Appraisal of antimicrobial prescribing practices of governmental and non-governmental dentists for hospitals in the western region of Saudi Arabia

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ABSTRACT

الأهداف: تقييم مدى المعرفة والسلوك والممارسة الوصفية للمضادات الحيوية بواسطة اطباء الاسنان في المنطقة الغربية من المملكة العربية السعودية

الطريقة: أجري المسح المقطعي المكون من استبيان حوى 61 عنصراً وزع على طلاب السنة السادسة وأطباء الامتياز والمقيمين والاستشاريين في مستشفى جامعة الملك عبد العزيز الجامعي ومستشفيات حكومية وأخرى خاصة بالمنطقة الغربية وشمل الاستبيان البيانات الشخصية المهنية، وموضوعات ذات صلة بالمضادات الحيوية تشمل الوعي بالنطاق الحالي لمقاومتها للبكتريا متى توصف و وتكرار وصفها ومصادر التعليم المستمر عنها

النتائج: تبين أن مدى المعرفة والوعي بشأن مضادات حيوية معينة تعالج مشكلة محدده في تجويف الفم كالتالي 78% من للطلبة والمتدربين، 80% من الأطباء المقيمين و95.3% من الاخصائيين. أما بخصوص مساهمة الاستخدام العشوائي في ظهور سلالات مقاومة للمضادات الحيوية فقد أيد ذلك 89% من الطلاب، والمتدربين، وجميع الاطباء المقيمين و98.4% من الاخصائيين. بالإضافة إلى وجود قصور في التعليم المستمر كعامل هام يساهم في الإفراط في استخدام المضادات فقد وافق على ذلك 93.4% من الطلاب، و90% من الأطباء المقيمين والمتدربين، و90% من الاخصائيين. لوحظ أن 91.9% من المتدربين، و80% من الاطباء المقيمين و75.5% من الاخصائيين يفضلون (أموكسيسيلين + كلافيولينك) كخيار أول، بينما وجد تباين واضح في نظام الجرعات ومدتها.

خاتمة: أغلب المشاركين في التقييم يدركون جيداً مقاومة البكتريا للمضادات الحيوية بشكل ظاهر واعتبروا أن الاستخدام الحكيم لها مهم للغاية للحد من هذه المشكلة. وقد تجلى الاختلاف بين الاخصائيين و المقيمين من اطباء الأسنان في السلوك والممارسة الوصفية – كذلك وجود ضوابط في المستشفيات لترشيد استخدام المضادات الحيوية كانت غير كافيه بشكل قوى. أن هذا البحث يسلط الضوء على الحاجة للتدخل الفعال والمتواصل من أجل تحقيق استراتيجية للحد من حدوث مقاومة البكتريا للمضادات الحيوية في مجال الأسنان في المملكة العربية السعودية.

Objectives: To scrutinize the knowledge, attitude, and antimicrobial practices in Saudi Arabian Dentistry.

Methods: In this cross-sectional survey of dentists, a self-administered questionnaire comprising of 61 questions was dispersed to the participants randomly, which included their professional profile, awareness of the current scope of antimicrobial resistance, prescribing practice, frequency of antimicrobial prescription, and sources of continuing education of antimicrobials. The study took place in the Faculty of Dentistry, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia between February and April 2013.

Results: Knowledge and awareness concerning specific antimicrobials, with specific oral cavity lesion was 78% for the students and interns, 80% for residents, and 95.3% for specialists. Approximately 89% of the students, interns and residents, and 98.4% of the specialists endorsed indiscriminate use of antibiotics. In addition, 93.4% of students, 90% of interns and residents, and 90.6% of specialists agreed that lack of health education is one of the contributors to overuse of antimicrobials. Moreover, 91.9% of the interns, 80% of residents, and 75.5% of specialists preferred amoxicillin + clavulanate as their first choice; however, a wide variation in the dosage frequency, and duration was observed.

Conclusion: Participants are well aware of the significance of antimicrobial resistance, and considered that judicious use of antimicrobials is highly imperative to restrain this fiery predicament. Divergence was demonstrated between specialists and residents in prescribing practices. Institutional antimicrobial guideline was not interesting to all the respondents. This highlights the need for incessant instructive intervention in order to accomplish the prime objective of retreating antimicrobial resistance.

