





# Antibiotics prescribing habits of Brazilian general dental practitioners during periodontal treatments

Hábitos de prescrição de antibióticos de dentistas brasileiros durante tratamentos periodontais

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## Resumo

**Introdução:** O tratamento periodontal envolve procedimentos que visam reduzir a carga bacteriana, envolvendo ou não o uso de antibióticos locais ou sistêmicos. **Objetivo:** O objetivo deste estudo foi avaliar o conhecimento dos cirurgiões-dentistas brasileiros sobre a prescrição de antibióticos durante o tratamento periodontal. **Material e método:** Foi disponibilizado um questionário online solicitando aplicação sistêmica de prescrição de antibióticos locais ou sistêmicos (frequência e sequência com tratamento periodontal mecânico) e em relação a diferentes doenças periodontais. A utilização de serviços de diagnóstico microbiano e dados demográficos dos voluntários também foram elucidados. Os dados foram analisados estatisticamente (Teste Binomial,  $p < 0,05$ ). **Resultado:** Trezentos e noventa e três voluntários responderam ao questionário. Vinte e três por cento do sexo masculino e 76,2% do sexo feminino. A idade média foi de 27,7 anos. A minoria (19,2%) dos voluntários relatou indicar antibióticos sistêmicos para tratamento de gengivite ou periodontite estágios I e II (antiga periodontite crônica leve e moderada). A maioria dos profissionais indica para tratar abscesso periodontal, gengivite ou periodontite ulcerativa necrosante, periodontite em imunodeficiências graves, periodontite agressiva antiga e periodontite estágios III e IV (periodontite crônica grave antiga). Raramente (2,5%) a prescrição foi sem a associação com terapia mecânica. Os exames microbiológicos como método auxiliar de diagnóstico raramente (3,1%) são solicitados por falta de informação ou custo. As respostas mais frequentes sobre o número de vezes que os profissionais relataram prescrever antibióticos sistêmicos como parte do tratamento periodontal por trimestre foram “pelo menos uma vez”, seguido de “2 vezes”. **Conclusão:** Pode-se concluir que os cirurgiões-dentistas brasileiros possuem conhecimento sobre a correta prescrição de antibióticos na terapia periodontal.

**Descritores:** Odontologia; periodontia; antibióticos; questionário.

## Abstract

**Introduction:** Periodontal treatment involves procedures aimed to reduce bacterial load, involving or not the use of local or systemic antibiotics. **Objective:** The purpose of this study was to assess Brazilian dentists' knowledge about antibiotics prescription during periodontal treatment. **Material and method:** An online questionnaire was available asking for systemic application of local or systemic antibiotics prescription (frequency, and sequence with mechanical periodontal treatment) and in relation to different periodontal diseases. The use of microbial diagnostic services and volunteers' demographic data were also elucidated. Data were statistically analyzed (Binomial Test,  $p < 0.05$ ). **Result:** Three hundred and ninety-three volunteers answered the questionnaire. Twenty-three percent males and 76.2% females. Average age was



27.7 years. Minority (19.2%) of the volunteers reported to indicate systemic antibiotics to treat gingivitis or periodontitis stages I and II (old slight and moderate chronic periodontitis). Majority of the professionals indicate it to treat periodontal abscess, necrotizing ulcerative gingivitis or periodontitis, periodontitis in severe immunodeficiencies, old aggressive periodontitis, and periodontitis stages III and IV (old severe chronic periodontitis). Rarely (2.5%) the prescription was without the combination with mechanical therapy. Microbiological tests as an auxiliary diagnostic method are rarely (3.1%) requested due to lack of information or cost. Most frequent answers about the number of times professionals reported prescribing systemic antibiotics as part of periodontal treatment per trimester was "at least once", followed by "2 times".

**Conclusion:** It can be concluded that Brazilian dentists have knowledge about the correct prescription of antibiotics in periodontal therapy.

**Descriptors:** Dentistry; periodontics; antibiotics; questionnaire.

## INTRODUCTION

Periodontium consists of tissues adjacent to the tooth: gingiva, periodontal ligament, root cementum and alveolar bone. Its role is to play the union between the tooth and the alveolar bone, protecting against masticatory forces, preserving the entire mucosa of the oral cavity<sup>1</sup>. In pathological cases such as occlusal trauma, periodontal diseases (PD) and pulpoperiapical lesions, periodontal tissues may be destroyed<sup>2</sup>.

