

Original Article

Pattern of Prescription of Antibiotics among Dental Practitioners in Jeddah, KSA: A Cross-sectional Survey

K Al-Johani^{1,2}, SG Reddy⁴, AS Al Mushayt^{2,3}, A El-Housseiny^{3,5}

¹Department of Oral Diagnostic Sciences Faculty of Dentistry, King Abdulaziz University, Jeddah, ²Qaseem Private Colleges, Buraidah, ³Department of Paediatric Dentistry, Faculty of Dentistry, King Abdulaziz University, Jeddah, ⁴Department of Preventive Dental Sciences, Faculty of Dentistry, Qaseem Private Colleges, Buraidah, ⁵Alexandria University, Alexandria, Egypt, Jeddah, Kingdom of Saudi Arabia

Date of Acceptance:
25-Jul-2016

INTRODUCTION

In the recent years, various health organizations have increased emphasis on the appropriate use of antibiotics in several health situations. In the past few decades, various medical professionals including dental professionals have experienced a rapid and dramatic increase in the therapeutic use of antibiotics required for the treatment of different infections.^[1] In United Kingdom, a survey conducted among general dental practitioners in 2004 revealed that 15% of the dentists prescribe antibiotics on a daily basis and 40% of the dentists on at least three occasions per week.^[2] These practices are either inappropriate or unnecessary.^[3]

Antimicrobial resistance is the resistance of a microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by it. WHO's 2014 report on global surveillance of antimicrobial resistance revealed that antibiotic resistance is no longer a prediction for the future; it is happening right now, across the world, and has placed at great risk

ABSTRACT

Background: Inappropriate use of antibiotics by clinicians leads to antibiotic resistance, and is a serious global health concern. **Aim:** The aim of this study was to determine antibiotic prescription practices of dental practitioners and their adherence to professional guidelines while treating oral health problems among children. **Materials and Methods:** All the dentists working in Jeddah were invited to participate and 126 dentists consented to be a part of this study. A two-part questionnaire was applied. First section explored the demographics and questions related to antibiotic use for certain dental clinical procedures, whereas the second section used five different clinical case scenarios to elicit the antibiotics prescription practices and adherence to professional guidelines by the dentists. **Results:** Amoxicillin (73.8%) was the most commonly preferred antibiotic for most of the orofacial infections among the dentists. The overall adherence to the professional guidelines ranged from 9.5 to 45%. **Conclusions:** A lack of consistency in the antibiotic prescription pattern among dentists in Jeddah and overall low adherence to the professional guidelines was observed.

KEYWORDS: Antibiotics, antibiotic abuse, antimicrobial resistance, children, orofacial infection

the ability to treat common infections in the community and hospitals. Without urgent, coordinated action, the world is heading toward a post-antibiotic era, in which common infections and minor injuries, which have been treatable for decades, can once again kill.^[4] Dentistry's contributions to the problem of antibiotic resistance could be substantial, because dentists prescribe approximately 10% of all common antibiotics.^[5]

Because of an overall rise in the health care costs, lack of uniformity in prescription of drugs and the emergence of antibiotic resistance, monitoring, and control of antibiotic use are a growing concern and strict antibiotic policies are warranted. Before such policies can be implemented, detailed knowledge on antibiotic prescription practices is imperative. Even though numerous guidelines for

Address for correspondence: Dr. SG Reddy, Associate Professor, Department of Preventive Dental Sciences, Faculty of Dentistry, Qaseem Private Colleges, Buraidah, Kingdom of Saudi Arabia.
E-mail: drsidgoud@gmail.com

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How to cite this article: Al-Johani K, Reddy SG, Al Mushayt AS, El-Housseiny A. Pattern of prescription of antibiotics among dental practitioners in Jeddah, KSA: A cross-sectional survey. Niger J Clin Pract 2017;20:804-10.

Access this article online

Quick Response Code:



Website: www.njcponline.com

DOI: 10.4103/1119-3077.196072

the rational use of antibiotics have been published, recommendations often conflict.^[6]

Antibiotics are prescribed in dental practice for prophylactic and therapeutic reasons. Most baseless prescriptions of antibiotics for children have been reported in cases of ear and dental infections.^[7] Inappropriate use of antibiotics by clinicians may lead to antibiotic resistance in children, and poses a serious global health concern.