Saudi Med J 2013; Vol. 34 (12): 1262-1269

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Received 29th June 2013. Accepted 4th November 2013.

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It is a well-known fact that, one of the biggest boon of antimicrobials (AMs) is the exclusivity to produce a radical curative treatment of infections, these compounds are not only life saving but they also renovate the quality of life, if not it would have been a gloomy situation. Evidently, well versed reality is that a great deal of global antimicrobial (AM) utilization is principally superfluous and inapt.[1,2] It is also noteworthy and pragmatic that inappropriate utilization of an AM is a worldwide concern for the development of antimicrobial resistance (AMR).[3-7] Antimicrobials are frequently employed in dental practice since majority of orofacial infections initiate from periodontal and soft-tissue.[8-10] In Great Britain, a report of antimicrobials prescription by the dentists represents to be 7% of the entire population prescriptions of AMs,[11] and in the United States annual prescription of dentistry practice are estimated to be approximately 200-300 million.[12] Several recent studies have demonstrated inappropriate prescription of AMs in the management of dentoalveoalar infections.[1,13] Furthermore, significant variations were observed in the knowledge of dentists as regards to AM utilization, AMs in non-indicated clinical conditions like localized swelling, dry socket, pulpitis, and periapical poriodontitis,[14-17] and another disappointing aspect of dental practice was found to be use of AMs in viral infections.[18,19] Amendments in AM prescribing patterns will truly require changes in the attitude and behavior of clinicians. Therefore, it is highly imperative to better comprehend the knowledge of dentists regarding antimicrobials, the way in which they acquire and uphold their knowledge in addition to the factors, which influences prescription of AMs. Any educational intervention targeting dentists on the issues of AM use, and resistance is futile without understanding their knowledge and attitude towards AM agents.[4] Moreover, the transformation of prescribing behavior of dentists is highly critical to curb the irrational antimicrobial use with the ultimate aim to repress the development of AMR.[20] In order to get acquaintance with the motivating forces at the rear of AM prescriptions, an appraisal of knowledge, attitude, and prescribing practice is vital. It was significant to note that merely 2 studies were found locally correlated to antimicrobial prescriptions,[21,22] this encouraged us to conduct this study to scrutinize the knowledge, attitude, and antimicrobial practices in Saudi Arabian Dentistry, which can explore and mark the instructive intrusion for AM prescription in dental practice.

Methods. The study consist of a cross sectional survey of dentist of governmental and non-governmental dentists of hospitals and clinics in Western region of Saudi Arabia from February to April 2013. The study sample comprises of 165 participants, which include 6th year undergraduate students, interns, residents, specialist, and consultants from university, public, and private hospitals of Jeddah city. The participants were divided into 3 groups comprising of students and interns as one group and residents as another and specialists as third group in order to evaluate the dissimilarity between their knowledge, attitude, and prescribing practices. The students were excluded for the evaluation of prescribing practice, as they are not authorized to prescribe medicine.

Accomplice and appraisal tool. A systematic exploration was done to retrieve appropriate articles/ studies in the Pubmed, Medline, Scopus and Google scholar search engine. The searching approach engaged the keywords and/ or the MeSH terms "antimicrobials," "antibiotics," and "dentists" combined with any alternative such as "indications of antimicrobials," "types of antimicrobials prescribed," "duration of prescription," "antimicrobial resistance," "knowledge," "attitude," and antimicrobial prescribing practices of the dentists. A planned questionnaire was designed after assessment of appropriate literature and questionnaires formerly utilized in analogous studies which includes demographic information, respondent's professional profile, their comprehension in reference to the current scope of antimicrobial resistance and the important sources of information they believe creditable for continuing education on antimicrobials.[4,23,24]

A professional group of experts comprising of 3 dental consultants, one clinical pharmacologist and one infectious disease expert critically studied and approved the designed questionnaire. This questionnaire was validated by performing a pilot study in 20 dental specialists and consultants prior to this study. A self-administered questionnaire comprising of 61 questions was dispersed to the participants randomly, subsequent to the approval of study protocol by institutional ethics committee. Questionnaires were dispersed on working place and during duty hours and partaker were solicit to respond straight away. Contributors were neither given any inducement nor any cue. Discretion of information acquired was secured during the study.