PD correspond to an inflammatory tissue response to the presence of subgingival and supragingival biofilms. Anaerobic bacteria of the species *Prevotella intermedia*, *Porphyromonas gingivalis* and *Fusobacterium nucleatum* are the main etiological agents of the diseases, causing rupture of periodontal fibers and loss of bone support<sup>3</sup>. First clinical signs of PD are gingivitis, generating a red appearance in the gums, edema, and bleeding, without loss of attachment tissues<sup>4</sup>. If an adequate treatment is not carried out after the clinical manifestation of gingivitis, the disease may progress to periodontitis when the loss of connective tissue attachment, periodontal pocket formation and alveolar bone resorption, which can lead to tooth loss, will be observed<sup>5</sup>. Periodontitis can progress slowly or quickly and affect few (localized or incisor-molar pattern) or several teeth (generalized)<sup>6</sup>. It may also be associated with factors that accelerate its progression, such as diabetes and smoking.

With therapeutic basis, there are two types of periodontal treatment, in addition to the guidance of oral hygiene, which are conventional treatment and surgical one. The conventional treatment of periodontal diseases begins with a mechanical removal of bacterial plaque through scaling and root planing (SRP). If there is persistence of the biofilm, the use of an adjuvant antibiotic can be associated with the SRP. It has been shown that SRP combined with amoxicillin and metronidazole results in an improvement in clinical parameters when compared to SRP alone, reducing the depth of the medium and deep pockets<sup>7,8</sup>. Surgical treatment, on the other hand, should be indicated considering it can facilitate removal of subgingival deposits, the patient's infection control and, thus, increase the preservation of the periodontium in the long term<sup>1</sup>.

In this context, it is important to emphasize that some dentists anticipate the prescription of antibiotics during the mechanical removal of bacterial plaque, even before the aggravation of these pockets so that there is no advanced periodontal disease and, consequently, lead to a surgical procedure, such as gingivectomy, original or modified Widman flap and mucogingival surgery<sup>1,9</sup>. Antibiotics for periodontal diseases can be applied either systemically or locally. Systemic administration is more commonly used in periodontics when microorganisms are restrictedly distributed throughout the mucosa, namely, penicillin, amoxicillin, doxycycline, tetracycline, clindamycin and metronidazole<sup>10,11</sup>. In local administration, on the other hand, it acts better on bacteria associated with the local biofilm and has a faster absorption at levels that cannot be reached by the systemic route; they are applied directly to the pockets in the form of gel or ointment, such as doxycycline gel and metronidazole gel<sup>11</sup>.

Dentistry professionals should have a broad knowledge of drugs, especially antibiotics, as irrational use can cause bacterial resistance, causing undesired consequences for the patient and hindering treatment results<sup>12</sup>. Scientific studies have evaluated the knowledge of dentists from Germany, Australia and the United Kingdom about the prescription of antibiotics during periodontal treatment<sup>13-16</sup>. To our knowledge, no study has been carried out in Brazil. Considering that the indiscriminate use of antibiotics can cause bacterial resistance, clinical relevance of the present study lies in to assess the knowledge of professionals about their proper prescription.

The purpose of the present study was to assess the knowledge of Brazilian dentists about the prescription of antibiotics during periodontal treatment. The hypothesis is professionals have knowledge about the correct use of these antimicrobials.

## **MATERIAL AND METHOD**

### **Study design and ethical aspects**

A cross-sectional study was carried out with Brazilian dentists through an online questionnaire. The professionals involved only participated in the research after a thorough explanation of their objectives and after reading the Informed Letter to the patient and signing the Informed Consent Form (FICF). This term included the description of how the dentist will be analyzed, ensuring the confidentiality of information, and disallowing any form of coercion or pressure for their voluntary participation.

### **Sample Calculation**

For the sample calculation, a confidence level of 95% was considered, a proportion of 50% to obtain the highest possible  $n$  considered parameters and a sampling error equal to 5%. Thus, a minimum sample of 384 volunteers was obtained. Students in their final year of undergraduate Dentistry were also invited to participate in the research.

