RESEARCH ARTICLE

Compliance of antimicrobial drug therapy in patients with dental periapical abscess

Vinay V Rao[1], Nitya Jhaveri[2], Kathan Nayak[3], Thati Jyotsnanjali[4], Parth Khamar[5], Hitesh Vadera[6], Anjali Kothari[1], Sneha Vyas Rao[7], Vandita A Shah[8], Amit M Shah[9]

[1]Department of Conservative Dentistry and Endodontics, AMC Dental College and Hospital, Ahmedabad, Gujarat, India, [2]Intern, AMC Dental College and Hospital, Ahmedabad, Gujarat, India, [3]Consultant Periodontist & Implantologist, Ahmedabad, Gujarat, India, [4]Department of Conservative Dentistry and Endodontics, Sibar Institute of Dental Sciences, Takellapadu, Guntur, Andhra Pradesh, India, [5]Department of Pedodontics, AMC Dental College and Hospital, Ahmedabad, Gujarat, India, [6]Department of Oral and Maxillofacial Surgery, AMC Dental College and Hospital, Ahmedabad, Gujarat, India, [7]Department of Prosthodontics, Government Dental College and Hospital, Ahmedabad, Gujarat, India, [8]Consultant Dental Surgeon, The Smile Gallery Dental Clinic, Ahmedabad, Gujarat, India, [9]Department of Pharmacology, GMERS Medical College & Hospital, Dharpur, Patan, Gujarat, India

Correspondence to: Amit M Shah, E-mail: dr_amit84@yahoo.co.in

ABSTRACT

Background: Dentist use of antimicrobial agents is characterized by a number of particularities. In effect, antibiotic prescription is empirical. Non-compliance to the prescribed medication can lead to the failure of the treatment. It should be noted that treatment failure can also result from several factors, but non-compliance can be considered the most critical factor. **Aims and Objectives:** The aim of the study was to assess the compliance with the full course of antibiotics as prescribed by a health-care provider to treat periapical abscess. **Materials and Methods:** A prospective, observational study was conducted to examine the prevalence of drug non-compliance. A total of 30 patients of any gender and age more than 16 years who attended outpatient department. Baseline information related to personal details, disease and drug therapy were recorded using a structured case record form. Compliance to therapy was evaluated by pill count adherence ratio (PCAR). **Results:** Most of the patients (73.33%) were compliant to antibiotic therapy. Males were more non-compliant antibiotic therapy as compared to females. Maximum patients (13.33%) with non-compliance to antibiotic therapy belong to the age group of 35–56 years. Patients with school level of education or below have maximum number of patients with non-compliance. Disappearance of symptoms and fear of side- effects of antibiotics are the commonest reasons for non-compliance. Mean value of PCAR was 0.89 ± 0.23. **Conclusion:** The result of our study shows that around 70% of patients were complying with the full course of antibiotics as prescribed. Therefore, health workers should make more effort to enhance the proper use of antibiotics in our population.

KEY WORDS: Compliance; Medical Adherence; Dental Practice; Periapical Abscess; Antimicrobials

INTRODUCTION

Compliance (also called adherence or capacitance) as described by the WHO is "the degree to which a patient correctly follows medical advice. Most commonly, it refers to medication or drug compliance, but it can also apply to other situations such as medical device use, self-care,

self-directed exercise, or therapy sessions." Both patients and health workers affect compliance. Making a positive relationship between the health-care provider and patient is considered the most important factor to improving compliance.[1] Non-compliance in a medical parlance that can be defined as any deviation by the patient from a physician's instructions. Non-compliance to the prescribed medication can lead to the failure of the treatment. It should be noted that treatment failure can also result from several factors, but non-compliance can be considered the most critical factor.[2]

Dental periapical abscess is a painful condition, it happens when bacteria or other microorganisms enter the dental pulp and also the bone in periapical tissues. This may cause abscess formation, leading to swelling and pain. Treatment includes root canal treatment or extraction or periodontal therapy.[3] If the abscess is spreading or the size is more then, adjunctive antibiotics are mandatory. In such cases, full course of antibiotics is prescribed by the dentist.[4] Amoxicillin is main drug to be started with. Dosage is 500 mg, thrice in a day, for 5 days total. Hence, a total of 15 tablets are mandatory for a complete course.[4]

