

# Antibiotic abuse during endodontic treatment in private dental centers

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## ABSTRACT

**الأهداف:** بتقييم وصف المضادات الحيوية من قبل أطباء الأسنان العامين خلال المعالجات اللبية في مراكز علاج الأسنان الخاصة في المدينة المنورة، المملكة العربية السعودية.

**الطريقة:** تم توزيع استبيان حول وصف المضادات الحيوية خلال المعالجات اللبية في الفترة من شهر آذار حتى نيسان م 2016 تم توزيع الاستبيان على 75 طبيب أسنان يعملون في المراكز الخاصة بعلاج الأسنان في المدينة المنورة، المملكة العربية السعودية بشكل عشوائي. تم جمع الاستبيان بعد أسبوع وتم استعمال اختبار مربع كاي من

**النتائج:** أظهرت نتائج هذه الدراسة أن 60% من أطباء الأسنان يقومون بوصف الأموكسيسيلين مع حمض الكلافولنيك كخيار أول لعلاج الأمراض اللبية. الكليندامايسين كان الخيار الأول (51.6%) للمرضى الذين يعانون من الحساسية تجاه البنسلين. لقد تم وصف المضادات الحيوية لمدة 5 أيام (83%) من الممارسين العامين قاموا بوصف المضادات الحيوية في الخراجات الذروية الحادة. تم وصف المضادات الحيوية وقائياً لـ: الحالات ذات تاريخ التهاب غشاء القلب الانتاني (65.5%)، وحالات صمامات القلب الصناعية التي وضعت خلال سنتين قبل المعالجة السننية (46.6%)، الداء السكري غير المضبوط (36.2%)، وأمراض القلب الولادية (36.2%)، وحالات الغسيل الكلوي (34.5%).

**الخاتمة:** أظهرت هذه الدراسة سوء استعمال المضادات الحيوية خلال المعالجات اللبية في مراكز علاج الأسنان الخاصة في المدينة المنورة- المملكة العربية السعودية. لقد افتقد الممارسون العامون المعرفة الكافية حول وصف المضادات الحيوية والحالات التي تقتضي وصفها وقائياً.

**Objectives:** We evaluated antibiotic prescription practices during root canal treatments among general dentists in private dental clinics in Al-Madinah Al Munawarah, Saudi Arabia.

**Methods:** A self-administered, questionnaire about antibiotic used during root canal treatment was

distributed to 75 randomly selected general dental practitioners working in private dental clinics in

Al-Madinah Al-Munawarah, Saudi Arabia, between March and April 2016. The questionnaires were collected one week later. To compare results of the collected data, Chi-square test was used.

**Results:** The results revealed that 60% of the dentists prescribed amoxicillin with clavulanic acid as the first choice treatment for endodontic pathosis. Clindamycin (51.6%) was the first choice for patients who were allergic to penicillin. Forty-five percent of the general practitioners prescribed antibiotics for 5 days. Approximately 83.3% of general practitioners prescribed antibiotics for acute apical abscesses. Prophylactic antibiotics were prescribed for cases with a history of infective endocarditis (65.5%), non-controlled diabetes (60.3%), placement of a prosthetic joint in the previous 2 years (46.6%), congenital heart disease (36.2%), and kidney dialysis shunts (34.5%).

**Conclusion:** This study reveals antibiotic abuse in endodontic treatment practice in private dental clinics in Al-Madinah Al Munawarah, Saudi Arabia. General dental practitioners are lacking knowledge regarding the prescription of antibiotics in endodontic treatment and situations requiring prophylactic antibiotics.

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Root canal infections are polymicrobial and predominantly caused by anaerobic bacteria and certain facultative bacteria.<sup>1,2</sup> Although oral infections can contain more than 500 species of bacteria, root canal infections involve 20–40 species, and it is not possible to determine which of these species is the “major” pathogen.<sup>3</sup> Endodontic microorganisms have the ability to form biofilms, which can induce apical periodontitis<sup>4,5</sup> and high levels of drug tolerance.<sup>6</sup> The role of systemic antibiotic therapy in endodontics is limited,<sup>7,8</sup> generally to patients with progressive, diffuse swelling; with systemic signs of infection such as fever, malaise, and lymphadenopathy; or who are medically compromised, such as history of prosthetic cardiac/heart valves and infective endocarditis for whom they are used prophylactically.<sup>7,9</sup> There is no evidence of the benefits of antibiotics for irreversible pulpitis, necrotic pulp, retreatment, or reducing postoperative pain.<sup>10,11</sup> The primary treatment for endodontic infections is removal of the intracanal infection by cleaning and shaping the root canal system during root canal procedures.<sup>12</sup> However, antibiotics continue to be over-prescribed in daily dental practice, without a rational justification.<sup>13,14</sup> In the past, antibiotic resistance of oral microflora has increased, which might be a consequence of antibiotic overuse for all diseases.<sup>15</sup> Microbial antibiotic resistance and antibiotic abuse vary globally.<sup>16</sup> The purpose of this study was to identify the patterns of antibiotic prescriptions among general dental practitioners during root canal treatments in private dental centers in Al-Madinah Al-Munawarah.