Literature abounds with studies performed regarding antibiotic prescription patterns in the Western countries, the Asian and African nations. However, little information is available concerning these practices among dentists of the Middle East region.

Hence, the aim of this study was to determine antibiotic prescription practices of dental practitioners and their adherence to professional guidelines while treating oral health problems among children.

MATERIALS AND METHODS

This study is a cross-sectional survey conducted from February to May 2013, to determine the antibiotic prescribing practices among dentists while treating children in Jeddah province. The proposed study was approved by the Research Ethics Committee of the institution. A total of 150 dentists, actively engaged in treating pediatric dental patients were invited to participate in this study. Voluntary, written informed consent was obtained from each dentist who participated in this study.

A special form designed to record all the required relevant general information and information related to antibiotic prescribing patterns was used as a tool for data collection. No identification of the person completing the form was made.

The self-administered questionnaire, composed of two main sections. The first section consisted of 27 questions to explore general information and questions related to antibiotics use in certain dental clinical procedures. The questions were mainly close ended, with few open questions to allow free response. The second section used five different clinical case scenarios to explore the antibiotics use (the case scenarios and the methodology were extracted from the 2012 published research by Cherry *et al.*,^[8] see Appendix I).

A convenient sample (Whole sample) of dentists actively engaged in treatment of pediatric dental patients in different public and private hospitals in the Eastern Province of Saudi Arabia were recruited for this study. The questionnaires were directly handed to the dentist in his/her office and retrieved after 1 week. Dentists who were unable to

complete the questionnaire in the first week were revisited after a week to collect the completed questionnaire.

The presented scenarios 1–3 were in-office cases and scenarios 4 and 5 were weekend cases. If the dentists reported that they would prescribe antibiotics for the appropriate collective signs and symptoms, then they were considered to be in adherence to the professional guidelines (Appendix II and Cherry *et al.*, 2012).^[8] For the weekend cases, if the dentists examined the child before prescribing antibiotics and if they prescribed antibiotics for the appropriate collective signs and symptoms, then they were considered to be in adherence to the professional guidelines.

The anonymous data were numerically coded and entered into Statistical Package for Social Science SPSS version 20 (SPSS Inc., Chicago, IL, USA) database and analyzed using descriptive statistics. Pearson's chi-square test was used to assess the difference between general dental practitioners and pediatric dentists in adherence to professional guidelines.

RESULTS

The questionnaire was distributed to 150 dentists and 126 dentists responded to the questionnaire, with an 84% response rate.

Table 1: Demographics and practice information

Variable	Number of dentists (%)
<i>Gender</i>	
Men	52 (41.3)
Women	74 (58.7)
<i>Experience after graduation</i>	
1--5 years	64 (50.8)
6--10 years	27 (21.4)
11--15 years	11 (8.7)
16 or more years	24 (19)
<i>Speciality</i>	
General dentist	80 (63.5)
Pediatric dentist	13 (10.3)
Others	33 (26.2)
<i>Dentists highest degree in dentistry</i>	
Bachelor	88 (69.8)
Masters	13 (10.3)
Doctoral	07 (5.6)
Others	18 (14.3)
<i>Practice location</i>	
Urban	113 (89.7)
Suburban	07 (5.6)
Rural	06 (4.8)

Contd...

Table 1: Contd...

Variable	Number of dentists (%)
<i>Practice type</i>	
Ministry of Health	95 (75.4)
National guard	12 (9.5)
Private sector	15 (11.9)
Others	04 (3.2)
<i>How many children do you treat per month</i>	
≤15	83 (65.9)
>15	[43] (34.1)
<i>How many hours per week do you provide patient care</i>	
10--20	31 (24.6)
21--30	34 (27)
30>	61 (48.4)

Table 1 shows the demographic and practice characteristics of the participated dentists. Most of them were general dental practitioners (63.5%), 10.3% pediatric dentists and 26.2% were from other dental disciplines. Almost 89.7% of the participating dentists were practicing in urban areas followed by 5.6% in suburban and 4.8% in rural areas.

Table 2 displays the general pattern of antibiotic prescription. In this study, Amoxicillin (73.8%) was the most prescribed antibiotic followed by Amoxicillin with Clavulanic acid (13.5%) and Clindamycin (8.7%). Most participants (99.2%) used oral route for administration of antibiotics and almost 59.5% of the dentists prescribed antibiotic for an average duration of 5 days.