Sometimes, the patients do not finish the entire course of the tablets due to multiple reasons such as lack of awareness, or due to reduction of pain in the initial few days, also due to high cost of medicines, and poor people avoid taking the full dose.[5] Sometimes, they are worried of the side effects, which generally do not occur very frequently in the prescribed dose. This leads to improper cure of the existing disease, as well as increase in the incidence of resistant microorganisms, which further complicates the healing process.[5] Hence, it is extremely necessary to check for the compliance of the drugs taken.

The aim of the present study is to assess the compliance with the full course of antibiotics as prescribed by a health-care provider to treat periapical abscess among patients coming to Smile Gallery Dental Clinic to find out up to which level people are aware of using antibiotics properly.

MATERIALS AND METHODS

A prospective, observational study was conducted to examine the prevalence of drug non-compliance among patients and its relationship with risk factors on compliance in The Smile Gallery Dental Hospital, a private dental hospital in Ahmedabad, Gujarat, India. The study protocol was approved by Sangini Hospital Ethics Committee of the institute before commencement of the study.

A total of 30 patients of any gender and age more than 16 years who attended outpatient department (OPD) of The Smile Gallery Dental Clinic and diagnosed having dental periapical abscess, in February 2019 were continuously recruited. Patients who were unable to communicate or who

had psychiatric illnesses were excluded from the study. The nature and purpose of the study was clearly explained in a language they understood and written informed consent was obtained. Baseline information related to personal details, disease and drug therapy were recorded using a structured case record form that included a questionnaire for evaluation of drug compliance. The format of the case record form was validated by obtaining the opinion of two subject experts.

Compliance to therapy was evaluated by pill count adherence ratio (PCAR). PCAR is a measure of how well a participant follows the prescription schedule and a continuous metric of adherence patterns in a clinical setting. PCAR indirect, objective measure counts the number of dosage units that have been taken between two scheduled appointments or clinic visits.[6] This number would then be compared with the total number of units received by the patient to calculate the adherence ratio. The formula to calculate PCAR is as follows:

$$PCAR=[(\text{Total Doses Dispensed})-(\text{Total Doses Missed})]/(\text{Total Doses Dispensed})$$

The low cost and simplicity of this method contribute to its popularity. However, several limitations have been identified. First, although it can be used for various formulations such as tablets, capsules, and actuated inhaler, this approach is unfeasible in assessing those with non-discrete dosages or pro re nata ("as needed") medication.[7] Moreover, adherence underestimation occurs frequently since this method simply uses the dispensed date as the denominator of the equation without considering the chance of having surplus medication. Especially for patients with chronic conditions, it is common for them to refill the medication before running out. Moreover, the cutoff value to differentiate adherence and non-adherence, in this case, is generated arbitrarily. This can lead to discrepancy on determining patient's adherence and comparing medication adherence among studies. Besides pill count's inability to characterize the adherence pattern, it is also unable to identify its causes. Pill count has shown higher accuracy comparatively to other subjective methods.[7]

Statistical Analysis

The data were subjected to statistical analysis using Microsoft Office Excel 2016. Data were expressed as absolute numbers with or without percentages, as means with standard deviation or as medians with ranges. $P < 0.05$ was considered to denote statistical significance.

RESULTS

A total of 30 patients were included in the study. During the study period, males (18, 60.00%) had attended OPD of dental clinic as compared females (12, 40.00%) with male:female ratio 1.5:1. Among the patients with different age groups, a maximum number (12, 40.00%) of patients belong to the

age group of 36–55 years. For the present study to calculate socioeconomic class of the patient, we have used BG Prasad's socioeconomic scale for 2019.[8] On categorizing the patients based on socioeconomic class, a maximum number (10, 33.33%) of patients belong to Class III [Table 1].

According to Figure 1, most of the patients (22, 73.33%) were compliant to antibiotic therapy. Only 8 patients (26.67%) patients were non-compliant to antibiotic therapy.