### **Inclusion and Exclusion Criteria**

Questionnaire was carried out electronically through a website. Final year undergraduate students and general practitioner dentists who perform periodontal treatment in their clinical activities were invited to answer the questionnaire by means of an invitation via email and via social networks.

We included 1) final-year undergraduate students of a bachelor's degree in Dentistry, 2) dentists with full graduation 3) dentists who despite having some specialty, they act as general practitioners.

### **Questionnaire**

Questionnaire was previously validated, having been carried out in Germany and published by Falkenstein et al.<sup>15</sup> Here, it was applied online and was designed to be a mix of qualitative and quantitative questions. Table 1 show the questions about local and systemic application of antimicrobials (substance, dose, frequency, and sequence with mechanical periodontal treatment), in relation to different periodontal diseases. In addition, the use of microbial diagnostic services was elucidated. Finally, participants were asked to provide personal information including age, gender, length of practice in Dentistry (in years) and participation in classes / courses / training in recent years.

**Table 1.** Questionnaire

<p>1. Do you offer periodontal treatment in your office?</p> <p>Yes</p> <p>No, I do refer to the specialist (please, go to the question number 10)</p> <p>2. For which of the following diseases do you usually recommend systemic use of antibiotics? (It is possible to select more than one option)</p> <p>Diseases</p> <p>Biofilm-induced gingivitis in normal periodontium</p> <p>Biofilm-induced gingivitis in reduced periodontitis (old refractory periodontitis)</p> <p>Periodontitis stage I (old slight chronic periodontitis)</p> <p>Periodontitis stage II (old moderate chronic periodontitis)</p> <p>Periodontitis stages III and IV (old severe chronic periodontitis)</p> <p>Old aggressive periodontitis</p> <p>Periodontal abscess (pericoronary, gingival or periodontal)</p> <p>Necrotizing ulcerative gingivitis</p> <p>Necrotizing ulcerative periodontitis</p> <p>Periodontitis in severe immunodeficiencies (HIV, leukemia, etc.)</p> <p>Health in normal or reduced periodontal</p> <p>3. Do you administer antibiotics (systemic) to perform periodontal treatment, as the sole therapeutic agent (without mechanical therapy)?</p> <p>Yes</p> <p>No, I do refer to the specialist (please, go to the question number 10)</p> <p>4. At what point do you administer (systemic) antibiotics as adjuvants to mechanical therapy? (NOTE: refers to the treatment of periodontal disease and does not include cases of prophylactic antibiotic therapy)</p> <p>Before starting mechanical therapy</p> <p>During mechanical therapy</p> <p>After starting mechanical therapy</p> <p>5. Do you use local antibiotics?</p> <p>No (please, go to the question number 7)</p> <p>Yes, for the following diseases: (it is possible to select more than one option)</p> <p>Chronic events (Ex: periodontitis)</p> <p>Acute events (Ex: periodontal abscess)</p> <p>Recurrent diseases (Ex: Biofilm-induced gingivitis in reduced periodontium (old refractory periodontitis)</p> <p>Others:</p> <p>6. Which local antimicrobials do you prefer to use? (It is possible to select more than one option)</p> <p>Doxycycline</p> <p>Chlorhexidine</p> <p>Tetracycline</p> <p>Others:</p> <p>7. Do you sometimes use microbiological tests to aid in the diagnosis of periodontitis?</p> <p>No (please, go to the question number 10)</p> <p>Yes</p> <p>8. What microbiological tests do you use?</p> <p>9. Why do you use microbiological tests? (It is possible to select more than one option)</p> <p>To choose the appropriate antibiotic therapy</p> <p>Suspicion of <i>Aggregatibacter actinomycetemcomitans</i></p> <p>Improve patient motivation with poor oral hygiene</p> <p>For patients who have a private health plan</p> <p>To control therapy success</p> <p>Residual pockets</p> <p>Routinely in the following diseases:</p> <p>Others:</p> <p>Please, go to the question number 11</p>
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**Table 1.** Continued...