Table 2: General pattern of antibiotics prescription

Question	Response No. (%)
<i>How often do you write prescriptions for antibiotics for dental infections?</i>	
Daily	12 (9.5)
Weekly	35 (27.8)
Monthly	26 (20.6)
Hardly ever	53 (42.1)
<i>How often do you write antibiotic prescriptions for prevention of subacute bacterial endocarditis?</i>	
Daily	6 (4.8)
Weekly	13 (10.3)
Monthly	28 (22.2)
Hardly ever	79 (62.7)
<i>What is the most common antibiotic prescribed by you?</i>	
Penicillin	03 (2.4)
Amoxicillin	93] (73.8)
Clindamycin	11 (8.7)
Cephalexin	02 (1.6)
Amoxicillin and clavulanic acid	17 (13.5)
<i>What is the most common route of administration of antibiotic preferred by you?</i>	
Oral	125 (99.2)
Intravenous	1 (0.8)
<i>Do you receive after hours telephone calls?</i>	
Yes	24 (19)
No	102 (81)
<i>For orofacial infection, what is the average number of days you usually prescribe antibiotic for children?</i>	
2 days	1 (0.8)
3 days	5 (4)
5 days	75 (59.5)
6 days	1 (0.8)
7 days	43 (34.1)
14 days	1 (0.8)

Contd...

Table 2: Contd...

Question	Response No. (%)
<i>Would you prescribe antibiotic for reversible pulpitis?</i>	
Yes	8 (6.3)
No	118 (93.7)
<i>Would you prescribe antibiotics for pain only</i>	
Yes	31 (24.6)
No	95 (75.4)

Table 3: Responses to clinical scenarios: Adherence to professional guidelines^a (N = 126)

Clinical scenarios and responses	Overall adherence to guidelines, No. (%) of dentists (N = 126)	No. (%) of general dentists adhering to guidelines (N = 113)	No. (%) of pediatric dentists adhering to guidelines (N = 13)
Case 1 Prescribe antibiotics only for pain, facial swelling, and radiographic evidence of pathology	57 (45.2)	50 (44.2)	7 (53.8)
Case 2 Prescribe antibiotics only for pain, facial swelling, and radiographic evidence of pathology	24 (19)	20 (17.7)	4 (30.8)
Case 3 Prescribe antibiotics only for pain, facial swelling, and radiographic evidence of pathology	39 (31)	33 (29.2)	6(46.2)
Case 4 Would see patient before prescribing antibiotics and prescribe antibiotics only for pain and facial swelling	29 (23.2)	24 (21.4)	5 (38.5)
Case 5 Would see patient before prescribing antibiotics and prescribe antibiotics only for pain, warmth of skin, and facial swelling.	12 (9.5)	9 (8)	3 (23.1)

^aSources: American academy of Pediatric Dentistry council on clinical affairs, American Dental Association Council on Scientific Affairs.^[9,21]

Table 3 presents dentists' responses to the clinical case scenarios. Overall, adherence rates were low, ranging from 9.5 to 45%. There was no significant difference ($P > 0.05$) between pediatric dentists and other dental practitioners including general dentists but there was a trend toward pediatric dentists' having higher levels of adherence to professional guidelines. According to the AAPD professional guidelines, dentists should consider antibiotic prescription when a patient has facial swelling with or without pain, radiographic evidence of pathology, or a combination of the preceding.^[9]

Case 1 represents the collective symptoms of facial swelling, pain, and radiographic evidence of pathology. Overall, 45% of the dentists in this study were in adherence to the professional guidelines. Among the pediatric dentists, 53.8% were in adherence with the professional guidelines and among the general dentists, 44% were in adherence. When fever was added to the list of collective signs and symptoms [case 2]; the overall adherence level dropped to 19%. When

local swelling was added and fever was removed from the list of collective signs and symptoms [case 3], the overall adherence level increased to 31% of respondents.

Dentists' adherence to the professional guidelines decreased for the weekend cases. The ADA guidelines state that to prescribe antibacterial drugs, the dentist must "make an accurate diagnosis."^[8,10] In other words, he or she should examine the patient before prescribing antibiotics. In case 4 scenario, 23% and in case 5 scenario only 9% of the dentists reported that they would prescribe antibiotics only after seeing the patient.

When participants were asked about the guidelines they follow in prescribing antibiotics, 65.9% of the respondents did not follow any guidelines while prescribing antibiotics for children.

