



## Self-Declarative Performance of General Dentists in Prescribing Analgesics and Antibiotics for Patients Requiring Root Canal Treatment

Fatemeh Dibaji<sup>1</sup>, Reza Yazdani<sup>2</sup>, Sara Sajadi<sup>3</sup>, Elahe Mohamadi<sup>3</sup>, Fatemeh Mohammadian<sup>1\*</sup>, Mohammad Javad Kharazi Fard<sup>4</sup>

1. Department of Endodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
2. Department of Community Oral Health, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
3. Private Practice, Tehran, Iran
4. Dental Research Center, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran

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**\*Corresponding author:**  
Department of Endodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

Email: drmohammadianfatemeh@gmail.com

### ABSTRACT

**Objectives:** This study aimed to determine the self-declarative performance of general dentists in prescription of analgesics and antibiotics for patients requiring root canal treatment (RCT).

**Materials and Methods:** In this cross-sectional study, 400 general dentists participating in the 55<sup>th</sup> International Annual Scientific Congress of the Iranian Dental Association (2015) were randomly selected, and requested to complete a questionnaire about their performance regarding prescribing analgesics and antibiotics for patients requiring RCT. The frequency and percentage of answers to each question were calculated and reported.

**Results:** The most commonly prescribed analgesics included ibuprofen (100.0%), Gelofen (100.0%), Novafen (68.5%) and acetaminophen (24.8%). After RCT, dentists prescribed ibuprofen (100.0%), Gelofen (98.3%), dexamethasone (35.3%), Novafen (27.3%) and acetaminophen/codeine (15.8%) in decreasing order of frequency. Antibiotic prescription was minimum (48.5%) for cases with painful (moderate or severe) irreversible pulpitis (vital tooth) before the treatment and maximum for cases of pulp necrosis with acute apical periodontitis, edema, and preoperative symptoms (moderate or severe) (97.3%). For non-allergic patients, the most frequently prescribed antibiotics were amoxicillin 500 mg (93.3%), cefixime 400 mg (81.3%), amoxicillin/metronidazole 250 mg (71.8%), co-amoxiclav 265 mg (36.3%) and injectable penicillin (0.5%). For allergic patients, dentists prescribed clindamycin 300 mg (84.0%), cephalexin 500 mg (15.8%), azithromycin 500 mg (13.5%), and erythromycin 500 mg (10.8%). Sex and graduation date had no significant effect on the results ( $P>0.05$ ).

**Conclusion:** Antibiotic prescription is excessive by general dentists, and their performance regarding the proper and logical prescription of antibiotics in RCT should be improved.

**Keywords:** Analgesics; Anti-Bacterial Agents; Dentists; Root Canal Therapy

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### INTRODUCTION

Various medicines are prescribed daily by dentists for patients undergoing dental

treatments. Thus, dentists should be adequately knowledgeable in this respect [1]. Although root canal treatment (RCT) can be done painlessly,

patients may experience some degrees of pain after treatment, which can be controlled by administration of analgesics [2]. Antibiotics are prescribed for treatment of infections with endodontic origin only in special conditions, for example, in patients with impaired immune system, systemic signs and symptoms of infection, or when the infection has spread to the head and neck spaces [3]. However, antibiotics are extensively prescribed in dental treatments [1,4,5]. Their inappropriate prescription causes problems over time such as the emergence of drug-resistant microbial species [5], e.g. antibiotic-resistant bacteria involved in endodontic infections [6]. Several years after graduation, dental clinicians may not be knowledgeable enough regarding the most recent guidelines on drug prescription [7]. Thus, it seems necessary to investigate the general dentists' performance in prescribing antibiotics and analgesics as they are the main group performing RCT for patients. Such findings can help provide effective educational content for continuing education courses for dental clinicians. This study was designed to assess the self-reported performance of general dentists in prescribing analgesics and antibiotics for patients requiring RCT.

## MATERIALS AND METHODS

The research protocol was approved by the Ethics Committee of Tehran University of Medical Sciences, Iran (IR.TUMS.VCR.REC.1395.1446). The participants consisted of general dentists taking part in the 55<sup>th</sup> International Annual Scientific Congress of the Iranian Dental Association (2015). General dentists were randomly included in the study after obtaining their verbal consent, and a self-report questionnaire about the performance of dental clinicians in prescription of analgesics and antibiotics for patients requiring RCT was distributed among them. The research objectives were explained to them in brief, and they were asked to return the questionnaires to the authors after completion. In order to design the questionnaire, a similar study by Jayadev et al.

