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The Knowledge and Attitude of Practicing Dentists towards the Antibiotic Prescription: A Regional Study

**Kamis Gaballah^{1*}, Adel A. Bahmani², Anas Salami²
and Nageeb A. M. Hassan³**

¹*Department of Oral and Maxillofacial Surgery, College of Dentistry, Ajman University, P.O.Box 5069, Ajman, United Arab Emirates.*

²*Department of Clinical Dentistry, College of Dentistry, Ajman University, P.O.Box 5069, Ajman, United Arab Emirates*

³*Department of Clinical Pharmacy, College of Dentistry, Ajman University, P.O.Box 346, Ajman, United Arab Emirates.*

Authors' contributions

This work was carried out in collaboration between all authors. Author KG designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors AAB and AS managed the questionnaire handling and performed the statistical analysis. Author NAMH assisted in the preparation of the study protocol and the revision and correction of the manuscript. All authors read and approved the final manuscript.

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*Corresponding author: Email: kamisomfs@yahoo.co.uk;

ABSTRACT

Aims: To assess dentist's knowledge and practice in relation antibiotic prescription and to investigate if they follow the current international guidelines.

Methodology: In this cross sectional study a structured and pretested questionnaire was sent to 202 licensed dental practitioners in UAE, Iran and Jordan took place in period between December 2011 and January 2012 by e-mail and physical delivery.

Results: Of 160 responding dentists 93.1% would prescribe antibiotics for dentofacial infections with systemic signs but many prescribe antibiotics for conditions where antibiotic therapy is not required according to good practice. Amoxicillin was the most frequently prescribed antibiotics. The non-clinical factor that may affect decision of the majority of dentists to prescribe antibiotics was perception of the effectiveness of those antibiotics in previous cases they treated with same agent (61.25%). Most of the respondents (84%) prescribe prophylactic antibiotics for patients at risk of infective endocarditis.

Conclusion: This study reveals that antibiotics were still being prescribed by dental practitioners where recent guidelines suggest there is no indication.

Keywords: Antibiotics; irrational use; resistance; prescribing guidelines.

1. INTRODUCTION

Antibiotics are commonly used in dental practice and typically prescribed to treat dental, oral and maxillofacial infections and also as prophylaxis against potential focal infections in patients at risk of developing oral or distant infective diseases. On the other hand, antibiotic prescribing by dental practitioners may therefore play a major role in the emergence of resistant bacterial strains [1]. Practically antibiotic prescription in dentistry is generally empiric: i.e., the clinician does not know the exact responsible organisms. As a result, broad-spectrum antibiotics are commonly used in dental practice which increase the risk of oral bacterial resistance [1-3]. Many guidelines set up to rationalize the use of antibiotics have been published and many surveys have been carried out to evaluate antibiotic prescription knowledge and attitude among dentists. We conducted this study in some middle eastern countries to assess the pattern of antibiotic prescribing and evaluate the knowledge and attitude of dental practitioners to determine if there is a rationality in prescribing antibiotics and if it is in accordance with ideal practice and recent guidelines or not.

2. MATERIALS AND METHODS

This study was a descriptive cross-sectional where a structured and anonymous questionnaire was administered to a sample of 202 dentists practicing dentistry in UAE, Iran and Jordan took place in period between December 2011 and January 2012. The proposal of the study was revised and approved by the research ethical committee at Ajman university, UAE. The sampling process was conveniently and randomly performed with no sample stratification done to establish the representative sample size required for each country. The Questionnaire was devised to assess the knowledge and pattern of antibiotic prescription by dentists practicing in the study countries (Fig. 1). The questionnaire consisted of 5 parts. Part 1 of questionnaire included demographic data of the participants such as gender of participants, type of their practice (public sector, private sector or both), years in practice and their speciality. Part 2 investigated the dental conditions which they would


prescribe antibiotics. Part 3 investigated the first and second line antibiotics they would prescribe for dento-alveolar infections and chosen antibiotics considered. Part 4 aimed to explore the non-clinical factors that may affect antibiotic prescription with closed and open styles of questions. In the last part, participants were asked if they'd prescribe antibiotics for medically compromised patients and those at risk of developing oral or distant infective diseases. In order to evaluate the reliability of the questionnaire, a pilot study was initially performed on 20 dental practitioners. The questionnaires have been distributed through e-mail, or by hand to hand delivery in private and public practices or hospitals. All data were descriptively analysed and cross-tabulated with the Chi Square test was performed to establish the significance when appropriate. The analysis was performed using the Statistical Package for the Social Sciences, SPSS[®] version 19 software.