Table 2 depicted the distribution of the patients according to the compliance of antibiotic therapy along with different sociodemographic factors. Males (6, 20.00%) were more non-compliant antibiotic therapy as compared to females (2, 6.67%). Among different age groups, maximum patients (4, 13.33%) with non-compliance to antibiotic therapy belong to the age group of 35–56 years as compared with other age groups. According to education level, patients with school level of education or below have maximum number of patients (4, 13.33%) with non-compliance. As such, patients belong to socioeconomic Class III have maximum patients (3, 10.00%) with non-compliance, but the ratio of patients with compliance to non-compliance, Class V (1:1) and Class IV (2:1) had higher ratio.

On eliciting different reasons for non-compliance to antibiotic therapy [Figure 2], different reasons were as follows: Disappearance of symptoms (three patients); fear of side effects of antibiotics (two patients); carelessness of patients (two patients); and high cost of drugs (one patient).

On calculation of PCAR [Table 3], the ratio values were following with mean value of 0.89 ± 0.23:
- 0.00–0.25: 1 (3.33%) patient
- 0.26–0.50: 2 (6.67%) patients
- 0.51–0.75: 3 (10.00%) patients
- 0.76–0.99: 2 (6.67%) patients
- 1.00: 22 (73.33%) patients.

DISCUSSION

Non-compliance in India has been noticed not only in medications. In fact, many articles found non-compliance toward primary health-care appointments, antenatal visits, and antiepileptic therapy.[9,10] Several studies have shown that one of the major problems in health care is non-compliance with the prescribed medications. Much money and resources have been wasted as a result of non-compliance, which has led to inadequate treatment, recurrent infection life-threatening resistance to medications.[11] It is very important to be active against the pathogens to achieve complete cure from bacterial infections. Potent activity is achieved by administering the best choice of antibiotics with recommended dosage, frequency, and duration. However, strict adherence of the patient to the antibiotic treatment is essential for the treatment success. Therefore,

| Table 1: Sociodemographic characteristics of the study population (*n*=30)	
Characteristics	**Frequency (%)**
Gender	
Males	18 (60.00)
Females	12 (40.00)
Age groups (years)	
16–35	10 (33.33)
36–55	12 (40.00)
56–75	8 (26.67)
Residence	
Urban	18 (60.00)
Rural	12 (40.00)
Education level	
School	10 (33.33)
Graduate	15 (50.00)
Postgraduate	5 (16.67)
Socioeconomic class	
Class I	5 (16.67)
Class II	9 (30.00)
Class III	10 (33.33)
Class IV	4 (13.33)
Class V	2 (6.67)
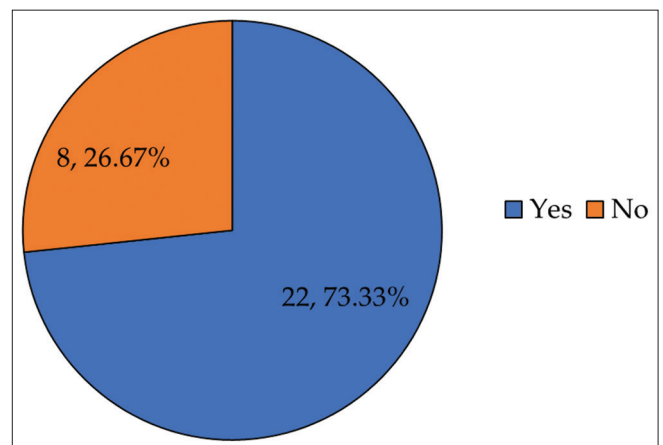
Figure 1: Antibiotic compliance (*n* = 30)

misuse of antibiotics can develop resistance of pathogenic bacteria and consequently complicate the management of bacterial infections among the population.[12] In the daily practice, oral antibiotics are used for treating most microbial infections. Therefore, we chose in this study to assess the behavior of Indian patients toward using antibiotics that exclusively treat dental infections. Overall, the percentage of non-compliers was 30%, which indicates misuse of antibiotics. Based on the results, compliance with antibiotic therapy was affected by health-care providers. Thus, the population must be sufficiently educated regarding the ineffectiveness of antibiotic therapy when instructions are not followed.