[8] was used, and some necessary changes were applied. These changes were done for evaluation of the medications prescribed for pulpal and periapical conditions by the Iranian general dentists according to the Iranian pharmacopeia. The questionnaire consisted of items related to clinical and non-clinical factors as well as the type of antibiotics and prescription of non-narcotic analgesics. The validity of the questionnaire was evaluated and approved by three general dentists, two endodontists, one epidemiologist, and one microbiologist. The content validity ratio and the content validity index for all questions were above 0.8. To evaluate the reliability of the questionnaire, it was given to 14 general dentists twice within 4 weeks, and the obtained results were compared. The alpha's coefficient was 0.80. Finally, 400 questionnaires were distributed. To prevent any loss of the questionnaires, the authors were present to receive the completed questionnaires from all the participants. Thus, all 400 questionnaires were returned. In order to analyze the data, SPSS version 22 was used. The frequency and percentage of dentists' answers to each item of the questionnaire were calculated and reported.

## RESULTS

Overall, 400 general dentists including 223 (55.9%) males and 160 (40.1%) females took part in this study and returned the completed questionnaires. Of all, 17 (4%) respondents did not disclose their gender.

**Table 1.** Frequency of drug prescription in terms of clinical symptoms and general considerations

Clinical symptoms & general considerations	N	Correct Answers (%)
Temperature rise + symptoms of systemic issues	117	29.3
Edema	296	74
Pain	360	90
Indefinite diagnosis	17	95.7
Prevention of postoperative complications	156	39.
Presence of periapical lesions on radiographs	158	60.5

**Table 2.** Frequency of prescribed medications and analgesics for dental pain control after root canal treatment

Type of medications and analgesics	Dental pain control		After root canal treatment	
	Number	Percentage	Number	Percentage
Ibuprofen	400	100	400	100
Gelofen	400	100	393	98.3
Mefenamic acid	2	0.5	0	0
Acetaminophen	99	24.8	0	0
Acetaminophen + codeine	11	2.8	63	15.8
Ibuprofen + acetaminophen	11	2.8	0	0
Novafen	274	68.5	109	27.3
Diclofenac	51	12.8	28	7.0
Diclofenac (suppository)	7	1.8	47	11.8
Ketorolac	0	0	0	0
Dexamethasone (oral - injectable)	9	2.3	141	35.3
Other	1	0.3	0	0

Gender had no significant effect on the responses ( $P= 0.978$ ). The frequency of drug prescription based on clinical symptoms is presented in Table 1. The most commonly prescribed analgesics for dental pain control after RCT among general dentists are presented in Table 2.

**Table 3.** Frequency of antibiotic prescription in different pulpal and periapical conditions

Condition	No.	Percentage
Irreversible pulpitis, moderate/severe preoperative symptoms	198	49.5
Irreversible pulpitis with acute apical periodontitis, moderate/severe preoperative symptoms	354	88.5
Necrotic pulp with chronic apical periodontitis, no edema, no/mild preoperative symptoms	363	90.8
Necrotic pulp with acute apical periodontitis, no edema, moderate/severe preoperative symptoms	345	86.3
Necrotic pulp with chronic apical periodontitis, sinus tract present, no/mild preoperative symptoms	324	81.0
Necrotic pulp with acute apical periodontitis, edema present, moderate/severe preoperative symptoms	389	97.3

All dentists under study prescribed ibuprofen (100.0%) after RCT. According to the results of the current study, 340 dentists (85%) recommended antibiotics after RCT while 60 (15%) did not recommend them. One-hundred and ninety-eight (49.5%) participants prescribed antibiotics for painful, irreversible pulpitis (moderate or severe) before treatment. The frequency of antibiotic prescription before treatment in different cases of pulp and periapical diseases and pain is presented in Table 3. The most commonly prescribed antibiotic in absence of allergy was amoxicillin 500 mg (93.3%). Other prescribed antibiotics in this condition are presented in Table 4.