3. RESULTS

Response rate to questionnaire was 79.2% with 160 questionnaire forms were completed out of the total of 202 forms distributed. The demographic characteristics of the respondents are represented in (Table 1).

3.1 Dental Conditions Which Dental Practitioners Prescribe Antibiotics

This report showed that principal indication of antibiotic prescription by dental practitioners was Abscess (with systemic signs) which 93.1% of practitioners prescribe antibiotics in this case (Table 2). The second most common indication for antibiotic prescription was for patients with medically compromised states by 71.2% of total dentists and about two-thirds (66.25%) of practitioners reported antibiotic use for Periodontal treatment (with surgery). From periodontal diseases point of view, 73.9% of periodontologists reported that they prescribe antibiotics in case of periodontal treatment with surgery but only 21.7% of them prescribe antibiotics for periodontal treatment without surgery. Only 17.3% of periodontologists reported the use of antibiotics for acute gingivitis and stomatitis as compared to 54.3% of GDPs prescribe antibiotics for the same case (Table 2). More than half (53.06%) of junior GDPs would use antibiotics in case of Dentofacial abscess (without systemic sign) and 44.8% of them prescribe antibiotics in case of endodontic treatment. The least indication for antibiotic prescription was failure of local anaesthesia as reported by 11.8% of total number of dentists. A considerable proportion endodontists (57.1%) reported the use of antibiotics during endodontic treatment (Table 2). Among all who prescribe antibiotics for toothache 43.2% are GDPs and interestingly quarter of endodontists still prescribe antibiotics for patients with toothache. More than one-third of all practitioners who admitted the antibiotic prescription following extraction of teeth (n=69) are GDPs in compare to oral surgeon which is 16% of those who still prescribe antibiotics for such cases. Analysis of data also showed that approximately one-third (36.25%) of practitioners reported that they prescribe antibiotics when inserting dental implants. Nearly quarter (24.3%) of dental practitioners would prescribe antibiotics for oral and mucosal conditions (Table 2).



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♦ Gender: Male Female
 ♦ Type of practice: public Private Mix
 ♦ Years in practice: up to 5 years 6-10years >10 years
 ♦ Speciality: GDPs Oral surgeon Periodontist Endodontist others
 ♦ Country of speciality Qualification:

Clinical cases in which you prescribe Antibiotics:		
Periodontal treatment without surgery	Oral Medical Treatment	
Periodontal treatment with surgery	Medically compromised states	
Acute gingivitis and Stomatitis	Endodontics	
Pain, toothache	Implant therapy	
If Anaesthetic failure is expected	Abscesses, unaffected general condition	
Extraction or Oral Surgery procedures	Abscesses, affected general condition	
When Anaesthetic doesn't work	Increased risk of endocarditis	

What are the first-line antibiotics that you prescribe?			
Amoxicillin	Augmentine	Clindamycine	Doxycycline
Erythromycin	Metronidazole	Cephalosporin	Minocycline
Others	If yes please mention:.....		

What are the second-line antibiotics that you prescribe?			
Clindamycine	Gentomycin	Doxycycline	Erythromycin
Azythromycin	Clarithromycine	Cephalexin	Minocycline
Cefuroxime	Others	If yes please mention it here:.....	

What are the non-clinical factor that affect your antibiotic prescription?	
Patient preference	
Reading of scientific materials, books, journals ...	
Knowledge's gained from undergraduate & postgraduate courses	
Availability in the nearby pharmacy	
Cost of antibiotics	
Recommendation of colleagues/Experts	
Effectiveness in previous cases you treated	
When in doubt of diagnosis	
When you are under time pressure	
International organisation guideline (Specify).....	