When dentists were asked about the source of information about antibiotic prescription, most of the dentists preferred scientific published literature (29.4%)

followed by textbooks (28.6%); continuing education courses (27.8%) and the internet (11.9%).

DISCUSSION

The WHO, antimicrobial resistance: global report on surveillance 2014^[11] makes a clear case that resistance to common bacteria has reached alarming levels in many parts of the world and that in some settings, few, if any, of the available treatments options remain effective for common infections. Another important finding of the report is that surveillance of antibacterial resistance is neither coordinated nor harmonized and there are many gaps in the information on bacteria of major public health concern.

Fortification of the global antimicrobial resistance surveillance is critical as it is the basis for forming global strategies, monitoring the effectiveness of public health interventions, and detecting new trends and threats (WHO, 2014).^[11] Hence, this study is an attempt toward contribution to the existing literature, related to antibiotic use and abuse, especially while treating children located in the Middle East region.

This study illustrated inconsistency in the prescription of antibiotics among dentists of Jeddah, while treating dental infection among children and a lack of adherence to guidelines was observed. A tendency to prescribe antibiotics in the absence of definite indications as per guidelines was observed. Almost 25% of the respondents agreed that they prescribe antibiotics when the patient suffers only pain, where only analgesics would have sufficed, in contradiction to the guidelines. Similarly, in a previous survey on Pediatric dentists in the USA, 15% and 4% of them prescribed antibiotics to relieve pain or satisfy parents, respectively.^[12]

In this study 65.9% of the dentists did not follow any specific guidelines. Similar finding were seen in other studies in the USA.^[8,12] This clearly indicates the increased likelihood of misuse and unwarranted use of antibiotics that may contribute to the world of antimicrobial resistance. Definitive steps and appropriate guidelines are the need of the hour worldwide, to combat the grim reality of antibiotic resistance.

However, the guidelines were followed in treatment of reversible pulpitis and facial swelling. High percentage of participants (93.7%) avoided antibiotic use in the treatment of reversible pulpitis. In pulpitis, the tooth pulp is vital, but inflamed, and is occasionally accompanied by severe pain. In case of acute pulpitis, without fever or facial swelling, inflammation is confined to the pulpal tissue or immediate surrounding tissue. Pulp extirpation or extraction under analgesics would resolve the complaint, avoiding antibiotic use.^[10,12]

Several studies have demonstrated varying low levels of adherence among pediatric dentists in various parts of the world, ranging from 10 to 56%.^[8,12]

Facial swelling due to dental infection is an emergency condition. Treatment may include drainage, extraction of the offending tooth with antibiotic coverage, or prescription of antibiotics for several days to confine the spread of infection followed by treatment. The dentist should take into consideration the severity of infection, the ability to achieve proper anesthesia, and the medical condition of the child (AAPD).

Amoxicillin was the most preferred antibiotic for most of the dental infections concurrent with studies conducted in other parts of the world.^[1,13,14]

Duration of antibiotic prescriptions vary based on the clinical conditions. The AAPD guidelines recommend usually a 5- to 7-day course of treatment dependent upon the specific drug selected. A study in the United Kingdom pointed out considerable proportion of dental practitioners prescribe antibiotics for a period up to 10 days.^[15] In this study, majority of the dentists preferred a period of 5–7 days of antibiotic coverage for children for most of the acute dental infections, which is in accordance with the guidelines and few other studies.^[16-18] Most acute infections resolve within 3–7 days.^[19] However, the revised AAPD guidelines (2014)^[9] recommend monitoring the effectiveness of the antibiotics to avoid antibiotic resistance and practitioners are advised to alter or stop antibiotics after determining either uselessness or cure before the completion of 5- to 7-day course.^[20,21]

This cross-sectional study has one main constraint in that the data collected was self-reported by the participants and did not examine the actual prescription from the patient files. Thus, we could not determine that the responses are accurate. However, their responses reflected their knowledge in the use of antibiotics and there is no evidence to support that they misreported their answers.

Although most participants obtain their information from published scientific literature, books, and continuing education, their adherence to the AAPD guidelines was inadequate. Programs to update antibiotic prescription guidelines should be available to the dentists worldwide. In addition, guidelines should be comprehensible and include multiple clinical case scenarios.

CONCLUSIONS

The results of this study illustrate the wide variation in prescription pattern of antibiotics among dentists for

orofacial infections in children. Higher inconsistencies and lack of uniform adherence to the professional guidelines was observed among dentists while prescribing antibiotics for odontogenic infections in children.