Statistical analysis. The entire information was scrutinized by using SPSS data version 19.0 and the results were expressed in absolute number and percentages. The dissimilarity between groups of the participants was analyzed by utilization of Fisher's exact test in case of normally distributed data in order to test for significant association between groups ($p<0.05$),

whereas non-normally data was analyzed by Kruskal-Wallis test. Regarding likert items, a 5-point scale was used to analyze the data, this was subsequently enfolded by the response preferences into agree, neutral, and disagree categories.

Results. *Characteristics of the study population.* The total population of participants in this study was 165, with 79 males and 86 females. One hundred and five participants were <30 years and they comprises of mainly 6th year dental undergraduates and interns, 36 participants were between the age of 41-50 years and only 4 participants were above the age of 50 years. Majority of the participants were from the University hospital (n=105), while 44 participants were from public hospital and only 16 were from private hospital. (data table included in supplementary file).

Frequency of use of antimicrobial by the participants. The frequency of AM use was evidently highest for specialist category which demonstrated daily use as 38.7% followed by residents as 30% and intern's use of AM very infrequent and least depicted as 2.2%.

Factors influencing the participant's choice of antimicrobial. In all the 3 categories most significant factors which influences the preference of AM consistently includes reading scientific materials, in case of students, interns 82.4%, residents 80% and specialist 75%, this was statistically significant (p=0.0001), (**Table 1**). Knowledge gained during undergraduate or postgraduate training accounted for 82.4% concerning students, interns, 80% for residents and 75% of the specialists (p=0.0482), and it was also interesting to recognize that attending courses and lectures had also illustrated considerable impact, students, Interns are were influenced maximum 74.7%, followed by specialist 64.1% and the least influenced were 50% of the resident.

Prescribing of antimicrobial by participants for selected clinical signs. Prescribing of AM by participants for selected clinical signs (**Table 2**) revealed quite uniformity amongst all groups in clinical signs. However, significant disparity was observed between the knowledge of students, interns, residents and specialists regarding antimicrobial use in localized fluctuant swelling and restricted mouth opening, here 58.2% of student, interns and 70% residents favors while only 23.4% of specialists are in agreement (p=0.0013). Secondly, divergence in concurrence was observed for

Table 1 - Persuading factors that influence the participant's choice of antimicrobials.

Factors influencing the participant's choice of AMs	Students and interns n (%)	Residents n (%)	Specialists n (%)	*P*-value
Parent/patient's demand	26 (28.6)	0 (0)	10 (15.6)	0.0092*
Comprehension of systematic resources (books, articles, internet)	75 (82.4)	8 (80)	48 (75.0)	0.0001*
Attending courses and lectures	68 (74.7)	5 (50)	41 (64.1)	0.0482*
Cost of the antibiotic	44 (48.4)	3 (30)	33 (51.6)	0.3161
Effectiveness and previous experience with the drug	53 (58.2)	8 (80)*	38 (59.4)	0.2025
Recommended by other colleagues	32 (35.2)	4 (40)	22 (34.4)	0.2648
Knowledge gained during undergraduate or postgraduate training	75 (82.4)	8 (80)	48 (75.0)	0.0482*
Peace of mind	23 (25.3)	1 (10)	12 (18.8)	0.1116

The 2-tailed p value by Fisher's exact test.
*Within the group analysis of students and interns, residents and specialists p value was significant. AMs - antimicrobials

Table 2 - Prescribing of antimicrobials by participants for selected clinical signs.

Clinical signs	Students and interns n (%)	Residents n (%)	Specialists n (%)	*P*-value
Gross diffuse swelling	86 (94.5)	10 (100)	64 (100)	0.4426
Elevated temperature	72 (79.1)	9 (90)	57 (89.1)	0.6861
Evidence of systemic spread	82 (90.1)	8 (80)	64 (100)	0.5582
Swelling and eye closure	81 (89.0)	8 (80)	54 (84.4)	0.1939
Patient's expectation for a prescription	17 (18.7)	2 (20)	18 (28.1)	0.7296
Localized fluctuant swelling	53 (58.2)	7 (70)	15 (23.4)	0.0013*
Restricted mouth opening	41 (45.1)	2 (20)	14 (21.9)	0.0001*
Swelling and difficulty in swallowing	56 (61.5)	6 (60)	24 (37.5)	0.0001*

The 2-tailed p value by Fisher's exact test. *Within the group analysis of students and interns, residents and specialists p value was significant.

restricted mouth opening, 45.1% of students and interns agreed while only 20% of the residents and 21.9% of specialists had shown their approval (p=0.0001).