Table 2: Sociodemographic characteristics and antibiotic compliance (*n*=30)

Characteristics	Antibiotic compliance *n* (%)		
	Yes	No	Total
Gender			
Males	12 (40.00)	6 (20.00)	18 (60.00)
Females	10 (33.33)	2 (6.67)	12 (40.00)
Age groups (years)			
16–35	8 (26.67)	2 (6.67)	10 (33.33)
36–55	8 (26.67)	4 (13.33)	12 (40.00)
56–75	6 (20.00)	2 (6.67)	8 (26.67)
Residence			
Urban	14 (46.67)	4 (13.33)	18 (60.00)
Rural	8 (26.67)	4 (13.33)	12 (40.00)
Education level			
School	6 (20.00)	4 (13.33)	10 (33.33)
Graduate	12 (40.00)	3 (10.00)	15 (50.00)
Postgraduate	4 (13.33)	1 (3.33)	5 (16.67)
Socioeconomic class			
Class I	4 (13.33)	1 (3.33)	5 (16.67)
Class II	7 (23.33)	2 (6.67)	9 (30.00)
Class III	7 (23.33)	3 (10.00)	10 (33.33)
Class IV	3 (10.00)	1 (3.33)	4 (13.33)
Class V	1 (3.33)	1 (3.33)	2 (6.67)

Table 3: PCAR (*n*=30)

PCAR	Frequency (%)
0.00–0.25	1 (3.33)
0.26–0.50	2 (6.67)
0.51–0.75	3 (10.00)
0.76–0.99	2 (6.67)
1.00	22 (73.33)
Mean±SD	0.89±0.23

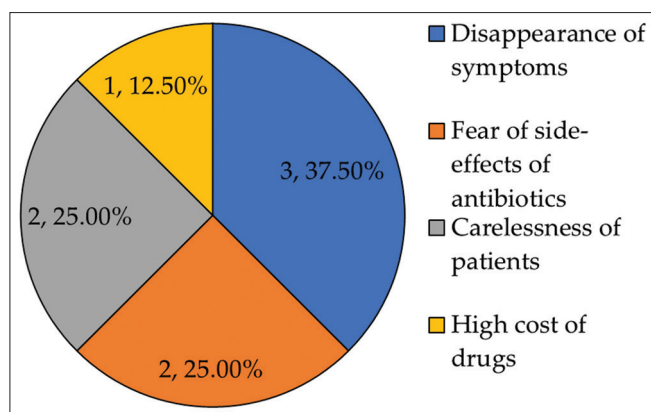PCAR: Pill count adherence ratio, SD: Standard deviation

Figure 2: Reasons for non-compliance (*n* = 8)

Antibiotics have emerged as a boon to humanity and this advancement has led to a better quality of life and reduction of morbidity and mortality. These are chemical substances that are capable of destroying and inhibiting the growth of specific microorganisms such as infectious bacteria and fungi. Dental infections are polymicrobial in nature. Majority of the orofacial infections require both systemic and local management. Systemic management is mostly by antibiotics, and hence, these antibiotics are pharmacotherapeutic adjuncts prescribed by dentists.[12,13]

Inappropriate, indiscriminate, and irrational use of antibiotics has led to the development of antibiotic resistance. Even more alarming is the rate at which bacteria develop resistance, microorganisms exhibiting resistance to new drugs often are isolated soon after the drugs have been introduced.[14] The main reason behind antibiotic resistance is due to overprescription by the health-care personnel, improper use by patients, and also due to the resistance developed by the bacteria.[15] There is a significant relationship between the increase of antibiotic resistance and utilization, with higher resistance levels in bacteria isolated from areas of high antibiotic utilization.[15,16] Dentists prescribe between 7% and 11% of all common antibiotics.[17] As per the National Center for Disease Control and Prevention, approximately one-third of all outpatient antibiotic prescriptions are unnecessary, dentistry's contribution to antibiotic resistance is unknown.[17]