What are the medical conditions which you prescribe antibiotic prophylaxis?		
Diabetes Mellitus	AIDS	peacemakers
Autoimmune_disease	Rheumatic heart Disease	Infective endocarditis
Pt. on immunosuppressive	Hodgkin's disease	Cardiac valve prosthesis
Renal transplant pt.	Coronary by-pass surgery	Ventricular septal defect

[Thank you for your Precious time](#)

Fig. 1. Copy of the questionnaire distributed to participants

Table 1. The demographic characteristics of participants

		No.	%
Gender N=160	Male	74	46.2
	Female	86	53.8
Years in practice N=160	Up to 5 years	74	46.3
	6-10 years	42	26.3
	>10 years	44	27.5
Speciality N=160	GDPs	66	41.3
	Oral surgeons	24	15.0
	Periodontists	23	14.4
	Endodontists	21	13.1
	Others	26	16.3
Type of practice N=160	Public sector	84	52.5
	Private sector	49	30.6
	Mixed-practices	27	16.9

3.2 First and Second Line's Antibiotics of Choice

The most common first line antibiotic was amoxicillin and was prescribed by 91.8% among all practitioners followed by amoxicillin/Clavulanate that reported to be prescribed by more than half (53.1%) of the dental practitioners. One third of respondents primarily consider prescribing Metronidazole for their patients (Fig. 2). On the other hand, only one-fifth of dental practitioners (21.8%) considered erythromycin as a first option. The least antibiotics being prescribed by all dental practitioners as a first line prescription were Minocycline with 3.7% and Cephalosporin with only 6.25% (Fig. 2). The first line choices vary in different specialities, for example while around two thirds of periodontologists tend to prescribe Metronidazole; the vast majority of GDPs (93.3%) tend to consider Amoxicillin as the first choice to treat dental infections. Clindamycin was the top second option antibiotic of choice among majority of practitioners (61.25%) followed by Gentamycin by 25% and Cefuroxime by 27.75 % (Fig. 3). As a second line prescription, Cefuroxime is prescribed by 23.7%, Erythromycin by 18.7%, Azythromycine by 17.5% and Clarithromycine by 13.7% among all dental practitioners. Minocycline is the least prescribe antibiotic as a second choice by 1.2% among all participants (Fig. 3).

3.3 Non-clinical Factors that Affect Antibiotic Prescription

The main non-clinical factor that may affect decision of antibiotic prescription for the majority of dentists was the effectiveness of certain antibiotics in previous cases that treated with same agent. This was reported by two-thirds (61.25%) of participants followed by knowledge gained from undergraduate and graduate courses that affected decision of dental practitioners to prescribe particular antibiotics (57.5%) (Table 3). Most of the oral surgeon (79.1%) reported that updated international organization guidelines affect their antibiotic prescription as compared to only 24.2% of all GDPs, 39.1% of periodontologists and 19.04% of endodontists (Table 3). Other non-clinical factors which influence antibiotic prescription of dental practitioners was availability of particular medicine in a nearby pharmacy by 23.1% of dental practitioners, uncertainty of final diagnosis has led more than one-fifth (21.8%) of

dental practitioners to consider antibiotic therapy and time pressure was reported by 13.7% to affects their decision on antibiotic prescription (Table 3).

3.4 Medical Conditions Which Prophylactic Antibiotics is Prescribed by Dental Practitioners

Most of the respondents (84%) prescribe prophylactic antibiotics for patients at risk of infective endocarditis and also for diabetic patients undergoing dental intervention (58.7%). More than half (53.1%) of the practitioners prescribe prophylactic antibiotics for patient on immunosuppressant medications and nearly one half (47%) of least experienced GDPs prescribe prophylactic antibiotics for the coronary by-pass cases undergoing dental procedures as compared to only one fifth(21%) of oral surgeons (Table 4). Other medical conditions which a considerable proportion of dentists prescribe the prophylactic antibiotics for were AIDS (37.5%), patients with cardiac pacemakers (33.1%) and autoimmune diseases (43.1%) (Table 4).