Antimicrobials prescribing pattern of the participants for selected clinical symptoms. In regards to prescribing of AMs by participants for selected clinical symptoms (**Table 3**) for reversible pulpitis only 7.7% of the students and interns, 10% residents and 3% specialists agreed, while for irreversible pulpitis 12.1% of the students and interns, 18.8% specialists, and none of the residents had shown their agreement to prescribe AMs. Both these conditions have revealed resemblance of outlook from all groups and statistically non-significant On the contrary, concerning AM therapy in acute periapical infection, 64.8% of students and interns and 60% of residents approved, while only 37.5% of specialists agreed, and this difference in opinion was statistically significant and p<0.0082. Uniform consistency was observed in all groups of participants concerning several important symptoms reminiscent of pericoronitis, for which 71.4% of students and interns revealed their approval (**Table 3**). In periodontal abscess 52.7% of the students and interns had shown their consent (**Table 3**).

Knowledge and awareness on the current scope of antimicrobial agents. Knowledge and awareness concerning specific AM with specific oral cavity lesion is needed, acquaintance on doses, frequency and duration of using of AMs is essential had similar viewpoint in all the group and statistically non-significant. The factor of acquaintance of prophylactic specific regimen of AMs is important, that remarkably revealed a consistent response (students and interns [93.4%], residents [100%], and specialist [98.4%]) (**Table 4**). The stands for accurate and lucid prescription writing is necessary that bear identical response from students and interns (97.8%), residents (90%), and specialist (100%). Knowledge of types of AMs that have broad-spectrum activity is essential, also that brought similar trend students and interns (85.7%), residents (90%), and specialist (93.8%) (**Table 4**).

The most commonly prescribed antimicrobials by dentists. The most common AMs preferred by the dentists for prescription were amoxicillin + clavulanate interns (91.9%), residents (80%), and specialist (75.5%), within group analysis of students and interns, residents and specialists, p-value was significant (p=0.0433). The second preference was revealed as amoxicillin (interns 48.6%, residents 60% and specialist 78.1%), while concerning clindamycin, 91.9%, residents 80%, and specialist 28.1% expressed their option, p-value was not significant (p=0.4001). Lastly, the choice of metronidazole was revealed as 59.5% by the interns, 30% by the residents, and 29.7% by the specialists, P-value was not significant (p=1.0000) (data table included in supplementary file).

Knowledge on antimicrobial use. All the 3 groups of participants fairly agreed to the believe that AMs are used in excess in dental practice (students and interns 79.1%, all residents, and 96.9% specialist) (**Table 4**). They almost consistently agreed that AMR is a worldwide problem (**Table 4**). The participants had similar outlook that antimicrobial resistance is a matter of concern in Saudi Arabia (students and interns 76.9%, all residents, and 85.9% of the specialists approved). Regarding the practicability of local antimicrobial guidelines over the international guidelines, there was rival response for local guideline (student and interns 64.8%, residents 60%, and specialist 68.8%) agreed.

Factors influencing antimicrobial misuse/overuse. Lack of health education seems to be the most

Table 3 - Prescribing of antimicrobials by participants for selected clinical symptoms.

Clinical signs	Students and interns n (%)	Residents n (%)	Specialists n (%)	*P*-value
Reversible pulpitis	7 (7.7)	1 (10)	3 (4.7)	0.5423
Irreversible pulpitis	11 (12.1)	0 (0)	12 (18.8)	1.0000
Acute periapical infection	59 (64.8)	6 (60)	24 (37.5)	0.0082*
Pericoronitis	65 (71.4)	7 (70)	45 (70.3)	0.3331
Acute ulcerative gingivitis	60 (65.9)	5 (50)	27 (42.2)	0.0128*
Periodontal abscess	48 (52.7)	4 (40)	34 (53.1)	0.6346
Cellulitis	72 (79.1)	9 (90)	56 (87.5)	0.6844
Chronic apical infection	30 (33.0)	6 (60)	16 (25.0)	0.3708
Lateral periodontal abscess	29 (31.9)	7 (70)	19 (29.7)	0.7715
Chronic periodontitis	20 (22.0)	2 (20)	12 (18.8)	0.3705
Dry socket	31 (34.1)	6 (60)*	25 (39.1)	1.0000

The 2-tailed p value by Fisher's exact test. *Within the group analysis of students and interns, residents and specialists p value was significant.