10. Why you do not you use microbiological tests? (It is possible to select more than one option)
High cost
Lack of information
I don't see advantages
Bad experiences in the past
Others:
11. How many years have you been practicing Dentistry?
12. How old are you?
13. What is your gender?
Female
Male
14. Over the past two years, I have participated in classes / courses / training on the use of antibiotics in the treatment of periodontitis
Yes
No
15. The number of times I prescribe (systemic) antibiotics as part of periodontal treatment, per trimester is:
1
2
3
4
5
More than 5

## Analysis of the Results

The collected data were tabulated and submitted to an exploratory analysis. The binomial statistical test of questions number 1, 3, 4, 7 and 14 was performed, with a significance level of 5%.

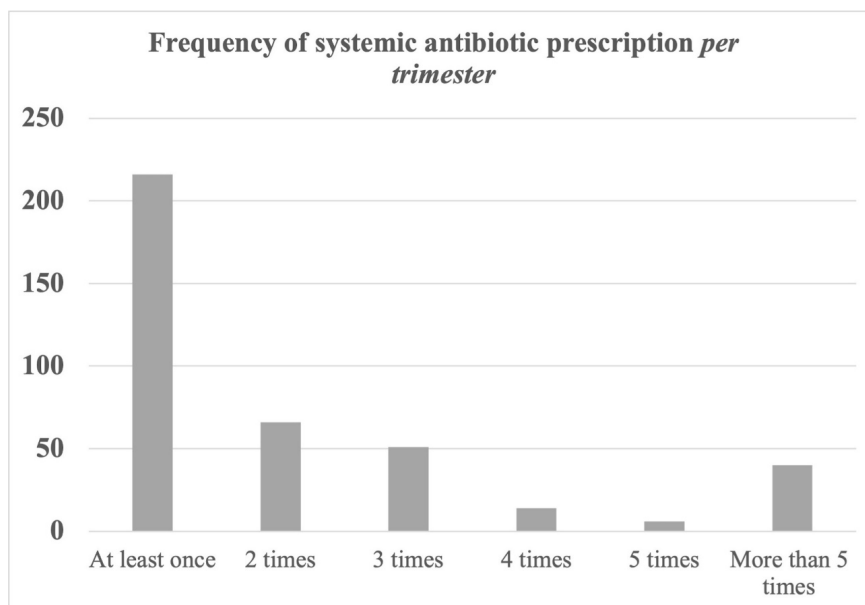
## RESULT

### Demographics

Three hundred and ninety-three volunteers agreed to participate of the research and answered the questionnaire (16.6% students and 83.4% professionals). Twenty-three percent were male and 76.2% female. Average age was 27.7 years. The majority (84.7%) reported to offer periodontal treatment in the office, while 15.3% reported refer to a specialist. Half (51.7%) of the volunteers reported not having participated in classes, courses, or training on the use of antibiotics during periodontal treatment in the last two years.

### Prescription Antibiotics and Microbiological Tests Asking

Fifty-one volunteers (almost 13%) reported to indicate systemic antibiotics to treat gingivitis or periodontitis stages I and II (old slight and moderate chronic periodontitis). Majority of the professionals indicate it to treat periodontal abscess, necrotizing ulcerative gingivitis or periodontitis, periodontitis in severe immunodeficiencies, old aggressive periodontitis, and periodontitis stages III and IV (old severe chronic periodontitis). Rarely (2.5%) the prescription was without the combination with mechanical therapy. Regarding the time when systemic antibiotics are indicated, the majority (60.2%) reported indicate it "before" or "after" mechanical therapy. The most frequent answers about the number of times professionals reported prescribing systemic antibiotics as part of periodontal treatment per trimester was "at least once", followed by "2 times". Figure 1 show frequencies of systemic antibiotic prescriptions.



**Figure 1.** Frequency of systemic antibiotic prescription.

Most professionals (59.8%) also reported the use of local agents. They usually indicate its use in chronic or acute events and recurrent diseases. Most used products were tetracycline (35.9%) and chlorhexidine (75.3%).

Microbiological tests as an auxiliary diagnostic method are rarely (3.1%) requested due to lack of information or cost.

### Correlation between Answers and Classes/Courses/Training

For frequency of systemic antibiotics prescription “more than 5 times”, 21 volunteers reported have participated and 18 volunteers reported have not attended to classes/courses/training about the use of antibiotics during periodontal treatment.