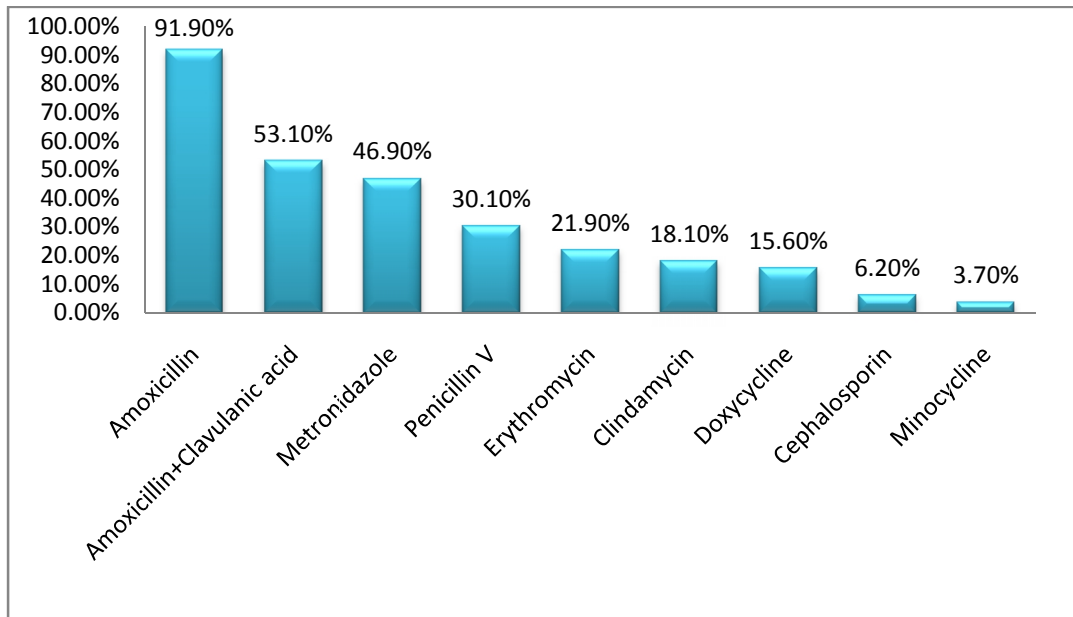


Fig. 2. First line antibiotics prescribed by dental practitioners

Table 2. The dental conditions in which dental practitioners would prescribe antibiotics

Specialty⇒ conditions↓	GDPs(≤5yrs) n=49	GDPs(>5yrs) n=17	Oral surgeons n=24	Periodontologists n=23	Endodontists n=21	Other n=26	Total n=160
Periodontal Rx. (without surgery)	6	7	7	5	5	1	31
Periodontal Rx. (with surgery)	33	9	15	17	15	17	106
Acute gingivitis & stomatitis	20	5	8	4	5	4	46
toothache	10	6	5	6	5	5	37
Extraction	16	8	11	11	10	13	69
Anaesthetic failure	2	2	6	2	5	2	19
Oral & mucosal conditions	11	2	8	9	3	6	39
Medically compromised	33	13	15	16	18	19	114
Endodontic treatment	22	6	8	6	12	10	64
After implant insertion	20	4	8	7	6	13	58
Abscess, (without systemic signs)	26	6	12	9	11	10	74
Abscess, (with systemic signs)	46	16	22	22	20	23	149

Table 3. Non-clinical factors that may influence practitioner's decision to prescribe antibiotics

Specialty→ factors↓	GDPs(≤5yrs) n=49	GDPs(>5yrs) n=17	Oral surgeons n=24	Periodontologists n=23	Endodontists n=21	Other n=26	Total n=160
Patients preference	14	4	7	6	4	10	45
Reading textbooks and periodicals	21	12	17	13	14	10	87
Knowledge gained from courses	31	11	13	11	9	17	92
Availability in nearby pharmacy	10	5	5	2	7	8	37
Cost of antibiotic	23	12	6	11	7	15	74
Recommendation of experts	23	12	12	9	13	14	83
Effectiveness in previous cases	31	8	13	18	14	14	98
Uncertainty of final diagnosis	8	3	7	4	7	6	35
If, under time pressure	6	1	3	5	6	1	22
Updated IOG	14	2	19	9	4	7	55

Table 4. The prescription of prophylactic antibiotics

Specialty→ med.conditions↓	GDPs(≤5yrs) n=49	GDPs(>5yrs) n=17	Oral surgeons n=24	Periodontologists n=23	Endodontists n=21	Other n=26	Total n=160
Diabetesmellitus	21	10	18	19	14	12	94
AIDS	19	2	8	13	8	10	60
Pacemakers	20	8	5	7	3	10	53
Pt, at risk of Infectiveendocarditis	41	15	20	19	17	22	134
Coronary by-pass	23	4	6	9	5	12	59
patients on immunosuppressant	27	6	11	15	10	16	85
Hodgkin'sdisease	9	1	3	5	3	0	21
Autoimmune disease	18	5	12	12	11	11	69