**Methods.** A self-administered, 5-question questionnaire on antibiotic used during root canal treatment (Appendix 1) was distributed to 75 randomly selected general dental practitioners working in private dental clinics in Al Madinah Al Munawarah, Saudi Arabia, between March and April 2016. A list of general dental practitioners working in private dental clinics in Al Madinah Al Munawarah was obtained from the Saudi Dental Society. This list was entered into Excel, and a random number was generated to select a

random sample of 75 general dental practitioners. The questionnaires were collected personally one week later. The questionnaire collected information about gender, work experience, year of graduation, and practitioners’ preferred choices regarding prescriptions for adult patients, indications for antibiotic use during root canal treatments, and identification of cases requiring prophylactic antibiotics.

To compare results of the collected data, Chi-square test was used. Statistical analyses were carried out using IBM SPSS Statistics for Windows, Version 20.0. (Armonk, NY: IBM Corp). Statistical significance was set at  $p < 0.05$ .

**Results.** Of the 75 questionnaires that were distributed, 60 were completed and returned (response rate: 85%; 25 female and 35 male respondents). Working experience varied from one year (minimum) to 28 years (maximum). At 95% confidence level there were no significant differences ( $p > 0.05$ ) in the patterns of antibiotic prescriptions between female and male practitioners or based on length of dental experience. The most commonly prescribed antibiotic treatment during root canal treatments in the absence of penicillin allergy was amoxicillin with clavulanic acid (Augmentin) (60%), and the most commonly prescribed antibiotic treatment in the presence of penicillin allergy was clindamycin (51.6%) (Table 1). The durations of antibiotic use are for 3 days 18.3%, for 5 days 45%, and for 7 days 36.7%. Acute apical abscesses were the most frequently reported reason for antibiotic prescription, for 83.3% of the general practitioners (Table 2). Prophylactic antibiotic prescriptions are summarized in Table 3.

**Discussion.** In the present study, when no allergy to penicillin was present, amoxicillin with clavulanic acid (Augmentin) was the most frequently prescribed antibiotic (60%) for root canal treatments by practitioners in private centers in Al Madinah Al Munawarah. Although other studies have reported that amoxicillin is the first-choice antibiotic for patients with no medical allergies,<sup>7,14,17</sup> amoxicillin with clavulanic acid is characterized by a much broader spectrum of activity.

There were no differences in the types of antibiotics prescribed between the female and male general practitioners or based on experience; practitioners want to quickly achieve efficacious results when prescribing antibiotics for endodontic treatment. However, other studies have shown that practitioners with more experience tend to prescribe antibiotics more often

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**Table 1** - Frequency of specific antibiotic use during root canal treatment.

Antibiotic	No penicillin allergy	Penicillin allergy
Amoxicillin	18.3%	0.0%
Amoxicillin + Clavulanic Acid (Augmentin)	60.0%	0.0%
Clindamycin (Dalacin C®)	15.0%	51.6%
Azithromycin (Zithromax®)	1.7%	20.0%
Metronidazole + Spiramycin (Rodogyl®)	5.0%	11.7%
Erythromycin	0.0%	16.7%

**Table 2** - Percentages of dental practitioners who prescribed antibiotics for different endodontic conditions.

Endodontic condition antibiotic	Prescription %
Irreversible pulpitis	6.7
Pulp necrosis	33.3
Symptomatic apical periodontitis	28.3
Asymptomatic apical periodontitis	13.3
Acute apical abscess	83.3
Chronic apical abscess	35.0
Diffused swelling	63.3
After all root canal treatments	0
During root canal treatments requiring two visits	0
During retreatment	10.0
Patient insistence	1.7

**Table 3** - Percentages of patients with different medical conditions who were prescribed prophylactic antibiotics by dental practitioners.

Medical condition	Prophylactic antibiotic prescriptions (%)
History of infective endocarditis	65.5
Non-controlled diabetes	60.3
Congenital heart disease (AV shunt and cardiac valve replacement)	36.2
Prosthetic joint placement in previous 2 years	46.6
Kidney dialysis shunts	34.5

than younger practitioners.<sup>18</sup> Clindamycin (Dalacin C®) was the antibiotic of choice for patients with allergies to penicillin (51.6%). Clindamycin is also a wide-spectrum antibiotic and is therefore preferred by general practitioners. In another study, the first-choice antibiotic for patients with penicillin allergies was erythromycin.<sup>19,20</sup> In the present study, 18.3% of the general practitioners prescribed antibiotics for 3 days, 45% for 5 days, and 36.7% for 7 days; comparatively, in other studies, general practitioners prescribed antibiotics for 6.92 days, 7.58 days,<sup>10</sup> and  $4.26 \pm 1.26$  days.<sup>21</sup> In general, orofacial infections continue for 3-7 days,<sup>22</sup> and patients undergoing treatment with antibiotics for