Most human orofacial infections originate from odontogenic infections. The prescribing of antibiotics by dental practitioners has become an important aspect of dental practice. Dentists were benefited greatly from the discovery of penicillin because it is a broad-spectrum antibiotic and covers most of the odontogenic infections. On the other hand, antibiotic use is the key driver of resistance. This is mainly due to its overuse in many parts of the world, particularly for minor infections, misuse due to lack of access to appropriate treatment, and underuse due to lack of financial support and awareness to complete full treatment courses.[17] Hence, a critical approach to the use of antibiotics in the treatment of odontogenic infections dictates precisely defined criteria for the indication of antibiotic therapy.[18]

Dentist use of antibiotics is characterized by a number of particularities. In effect, antibiotic prescription is empirical, i.e., the clinician does not know what microorganism is responsible for the infection since pus or exudate cultures are not commonly made.[18] Based on clinical and bacterial epidemiological data, the germs responsible for the infectious process are suspected, and treatment is decided on a presumptive basis, fundamented on probabilistic reasoning. As a result of the above, broad-spectrum antibiotics are typically prescribed.[18] A broad range of organisms can be isolated from the oral cavity, and although not all of them are potential human pathogens, the list of bacteria related with oral infections is relatively long (cocci, *Bacilli*, Gram-positive and Gram-negative organisms, aerobes, and anaerobes). As has been commented above, a very limited range of drug

products is typically used – sometimes as few as two or three antibiotics. In turn, prescription is characteristically made for short periods of time – typically no more than 7–10 days. The antibiotic sensitivity of the bacteria found within the oral cavity is gradually decreasing, and a growing number of resistant strains is detected – particularly *Porphyromonas* and *Prevotella*, though the phenomenon has also been reported for *Streptococcus* viridans and for drugs such as the macrolides, penicillin, and clindamycin.[18]

Dental health-care professionals prescribe antimicrobial agents for conditions both therapeutically and prophylactically.[16] In one such study, dental health-care professionals account for 7–11% of the total antimicrobial prescriptions.[17] These antimicrobials are given prophylactically before dental procedures, during treatments, after treatment, or as the only form of treatment. Unfortunately, the last type of prescription is very common in developing countries where a large fraction of population cannot afford dental treatment in private dental setups and the government facilities for the same are limited and overburdened. Many patients suffering from dental pain visit the dentist to just get a prescription for medicine which very often includes an antimicrobial agent without getting any kind of operative treatment done. In developing countries, where legislation regarding the prescription of antimicrobials is not very strong or is not strongly implemented, people just go to a neighborhood pharmacy to buy medicines over the counter for dental pain, which again include antimicrobial agents. This cycle is repeated many times before the person finally decides to get any kind of definitive dental treatment done. Although the patient's expectations are a contributing factor in the overuse of antimicrobials by dentists, it is by no means the only contributing factor. The dental health-care professionals are equally, if not more responsible for the abuse of antimicrobial agents. The use of prophylactic antimicrobials taken before various dental procedures for the prevention of local post-operative complications such as dry socket and infections or to prevent systemic complications like infective endocarditis is extremely common.[18] There are numerous studies in place to prove that the prophylactic prescription of antibiotics does not decrease the risk of post-operative infections or dry socket, and they are of little use if any in dentoalveolar surgical procedures including third molar surgical extractions in a non-medically compromised patient.[19-21] Even in patients who are at risk of developing infective endocarditis, the use of antibiotics is recommended only for those who are in the highest risk category. The American Heart Association modified its recommendations in 2007 in keeping with the current research. It now supports the prophylactic use of antibiotics only in patients with a prosthetic heart valve, patients with a history of endocarditis, patients with a heart transplant, patients with abnormal heart valve function, and those with certain congenital heart diseases only.[22] It is not uncommon in developing countries to find dentists prescribing antimicrobials to cover defects in asepsis and improperly sterilized instruments which increase the risk of post-operative infections.[23,24] The most common cause for a