Table 4 - Knowledge regarding antimicrobials (AMs) use among interns, residents, and specialists.

Factors influencing utilization of AMs	Students and interns n (%)	Residents n (%)	Specialists n (%)	*P*-value
Do you believe AMs are used too much in dental practice?	54 (79.1)	10 (100)	62 (96.9)	0.1752
Patients consulting another dentist to prescribe antibiotics if their dentists disagreed to do so	82 (59.3)	9 (90)	55 (85.9)	0.2332
Do you think that patients should be informed about judicious antibiotic use?	82 (90.1)	9 (90)	62 (96.9)	0.4940
AMR is a problem worldwide	70 (90.1)	9 (90)	55 (85.9)	0.6829
AMR is a problem in Saudi Arabia	50 (76.9)	10 (100)	55 (85.9)	0.2354
AMR is a problem in your daily practice	78 (54.9)	8 (80)	51 (79.7)	0.1867
I would like the development of AM educational programs	51 (85.7)	9 (90)	57 (89.1)	0.2386
My choice of AM is more influenced by its availability rather than by the cause of disease	59 (56)	5 (50)	38 (59.4)	0.1752
A local AM guideline would be more useful than an international one	80 (64.8)	6 (60)	44 (68.8)	0.7936
Knowledge on AMR should be considered when AMs are prescribed to a patient	83 (87.9)	9 (90)	42 (65.6)	0.0237*
AMs may kill "friendly"/"good" microbes	73 (91.2)	5 (50)	47 (73.4)	0.1158
AMs might develop allergy leading to death	78 (80.2)	5 (50)	48 (75.0)	0.0785*
AMs could be harmful for children's teeth	54 (85.7)	2 (20)*	42 (65.6)	0.4209

*Within the group analysis of students and interns, residents and specialists *p* value was significant.

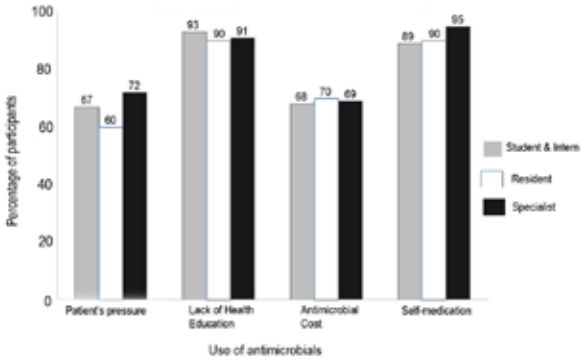

Figure 1 - Factors influencing antimicrobials (AMs) misuse/overdue.

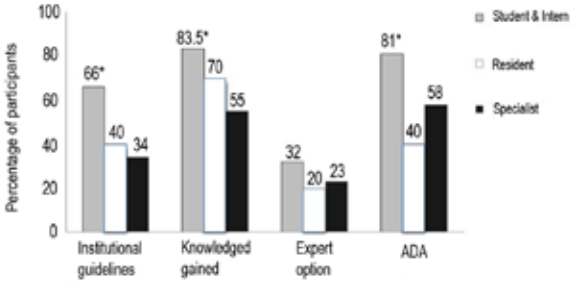

Figure 2 - Guidelines determining frequency of antimicrobials (AMs) prescribing and duration. ADA - American Dental Association, Inst. - Institutional, *$p<0.05$ Chi-square

important contributor for abuse or excessive use of AMs for all the respondents (**Figure 1**), and for this ground, attribution of the students and interns was 93.4%, residents 90%, and specialists 90.6%. Patient's pressure does not emerged to be a momentous contributor for all the participants as only 67% of the students and interns, 60% of the residents and 71.9 of the specialists had positive expression.

Participants' knowledge regarding cause of AMR. Important predictor for AMR is their indiscriminate use, this was significantly endorsed by almost all groups, students and interns 89%, all residents, and 98.4% of the specialists (p=0.6261). When we asked about the significant contributor of AMR in non-compliance, uniformity of all the participant was observed in this regard, students, interns 79.1%, residents 80% and 92.2% of the specialists agreed (p=0.7620).