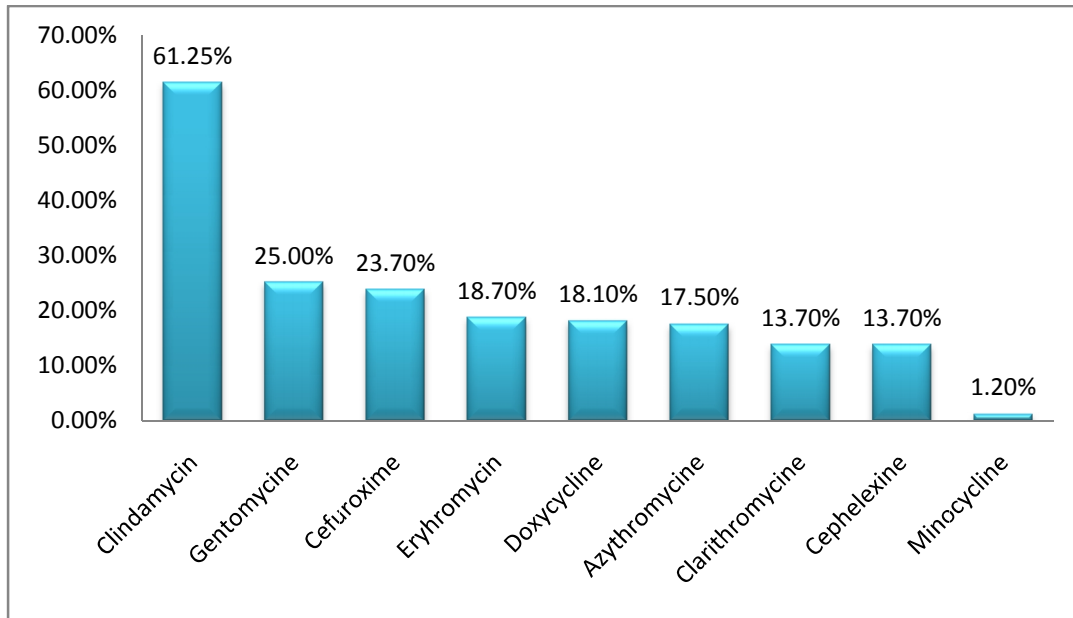


Fig. 3. Second line antibiotics prescribed by dental practitioners

4. DISCUSSION

The principles of treating odontogenic infections are well documented and are essentially limited to incision and drainage, removal of the source of infection (i.e. tooth extraction), and adjunctive pharmacologic/antibiotic intervention for acute and spreading cellulitis and dento-alveolar abscess. Prophylactic therapeutic antibiotic therapy may be considered for prevention of infective endocarditis, and total joint replacement prosthesis, and also for patients with immune deficiencies. Antibiotics are used as an adjunct to surgical procedures, and are only indicated in the presence of systemic features of infection, i.e. fever, malaise, lymphadenitis, or in the presence of spreading cellulitis [4]. This study showed an evidence for inadequate prescription practice of antibiotics by dental practitioners. Our data revealed the overall tendency of dentists to over prescribe antibiotics in many cases where those medications were not required. This phenomenon was reported by earlier studies [5,6]. Fortunately, the majority of participants scored well on the most common clinical signs necessitate the need for prescribing antibiotics such as abscess with systemic signs. But on the other hand, more than half of least experienced GDPs consider antibiotic in cases of localized abscess without any systemic signs which may reflect the defensive attitude in treating dental infections. The analysis of results also showed that a considerable proportion of practitioners overprescribe antibiotic in many other clinical cases which antibiotics are not required. These conditions include pain-toothache, anaesthetic failure, routine extraction, endodontic and periodontal treatment. Generally, it is not recommended to use antibiotics routinely for the treatment of adult periodontal disease. Mechanical debridement methods, including root planning and drainage of pus for acute periodontal abscesses, should be considered as the first-line treatment for most cases. Systemic antimicrobials are only considered as adjuncts to such methods, and never used on your own in such chronic disease, as they proven ineffective and can predispose to further abscess formation. The systemic antimicrobials may be considered in acute disease where debridement or drainage