dental visit is pain and the most common cause of dental pain is odontogenic infections. Localized odontogenic infections when restricted to the pulp or spreading into the periapical area do not warrant the use of antimicrobial agents.[25] Two of the most painful conditions in dentistry, namely acute pulpitis and acute apical abscess, do not require antimicrobials for their treatment. The treatment for these conditions is the removal of the pulp and establishment of drainage either through the root canal or surgically, respectively.[26] The use of interappointment antimicrobials is widespread, especially in endodontic treatment procedures.[27,28] Time and again studies have proven that the use of antimicrobials before, during, or after endodontic treatment, including flare-ups and endodontic surgeries is of little consequence in altering the prognosis of the treatment in anyway.[29] There are very few conditions where antimicrobial therapy is indicated. Only when systemic signs of infections such as pyrexia, malaise, and lymphadenopathy are noticed, the use of antimicrobial agents is recommended to prevent the spread of infections to other vital organs.[30] There are also some localized conditions which require antimicrobial therapy such as acute necrotizing ulcerative gingivitis and pericoronitis.

Some of the challenges faced in India to combat the issue of antibiotics are the lack of surveillance system and operating guidelines for antibiotics prescription. Over-the-counter sale of antibiotics, lack of public awareness, and commitment on the part of policymakers are other issues.

From the dental perspective, it is, therefore, suggested that antibiotics should be used as an adjunct and not a substitute for a definite treatment. In the absence of signs and symptoms of infections, dental practitioners should refrain from prescribing antibiotics for relieving pain. It is required to analyze the condition before prescribing antibiotics to the patients.

At the level of policymakers, it is recommended to have a national action plan, improved surveillance system, regulation and promotion of guidelines, and survey of the impact of information to follow-up whether the improvement is there or not. At the level of health care workers promotion of hand, instrument, and environmental sanitation to avoid the development of infection in the first place, antibiotic prescription only when needed, right drug, dose, and duration while prescribing and test to confirm when in doubt is recommended. For the general public or the patients, it is required that they use antibiotics only when prescribed, take full prescription, discard leftover, do not share their prescription with friends or family, and prevent infection by maintaining hygiene.

CONCLUSION

The result of our study shows that around 70% of patients were complying with the full course of antibiotics as prescribed. Therefore, health workers should make more effort to enhance the proper use of antibiotics in our population.

REFERENCES

1. De Geest S, Sabaté E. Adherence to long-term therapies: Evidence for action. Eur J Cardiovasc Nurs 2003;2:323.

2. Kardas P. Patient compliance with antibiotic treatment for respiratory tract infections. J Antimicrob Chemother 2002;49:897-903.

3. Sunitha V R, Emmadi P, Namasivayam A, Thyegarajan R, Rajaraman V. The periodontal -endodontic continuum: A review. J Conserv Dent 2008;11:54-62.

4. Siqueira JF Jr. Rôças IN. Microbiology and treatment of acute apical abscesses. Clin Microbiol Rev 2013;26:255-73.

5. Brown MT, Bussell JK. Medication adherence: WHO cares? Mayo Clin Proc 2011;86:304-14.

6. Lee JK, Grace KA, Foster TG, Crawley MJ, Erowele GI, Sun HJ, *et al*. How should we measure medication adherence in clinical trials and practice? Ther Clin Risk Manag 2007;3:685-90.

7. Wu P, Johnson BA, Nachega JB, Wu B, Ordonez CE, Hare AQ, *et al*. The combination of pill count and self-reported adherence is a strong predictor of first-line ART failure for adults in South Africa. Curr HIV Res 2014;12:366-75.

8. Prasad's BG. Socioeconomic Scale for; 2019. Available from: https://www.prasadscaleupdate.weebly.com. [Last accessed on 2019 Feb 07].

9. Al-Shammari SA, Khoja T, Jarallah JS. The pattern of antenatal visits with emphasis on gestational age at booking in Riyadh health centres. J R Soc Health 1994;114:62-6.

10. Bawazir SA. Prescribing patterns of ambulatory care physicians in Saudi Arabia. Ann Saudi Med 1993;13:172-7.

11. Yamamoto Y, Kadota J, Watanabe A, Yamanaka N, Tateda K, Mikamo H, *et al*. Compliance with oral antibiotic regimens and associated factors in Japan: Compliance survey of multiple oral antibiotics. Scand J Infect Dis 2012;44:93-9.

