. Rational use of medicine in dentistry: do dentists prescribe antibiotics in appropriate indications? *Eur J Clin Ph*.
9. Hosam M. Zowawi, M Clin Sc (Clin Micro) (Hons), PhD. *Antimicrobial resistance in Saudi Arabia, An urgent call for an immediate action*. 2016 Sep; 37(9): 935–940.
10. AboAlSamh A, Alhussain A, Alanazi N, Alahmari R, Shaheen N, Adlan A. Dental Students' Knowledge and Attitudes towards Antibiotic Prescribing Guidelines in Riyadh, Saudi Arabia. *Pharmacy*. 2018;6(2):42.
11. Mansour H, Feghali M, Saleh N, Zeitouny M. Knowledge, practice and attitudes regarding antibiotics use among lebanese dentists. *Pharm Pract (Granada)*. 2018;16(3):1–11.
12. Horne R, Weinman J, Barber N, Elliott R, Morgan M, Cribb A, et al. *Concordance, adherence and compliance in medicine taking*. London: NCCSDO; 2005. p. 40–6.
13. Sturgis P, Allum N. Science in society: re-evaluating the deficit model of public attitudes. *Public Underst Sci*. 2004;13(1):55–74.

Comment [SM-T56121]: The reference is not complete. no year of publication, no volume, no issue, no page number

14. McNulty CA, Boyle P, Nichols T, Clappison P, Davey P. Don't wear me out—the public's knowledge of and attitudes to antibiotic use. *J Antimicrob Chemother.* 2007;59(4):727–38.

15. Vallin M, Polyzoi M, Marrone G, Rosales-Klitz S, Wisell KT, Lundborg CS. Knowledge and attitudes towards antibiotic use and resistance—a latent class analysis of a Swedish population-based sample. *PLoS One.* 2016;11(4):e0152160.

UNDER PEER REVIEW