of pus is difficult, or there is local spread or systemic signs [7,8]. From endodontics point of view, our results showed that more than half of the endodontists prescribe antibiotic between root canal treatment visits. Such practice lacks the support of sound scientific evidence so the indiscriminate use of antibiotics during root canal therapy should be discouraged [9,10]. In agreement with many earlier studies, clearly amoxicillin was the overwhelming choice of antibiotic by most respondents [10,11]. In contrast, few authors reported that common use of the Phenoxymethylpenicillin (penicillin V) [12,13]. The latter historically was the gold standard for treating odontogenic infection in non-allergic patients and this may be due to its efficacy in polymicrobial infections, relatively narrow spectrum for bacteria than amoxicillin and amoxicillin/clavulanate, low toxicity and low cost [14]. However increasing rate of resistant strain particularly those that produce beta-lactamase have reduced its effectiveness. There were reports demonstrated less resistant to amoxicillin than penicillin V [13,15]. Metronidazole was also commonly prescribed by the participants. It is the drug of choice in strictly anaerobic infections, although many facultative anaerobes and Actinomyces species are resistant. It's usually prescribed in combination with penicillin in severe infections. While metronidazole is a comparatively safe drug, it has many contraindications and interactions with other drugs often underestimated by practicing dentists [16]. Erythromycin was first line antibiotic of choice by more than one fifth of practitioners despite being ineffective in treating dental infection due to poor absorption and rapid emergence of resistant strains. Clindamycin was also popular second choice among the majority of practitioners. The Dental Practitioner's Formulary (DPF) recommends that clindamycin should not be used routinely for the treatment of dental infections [17]. The main reason for this is because of its association with acute pseudomembranous colitis [18,19]. Two surveys have indicated that clindamycin is not frequently prescribed in the UK for the management of dento-alveolar infections [20,21]. In other countries such as Canada there has been resurgence in the prescribing popularity of clindamycin [22]. The reasons for this may be related to publications in the dental literature advocating clindamycin as a first line drug in the management of odontogenic infections. There was a complex range of non-clinical factors that affect decision of antibiotic prescription. The effectiveness of certain medicine in previous cases that dentist treated was the most common reason. according to the principles of evidence-based medicine, decision based on such experience is considered among the weak evidences for the effective and safe treatment. The sound evidence usually relay on meta-analysis review of randomized control trials. Large proportions of participants claimed that their decision is usually based on the knowledge gained from undergraduate curriculum or reading of textbooks and also based on recommendations from experts. Keeping in mind the evidence for over prescription seen in our results, these sources were not standardly adequate. This can be helped with continuous education courses organized to review and update such aspects of dental practice. This study also revealed that updated international organization guidelines for antibiotic prescription are only followed by a minority of practitioners that may explain the many unsatisfactory responses reported in the current survey. Harvey et al. [23], showed that adherence to the guidelines can improve the quality of medicine prescription. The claim of "Pressure of time" that force dental practitioners to delay the interventional treatments along with the doubt of diagnosis were also common factors which make many practitioners prescribing antibiotics without clear indications. Approximately one third of all antibiotics used in medicine are prescribed for prophylactic purposes [24]. Although prevention of infection is important, it must be balanced against the expanding the problem of antibiotic resistance and allergy [25]. The evidence for antibiotics acting to prevent infection from surgical wounds in the mouth is poor to non-existent [26]. For example in case of patients at risk of Infective Endocarditis (IE) which majority of respondents reported that they would consider prophylactic antibiotic for this condition, absolute risk rate after dental treatment, even in at high risk patients, is considered very low.

This is according to the latest guidelines from the British Society for Antimicrobial Chemotherapy [27] and the American Heart Association [28] that recommends that only patients in the high risk category require antibiotic cover. On the other hand, National Institute for Health and Clinical Excellence (NICE) clinical guideline issued on 2008 do not support any kind of antibiotic prophylaxis against IE for all individuals undergoing dental or other surgical procedures [29]. The later guidance was driven by the lack of sound evidences to support of antibiotic prophylaxis in preventing the IE against the established potential for the serious allergy and raise in microbial resistance caused by irrational use of broad spectrum antibiotics. Interestingly high proportion of participants reported that they would prescribe antibiotic prophylaxis for their dental patients with non-cardiac medical conditions such as, diabetes mellitus, patients on immunosuppressant, AIDS and even autoimmune diseases. This highlights the need for refresher's courses on the use of antimicrobials in dentistry to be made available for all dental practioners. Finally, the limitations of this study to represent the actual practice taking place in this region, are clear in the sampling process without being able to recruit the representative sample size from each country and from each dental discipline in addition to restrict the study to one tool i.e. questionnaire where the risk is possible that participant tend to show higher standard than their real daily practice.

5. CONCLUSION

In many middle east countries, dentists practitioner's knowledge of use of antibiotics is significantly below the international standards and decision making in antibiotic therapy requires improvement to enforce a rational prescribing based on sound updated knowledge and evidences.

CONSENT

Not applicable.

ETHICAL APPROVAL

All authors hereby declare that the current study proposal been examined and approved by the research ethical committee at Ajman University of Science and Technology, UAE and have therefore been carried out in accordance with the ethical standards stated by declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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