12. Al-Shammari SA, Khoja T, Al-Yamani MJ. Compliance with short-term antibiotic therapy among patients attending primary health centres in Riyadh, Saudi Arabia. J R Soc Health 1995;115:231-4.

13. Naveen N, Suhas PG, Vanishree N, Patnaik S, Bharath C, Prasad KS. Current trends in prescription of antibiotics among dentists working in various dental colleges of Bengaluru City, India a cross sectional study. Int J Oral Health Med Res 2015;2:8-14.

14. Cope AL, Francis NA, Wood F, Chestnutt IG. Antibiotic prescribing in UK general dental practice: A cross-sectional study. Community Dent Oral Epidemiol 2016;44:145-53.

15. Martinez JL, Baquero F. Mutation frequencies and antibiotic resistance. Antimicrob Agents Chemother 2000;44:1771-7.

16. World Health Organization. Global Action Plan on Antimicrobial Resistance. Geneva: World Health Organization; 2015.

17. Dar-Odeh NS, Abu-Hammad OA, Al-Omiri MK, Khraisat AS, Shehabi AA. Antibiotic prescribing practices by dentists: A review. Ther Clin Risk Manag 2010;6:301-6.

18. Abukaraky AE, Afifeh KA, Khatib AA, Khdairi NO, Habarneh HM, Ahmad WK, *et al*. Antibiotics prescribing practices in oral implantology among Jordanian dentists. A cross sectional, observational study. BMC Res Notes 2011;4:266.

19. Perić M, Perković I, Romić M, Simeon P, Matijević J, Mehičić GP, *et al*. The pattern of antibiotic prescribing by dental practitioners in Zagreb, Croatia. Cent Eur J Public Health 2015;23:107-13.

20. Goud SR, Nagesh L, Fernandes S. Are we eliminating cures with antibiotic abuse? A study among dentists. Niger J Clin Pract 2012;15:151-5.

21. Kakoei S, Raoof M, Baghaei F, Adhami S. Pattern of antibiotic prescription among dentists in Iran. Iran Endod J 2007;2:19-23.

22. Halboub E, Alzaili A, Quadri MF, Al-Haroni M, Al-Obaida MI, Al-Hebshi NN, *et al*. Antibiotic prescription knowledge of dentists in kingdom of Saudi Arabia: An online, country-wide survey. J Contemp Dent Pract 2016;17:198-204.

23. Saadat S, Mohiuddin S, Qureshi A. Antibiotic prescription practice of dental practitioners in a public sector institute of Karachi. J Dow Univ Health Sci 2013;7:54-8.

24. Jaunay T, Sambrook P, Goss A. Antibiotic prescribing practices by South Australian general dental practitioners. Aust Dent J 2000;45:179-86.

25. Karibasappa GN, Sujatha A. Antibiotic resistance a concern for dentists? J Dent Med Sci 2014;13:112-8.

26. Patait M, Urvashi N, Rajderkar M, Kedar S, Shah K, Patait R, *et al*. Antibiotic prescription: An oral physician's point of view. J Pharm Bioallied Sci 2015;7:116-20.

27. Rubinstein E. Short antibiotic treatment courses or how short is short? Int J Antimicrob Agents 2007;30 Suppl 1:S76-9.

28. Lisboa SM, Martins MA, Castilho LS, Souza e Silva ME, Abreu MH. Prescribing errors in antibiotic prophylaxis by dentists in a large Brazilian city. Am J Infect Control 2015;43:767-8.

29. Kuriyama T, Williams DW, Yanagisawa M, Iwahara K, Shimizu C, Nakagawa K, *et al*. Antimicrobial susceptibility of 800 anaerobic isolates from patients with dentoalveolar infection to 13 oral antibiotics. Oral Microbiol Immunol 2007;22:285-8.

30. Kamulegeya A, William B, Rwenyonyi CM. Knowledge and antibiotics prescription pattern among Ugandan oral health care providers: A Cross-sectional survey. J Dent Res Dent Clin Dent Prospects 2011;5:61-6.