**Table 4.** Frequency of prescribed antibiotics in absence of allergy to penicillin

Antibiotic	N	%	Correct Answers (%)
Amoxicillin 500 mg	373	93.3	93.3
Amoxicillin + metronidazole 250 mg	287	71.8	71.8
Amoxicillin + clavulanic acid 625 mg	145	36.3	63.7
Cefixime 400 mg	325	81.3	18.7
Penicillin (injectable)	2	0.5	99.5

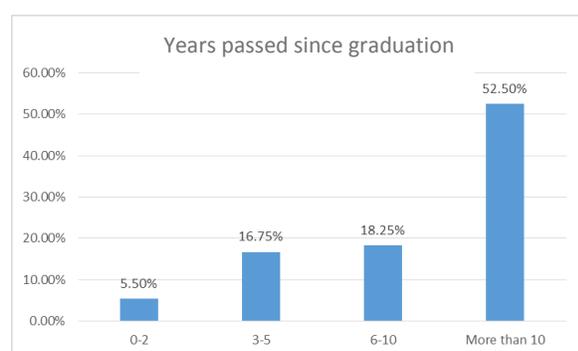
In case of allergy to penicillin, the first choice of dentists was prescription of clindamycin 300 mg (84.0%). Other prescribed antibiotics in case of allergy to penicillin are reported in Table 5.

**Table 5.** Frequency of prescribed antibiotics in case of allergy to penicillin

Antibiotic	N	Percentage
Cephalexin 500 mg	63	15.8
Ciprofloxacin 500 mg	0	0
Clindamycin 300 mg	336	84.0
Azithromycin 500 mg	54	13.5
Erythromycin 500 mg	43	10.8
Ceftriaxone	0	0
Doxycycline 100 mg	0	0

With regard to non-clinical factors, the reason for antibiotic prescription was expectation and insistence of patients for antibiotic prescription in 3.8%, indefinite diagnosis in 17.5%, and inability to complete the treatment or delayed treatment in 78.3%. The sources of information for prescription of medications in RCT were continuing education courses in 98.5%, Internet in 94.5%, and pharmaceutical companies in 78.5%. Graduation year had no significant effect on the responses ( $P=0.632$ ). Figure 1 shows the results in this respect.

Also, most general dentists participating in the study had been graduated from Tehran University, Azad University of Tehran, and Tabriz University of Medical Sciences in decreasing order of frequency.

**Fig. 1.** Frequency of dentists based on the time passed since their graduation (in years)

## DISCUSSION

According to the findings of the present study, ibuprofen (100.0%), Gelofen (100.0%) and Novafen (68.5%) were the most frequently

prescribed analgesics for dental pain control. Besides, 100% of dentists prescribed ibuprofen after endodontic treatment, and 98.3% prescribed Gelofen for this purpose. Taking ibuprofen before treatment leads to suppression of post-treatment pain in patients [9]. Ibuprofen and other non-steroidal anti-inflammatory drugs have confirmed significant efficacy for pain control and pain reduction before and after RCT [10-12]. Perhaps the high prevalence of ibuprofen prescription in the current study is due to the knowledge of dentists about the optimal efficacy of ibuprofen in reducing endodontic pain. The high frequency of prescription of ibuprofen in this study is consistent with previous studies [4, 13] and inconsistent with a study by Jayadev et al, [8] that reported diclofenac as the most commonly prescribed analgesic. It is argued that systemic antibiotic prescription is not necessary to control endodontic pain after treatment [14]. However, in a study by Al-Maslamani et al, [13] a large number of dentists prescribed antibiotics for severe pain (13); such a high frequency has been observed in other similar reports as well [10, 11, 15, 16].

Cases requiring antibiotic prescription for RCT are limited. Presence of systemic symptoms (fever, malaise), unexplained trismus, neck, and facial edema and cellulite, lymphadenopathy, and immune deficiency are almost all cases to include as indications for antibiotic prescription in RCT [14].

In this study, the most commonly prescribed antibiotics in absence of allergy to penicillin were amoxicillin, cefixime and amoxicillin/metronidazole. In various studies, amoxicillin has been reported as the most commonly prescribed antibiotic by dentists for patients without allergy to penicillin [8,13, 17-19]. Yingling et al. [11] assessed active members of the American Association of Endodontists and reported that penicillin VK 500 mg, was the antibiotic prescribed by 61.5% of the respondents.

Oral penicillin is mentioned as the first choice of patients. Effectiveness of penicillin VK against most aerobic and anaerobic bacteria in oral infections has been confirmed. However, since amoxicillin, a penicillin analog, has a

better absorption and longer half-life, more dentists are willing to treat their patients with this antibiotic for logical reasons [20]. In cases requiring antibiotic prescription for RCT, both penicillin and amoxicillin can be prescribed [21].