Acknowledgments

The authors thank Ms. Amal Al Jeshi and Mr. Rawan Al Hasawi for their help in data collection, and the authors also thank Dr. Shoba Fernandes for manuscript editing and review.

Appendix I: Clinical case scenarios (Cherry *et al.*, 2012; ASA, 2011)

Case scenarios

Case 1

A healthy (ASA I) 9-year-old child, who is a patient of record, visits your office during regular business hours with tooth pain in the lower right quadrant. On clinical examination, you notice a deep carious lesion on tooth number 85 (mandibular right primary second molar). Would you prescribe antibiotics for the following:

Pain only?

Symptoms of pain and local swelling with no radiographic evidence of pathology?

Symptoms of pain and local swelling with radiographic evidence of pathology? Symptoms of pain and facial swelling with radiographic evidence of pathology?

Case 2

A healthy (ASA I) 9-year-old child, who is a patient of record, visits your office during regular business hours with tooth pain in the lower right quadrant and a fever of 101 F. On clinical examination, you notice a deep carious lesion on tooth number 85 (mandibular right primary second molar). Would you prescribe antibiotics for the following:

Pain and fever?

Symptoms of pain and local swelling with no radiographic evidence of pathology? Symptoms of pain and local swelling with radiographic evidence of pathology? Symptoms of pain and facial swelling with radiographic evidence of pathology?

Case 3

A healthy (ASA I) 9-year-old child, who is a patient of record, visits your office during regular business hours with tooth pain in the lower right quadrant. The child has no fever. On clinical examination, you notice a deep carious lesion on tooth number 85 (mandibular right

primary second molar) along with a draining fistula. Would you prescribe antibiotics for the following:

Pain only?

Symptoms of pain and local swelling with no radiographic evidence of pathology? Symptoms of pain and local swelling with radiographic evidence of pathology? Symptoms of pain and facial swelling with radiographic evidence of pathology?

Case 4

The parent of a healthy (ASA I) 9-year-old child, who is a patient of record, calls you on a Saturday afternoon because the child has a chief complaint of tooth pain in the lower right quadrant. Would you prescribe antibiotics for the following:

Pain only?

Symptoms of pain and local swelling?

Symptoms of pain and facial swelling?

Would you see the child before prescribing antibiotics?

Case 5

The parent of a healthy (ASA I) 9-year-old child, who is a patient of record, calls you on a Saturday afternoon and reports that the child has pain on the lower right quadrant with some warmth of the skin and some swelling that she noticed that morning. Would you prescribe antibiotics for the following:

Pain only?

Symptoms of pain and warmth of the skin?

Symptoms of pain, warmth of the skin, and localized swelling?

Symptoms of pain, warmth of the skin, and facial swelling?

Would you see the child before prescribing antibiotics?

Appendix ii: Professional guidelines for antibiotic use (American Academy of Pediatric Dentistry)^a

Oral wound management: Antibiotic therapy should be considered with oral wounds that are at an increased risk of bacterial contamination, examples, soft-tissue lacerations, complicated crown fractures, severe tooth displacement, extensive gingivectomy, and severe ulcerations.

Pulpitis/apical periodontitis/draining sinus tract/localized intraoral swelling: If a child has acute symptoms of pulpitis and the infection is contained within the pulpal tissue or the immediate surrounding tissue, treatment should be performed and an antibiotic should not be prescribed.

Acute facial swelling of dental origin: Facial swelling, secondary to a dental infection should receive immediate dental attention; depending on clinical findings, treatment may consist of treating or extracting the tooth or teeth in question with antibiotic coverage or prescribing antibiotics for several days to contain the spread of infection and, then treating the involved tooth or teeth.

Dental trauma: Application of an antibiotic to the root surface' of an avulsed tooth is recommended to prevent resorption and increase rate of pulpal revascularization; the need for systemic antibiotics with avulsed teeth is unclear.

Pediatric periodontal diseases: In pediatric periodontal diseases associated with systemic diseases such as neutropenia, Papillon-LeFevre syndrome and leukocyte adhesion deficiency, antibiotic therapy is indicated.

^{a*}Adapted from (American Academy of Pediatric Dentistry Council on Clinical Affairs, 2010; Cherry *et al.*, 2012).^[8,10]

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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