Guidelines determining frequency of antimicrobial prescribing and duration. As regards decision making for the use of AMs, knowledge acquired during training was shown to be most significant (**Figure 2**) for interns and students it was remarkably 83.5% and for resident 70% while only 54.7 % of the specialists accounted for it (p=0.0010). This was followed by guidelines of American Dental Association (ADA), 81.3% of the students, while only 40% of the resident and 57.8% of the specialists have shown this as their option (p=0.0091). Surprisingly, institutional AM guidelines were not so appealing to all the respondents.

Discussion. The dilemma of over enthusiastic utilization of AM agents had established detrimental impact on the population worldwide.[25] Moreover; this phenomenon is characterized by emergence and spread of AMR by genetic routes, escalation in the incidence of microbial resistant infection, adverse drug reactions and economic encumbrance, this fact had significantly raised substantial global alarm and awareness of healthcare professionals, research scientists, and healthcare providers.[26] The predicament of AMR in dental practice can be overcome to certain extent by finding the prescribing practice of dentists and raising the quality of prescription, and this can be achieved by conducting their customary appraisal.[17]

This is substantiated by the reports that in spite of warning against the AM use in acute pulpitis, questionnaire appraisals revealed that in UK 12.5% of general dental practitioners, and 16.8% endodontists in US prescribed AMs for this clinical condition.[1] Furthermore, several other similar studies illustrated that dentists do not follow clinical guidelines and ill informed regarding scientific information with inappropriate prescription.[1,27,28] Prescription of AMs are quite often based on the knowledge gained during their education, reading scientific materials, attending courses and lectures as well as national and international guidelines. This study revealed that all the 3 categories are influenced and follow the aforesaid guidelines except institutional AM guidelines, and this is quite unanticipated, acceptance of protocol and local institutional guidelines is directed to rationalize and improve the standard of prescription by dentists.[13]

Antimicrobials prescriptions have been shown to be influenced by patient/parent's insistence; in contrast, this study reflects positive prescribing approach of steadfast to this stipulation. Antimicrobials prescription were also observed to provide serenity of mind of the dentist, evidently this is required when there is inability to diagnose, large number of patients are seen in rapid sequence and limitation of time for dental procedures.[1,14,29] On the contrary, the results of our study signifies that our participants do not comply to adopt such outlook.

Important aspect of this study was to assess the respondents attitude towards AM use based on selected symptoms and signs, and positive response was observed concerning reversible and irreversible pulpitis in all the groups, it is well documented that dental pain of pulpal origin needs surgical intervention in the form of filling, root canal therapy or tooth extraction as a last resort rather than the use of antimicrobials.[14,15,17,18] In contrast, statistically unanticipated response was perceived for periapical infection, where higher proportion of students, interns and residents, but not the specialists advocated use of antimicrobials in this non-indicated clinical condition.[1,14] Similarly, dry socket which also does not require antimicrobial therapy, received affirmative signals from more than half of the students, interns, and residents and approximately one quarter of the specialists, surprisingly similar daunting trends was also reported in approximately half or more of the dentists from UK, Kuwait, Turkey and Iran.[6,14,15] In acute ulcerative gingivitis, AM agent is recommended as a part of initial therapy, and in our survey this indication was reasonably sustained more by the students and interns rather than residents and specialists and quite comparable with a similar study in Iran.[6] Regarding AM treatment in pericoronitis, facial cellulitis and periodontal abscess, a steady rejoinder was observed more in favor of pericoronitis than periodontal abscess from all the groups of participants, this is moreover authenticated in similar studies.[6,14] Furthermore, chronic apical infection, lateral periodontal abscess, and chronic periodontitis require definitive treatment decision, and seldom necessitate AMs, except in substantiation of gross local spread.[1,14,30] Moreover, in other recent similar appraisals,[6,14,29] all the groups of our participants except residents for chronic apical infection and lateral periodontal abscess are seemingly more knowledgeable. Dentoalveoalar infections, which is characterized by the clinical signs of gross diffuse swelling, elevated temperature with evidence of systemic spread and swelling with eye closure are the validated indications for AM therapy,[1,6] and all groups of participants of our study unequivocally endorsed their consent in this regard. Dysphagia and restricted mouth opening are the signs of facial cellulitis, and therefore necessitates suitable antimicrobial therapy on empirical basis,[1,6,14] and in these survey students, interns, and residents significantly endorsed while affirmative signal from specialists was found to be relatively diminutive. In contrast to this localized fluctuant swelling is a non-indicated,[1] but frequently treated by dentist with antimicrobials.[6,14] In our survey, most of the students, interns, and residents were found to be sailing in the same boat, nevertheless preponderance of specialist significantly designated the exact option.