According to the present study, in case of allergy to penicillin, dentists prescribed clindamycin, cephalixin, azithromycin, and erythromycin for patients from the highest to the lowest frequency. Prescription of clindamycin has been recommended as an alternative to penicillin (or amoxicillin). Clindamycin is well distributed in tissues, and is effective for treatment of patients allergic to penicillin [20, 22-24]. In previous studies, clindamycin was reported as the most commonly prescribed antibiotic for patients with allergy to penicillin [11,17,19, 22], which was similar to the findings of the current study. In a study by Jayadev et al, [8] erythromycin was the first selected antibiotic for patients with allergy to penicillin, which was different from the current results.

According to the results of this study, rate of antibiotic prescription was the lowest for irreversible pulpitis with moderate or severe pain (49.5%) and the highest for pulp necrosis and preoperative pain (moderate to severe) and edema (97.3%). Scientifically, there is no need to prescribe antibiotics for such cases [25,26]. In a study by Skucaite et al, [27] on Lithuanian dentists, 60% prescribed antibiotics for treatment of symptomatic apical periodontitis, and 83.9% considered symptomatic apical periodontitis with periostitis as a clear indication for antibiotic therapy. Segura-Ege et al. [19] evaluated Spanish surgeons and showed that 86% prescribed antibiotics for patients with irreversible pulpitis, 71% for pulp necrosis (acute apical periodontitis without edema) and 60% for necrotic pulp with acute apical periodontitis associated with a sinus tract. Also, 40% of Spanish endodontists prescribed antibiotics for irreversible pulpitis, 52.9% for pulp necrosis with acute apical periodontitis and edema, and about 21.5% for pulp necrosis with chronic apical periodontitis and oral fistula [18]. Among American endodontists,

16.75% prescribed antibiotics for irreversible pulpitis, 53.9% for necrotic pulp, acute apical periodontitis and edema, and 12% for pulp necrosis with chronic apical periodontitis and sinus tract [11]. In a study by Saatchi et al, [17] on general dentists in Iran, antibiotic prescription was the lowest for painful pulpitis without apical periodontitis (5.7%) and the highest for pulp necrosis with acute apical abscess (85%). High prevalence of antibiotic prescription for pulpitis and apical periodontitis in this study was in line with the above-mentioned studies, although the frequency was higher in this study. Antibiotics cannot be used as analgesics in RCT [28]. In the above-mentioned circumstances, despite the lack of a logical indication for antibiotic therapy, it seems that a significant number of dentists are willing to use antibiotics. Possibly, concerns regarding pain or flare-up in patients is the reason for wrongful and unnecessary prescription of antibiotics. Therefore, proper training regarding the indications of antibiotic therapy in RCT is essential for dentists.

According to the current findings, 78.3% of general dentists prescribed antibiotics for incomplete or delayed RCTs, 17.5% prescribed antibiotics in case of indefinite diagnosis, and 3.8% prescribed antibiotics to meet patients' expectations. In the study by Jayadev et al, [8] dentists prescribed antibiotics upon the request of patients (5.6%), due to inadequate time and high work load (7.8%), indefinite diagnosis (36.1%) and delayed or incomplete treatment (34.8%) [8]. Unnecessary prescription of antibiotics and analgesics by dentists should be investigated more thoroughly.

Considering the high frequency of antibiotic prescription in endodontic treatments, it seems that some modifications in educational methods related to antibiotic prescription are required, and greater emphasis should be placed on the indications of antibiotic prescription, their therapeutic effects, and their side effects. In the current study, participation in continuing education courses, Internet, and pharmacological companies were the most commonly used sources by dentists to update their knowledge regarding

indications for antibiotic prescription. Indications for antibiotic prescription in dental settings should be extensively discussed in continuing education courses for general dentists. Also, most recent information on antibiotic prescription should be presented to dentists via the Internet and by the pharmaceutical industry to ensure efficient and scientific dental care. Furthermore, since some patients may use antibiotics without prescription, this issue should be addressed in future studies, and the dosage and frequency of antibiotic usage should be investigated as well.

## CONCLUSION

Prescribing non-steroidal anti-inflammatory drugs for pain control by general dentists shows their optimal knowledge in this respect, but cases of unnecessary antibiotic prescription for RCT by dentists was also high. Thus, the performance of general dentists should be improved in this respect.

## ACKNOWLEDGMENTS

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## CONFLICT OF INTEREST STATEMENT

None declared.

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