orofacial infections should be evaluated daily. When a patient's host defenses exhibit sufficient clinical evidence of infection control and the infection is being or is resolved, antibiotic therapy should be terminated;<sup>9</sup> furthermore, the use of antibiotics should not continue for more than 1-2 days after clinical evidence indicates that the infection is certain to resolve or is resolved.<sup>1</sup> The rates at which antibiotics were prescribed for endodontic pathosis varied from 1.7% in cases of patient insistence after root canal treatment to 83.3% in cases of acute apical abscess. Among the sampled practitioners in this study, 6.7% prescribed antibiotics for cases of irreversible pulpitis, which is lower than the percentages reported in other studies.<sup>13,19,21,23</sup> This might be due to improved knowledge of general dental practitioners regarding irreversible pulpitis and the risks of antibiotic abuse. The lowest rate of antibiotic prescription (1.7%) for patient insistence after root canal treatment is also indicative of improved knowledge of general practitioners regarding the risks of antibiotic abuse; in a previous study, this rate was higher, at 5.6%.<sup>20</sup> The highest rate of antibiotic prescription related to root canal treatment occurred for cases of acute apical abscess (83.3%), compared with 69% in another study.<sup>24</sup> An incision for drainage and adequate cleaning and shaping of the root canal system or tooth extraction are the appropriate treatments for this condition.<sup>9,25</sup> There is no need for systemic antibiotic therapy for symptomatic apical periodontitis with localized swelling in healthy patients.<sup>25</sup> The majority of infections with an endodontic source can be treated without antibiotics.<sup>1</sup> Antibiotics are indicated when the signs and symptoms suggest systemic involvement, such as high fever, malaise, cellulitis, unexplained trismus, and persistent and progressive infections, and for patients who are immunologically compromised.<sup>26</sup>

The general dental practitioners in the present study prescribed prophylactic antibiotics for 65.5% of the patients with a history of infective endocarditis, 46.6% of patients with placement of a prosthetic joint in the previous 2 years, and 36.2% of patients with congenital heart disease. The American Association of Endodontists guidelines for prophylaxis recommend that prophylactic antibiotics should be considered for these patients prior to dental procedures.<sup>27</sup> Although the prescription of antibiotics is mandatory for patients with non-controlled diabetes,<sup>27,28</sup> only 60.3% of the general practitioners prescribed prophylactic antibiotics for these patients. The antibiotic prophylaxis recommends for patients undergoing hemodialysis,<sup>29</sup> and 34.5% of the general practitioners prescribed prophylactic antibiotics for individuals with kidney dialysis shunts.

**Study limitations.** We included just private dental centers and general practitioners, and the sample was not too large. The data indicate the importance of improving knowledge about antibiotic prophylaxis and also reveal gaps in clinical practice. The results of this study also showed the need for prospective studies to observe the improvement in antibiotics description during endodontic therapies.

In conclusions, this study provides important data regarding the patterns of antibiotic prescription related to endodontic treatment by general dental practitioners in private dental centers in Al-Madinah Al-Munawarah. Antibiotics of the penicillin group remain the first choice for prescription. Furthermore, our findings suggest that antibiotic abuse occurs during routine endodontic treatment and that there are deficiencies in knowledge regarding prescribing antibiotic and appropriate prophylactic antibiotic use. Therefore, a continuing education program is essential to update practitioner knowledge about endodontic pharmacology. There is also a need for further research to evaluate improvements in antibiotic prescription practices during root canal treatment.

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**Appendix 1** - Self-administered, 5-question questionnaire regarding antibiotic used during root canal treatment.

*If you perform root canal treatments, please answer the following questions:*

1. Gender: Male Female
2. Year of graduation:
3. Work experience:

*Q1-Which of the following antibiotics is your preferred choice for adult patients with no medical allergies?*

1. Amoxicillin (Amoxil): A. 500 mg B. 750 mg C. 1 g
2. Amoxicillin + Clavulanic Acid (Augmentin): A. 250 mg/62.5 mg B. 500 mg/125 mg C. 875 mg/125 mg
3. Clindamycin (Dalacin®): 300 mg
4. Azithromycin (Zithromax®): A. 150 mg B. 200 mg C. 250 mg D. 500 mg E. 1 grm
5. Metronidazole + Spiramycin (Rodogyl®)
6. Other:

*Q2-Which of the following antibiotics is your preferred choice for adult patients with allergies to penicillin?*

1. Clindamycin (Dalacin®): 300 mg
2. Azithromycin (Zithromax®): A. 150 mg B. 200 mg C. 250 mg D. 500 mg E. 1 grm
3. Metronidazole + Spiramycin (Rodogyl®):
4. Erythromycin:
5. Lincomycin (Lincocin®):
6. Other:

*Q3-For how many days do you prescribe antibiotics?* A. 3 days B. 5 days C. 7 days D. no answer

*Q4-In which of the following conditions would you prescribe antibiotics?*

- 1) Irreversible pulpitis
- 2) Pulp necrosis
- 3) Symptomatic apical periodontitis
- 4) Acute apical abscess
- 5) Chronic apical abscess
- 6) Diffused swelling
- 7) After all root canal treatments
- 8) Root canal treatment requiring two visits
- 9) During retreatment
- 10) Patient insistence

*Q5- When do you prescribe antibiotics for endocarditis prophylaxis?*