Antimicrobials prescribed by all categories observed to be quite consistent with the guidelines of American Dental Association, and apparently more conversant with regard to selection of AMs, dosage frequency, and duration than the respondents of similar studies.[6,29] However, the proportion of AM prescribed by dentists from UK[1] was lower compared with our dentists.

Currently, short courses of AM therapy with reduced frequency of administration invoked great deal of awareness, with added advantage of convenience and compliance, and moreover significant improvement of patients in 2-3 days of AM treatment,[31,32] whereas prolonged duration often kills the commensal microorganisms.[33] Comprehension of the theoretical knowledge of AMs is essential; its application in practice definitely tends to reduce antimicrobial resistance.[4] This appraisal of knowledge concerning AMs indication, contraindication, interaction, adverse effects in all the group of participants was found to be excellent. Moreover, in view of the fact that antimicrobial resistance is not only a matter of concern for specialists; nevertheless, an enhanced understanding of students, interns, and residents is indispensable.

Irrespective of group of respondents, the knowledge of antimicrobial resistance was unequivocally recognized as worldwide and nationwide setback. In addition, it was moreover accepted as a predicament in their daily practice. Analogous drift has also been revealed remarkably in the US.[34] Interestingly, a recent study pointed out that general practitioners in the US seldom practice what they said and contributes to the escalating AMs.[35] The likelihood of commensal microorganism getting killed by AMs and detrimental effect on children teeth received more favorable response from the students and interns rather than residents and specialists, while severe type B adverse drug reactions received positive response from the residents and specialists. Better understanding of the basic grounds of antimicrobial resistance and persuading dynamics of antimicrobial exploitation and unwarranted utilization are highly imperative to surmount the fiery concern of antimicrobial resistance.[1,4,17,19] In our survey, this was found to be appreciably approved by all the groups. Furthermore, contributing factors reminiscent of noncompliance, self medication, lack of health education revealed strong affirmative signals irrespective of categories under this study, whereas patients' demand and antimicrobial cost received relatively cautious rejoinder.

This study quite evidently revealed a good knowledge and attitude of all the participants. They had appreciably endeavored to acquire knowledge principally by comprehension of scientific resources, this is indicative that they deemed the significance of the predicament of antimicrobial resistance and enthusiastic to strive and gain further knowledge regarding superlative antimicrobial use. However, incongruity was observed in their prescribing practice and secondly they do not opt for the institutional guidelines for antimicrobial as their initial preference. An impending limitation of this appraisal could be the predisposition of the participants to furnish enviable response as a substitute of enlightening their factual outlook. Nevertheless, we endeavor to curtail this by giving the indemnity of complete confidentiality and anonymity.

Enduring educational interventions is highly recommended for the most favorable antimicrobial use, and a forceful move is highly required from all the tracks to curtail the surge of antimicrobial resistance in Saudi Arabian dentistry.

Limitation of the study. Recollect prejudice is an intrinsic limitation of questionnaire based studies and the respondents often misjudge the real state of affairs. In order to trounce this realistic state, 2 validity and reliability questions were included in our questionnaire. These questions were both positive and negative, respondents answers were authenticated by these questions.

Recommendations. Frequent educational interventions of dentists are essential, more specifically to pursue local and national guidelines for antimicrobial therapy to diminish antimicrobial resistance; such campaigns and development of excellent assertive events should be focused towards altering the outlook of dentists to rationalize and promote the vital facet of antimicrobial utilization and avert their excessive use.

In conclusion, this appraisal revealed that all the students, interns, residents, and specialist are well aware of the significance of AMR as well as consideration that the judicious use of AMs is highly imperative to restrain this fiery predicament. Divergence was demonstrated between specialists and residents in prescribing practices, and an institutional AM guideline was not so interesting to all the respondents. This highlights the need for incessant instructive intervention in order to accomplish the prime objective of treating AMR.

Acknowledgment. *The authors would like to express their appreciation and gratitude to the participants. We are also grateful to Dr. Ehlam Alsahafi and Dr. Rayan Alrehali for relentlessly executing the mission of receiving the questionnaire from the participants.*

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