Fifty-five percent of the 51 volunteers reported to indicate systemic antibiotics to treat gingivitis or periodontitis stages I and II did not attend to class/courses/training on this topic.

Table 2 show frequencies of systemic antibiotic prescriptions in different periodontal diseases (with or without generally accepted recommendation for antibiotic prescription).

**Table 2.** Percentages of systemic antibiotic prescriptions in different periodontal diseases

%	Periodontal diseases
<i>Diseases without generally accepted recommendation for antibiotic prescription</i>	
0.3	Biofilm-induced gingivitis in normal periodontium
2.2	Biofilm-induced gingivitis in reduced periodontitis (old refractory periodontitis)
3.6	Periodontitis stage I (old slight chronic periodontitis)
12.5	Periodontitis stage II (old moderate chronic periodontitis)
0.6	Health in normal or reduced periodontal
<i>Diseases with generally accepted recommendation for antibiotic prescription</i>	
39	Periodontitis stages III and IV (old severe chronic periodontitis)
46	Old aggressive periodontitis
84.1	Periodontal abscess (pericorony, gingival or periodontal)
52.9	Necrotizing ulcerative gingivitis
67.7	Necrotizing ulcerative periodontitis
50.1	Periodontitis in severe immunodeficiencies (HIV, leukemia, etc.)
13.6	For cases where periodontal surgery is contraindicated

## DISCUSSION

The hypothesis of the present study was Brazilian dentists have knowledge about the prescription of antibiotics during periodontal treatment. Hypothesis was partially accepted.

Only 13% of the volunteers reported to indicate systemic antibiotics to treat diseases without generally accepted recommendation for antibiotic prescription, such as gingivitis or periodontitis stages I and II (old slight and moderate chronic periodontitis). So, majority indicate it to diseases with generally accepted recommendation for antibiotic prescription (severe chronic periodontitis, aggressive periodontitis, periodontal abscess, necrotizing ulcerative gingivitis, necrotizing ulcerative periodontitis, periodontitis with underlying immunodeficiency and refractory periodontitis).

The importance of carrying out this study can be evidenced by other studies that demonstrated that the incorrect prescription of these drugs can lead to more serious complications such as microbial resistance<sup>17</sup>. The importance of combining antimicrobial substitutes for antibiotics has also been discussed recently in the literature. For example, antimicrobial photodynamic therapy (aPDT) has been suggested as a possible and effective complementary antimicrobial therapy<sup>18,19</sup>.

Antibiotics are drugs that kill or block the multiplication of bacteria at concentrations that are relatively innocuous to host tissues and can be used to treat infections caused by bacteria<sup>1</sup>. Due to the difficulty of completely eliminating microorganisms by mechanical instrumentation alone during treatment periodontal disease, the use of antibiotics may be suggested as an additional therapy<sup>1</sup>.

Several recent systematic reviews, with or without meta-analysis, were carried out evaluating the effectiveness of the combination of systemic antibiotics with non-surgical periodontal therapy (scaling and root planing)<sup>20-23</sup>. Although the results are still controversial, there seems to be a benefit from using of these drugs as a complementary therapy to conventional mechanical periodontal therapy<sup>19,20,24</sup>.

In the present study, it was observed that different types of antibiotics are indicated in periodontal therapy, and the most suggested was tetracycline. In this context, it is important to consider that the professionals also indicated that this prescription should be applied locally and not systemically. Regarding the systemic use of antibiotics during periodontal therapy, the most effective and recommended prescription is amoxicillin combined with metronidazole<sup>1</sup>. However, studies have also evaluated other drugs as a possibility of complementary therapy. Kaufmann et al.<sup>19</sup> evaluated the effectiveness of amoxicillin combined with metronidazole or azithromycin. The two prescriptions seem to have promoted the same clinical results, suggesting that azithromycin may also be indicated in periodontal treatment.

The correct or incorrect performance of periodontal therapy can have an impact on the general health of patients. For example, the glycemic control of diabetic patients can be influenced by their periodontal condition<sup>23-25</sup>. It has been shown that patients' glycosylated hemoglobin levels have been significantly reduced after periodontal treatment<sup>23</sup>. The use of antibiotics complementary to scaling in the treatment outcome of these patients also was evaluated<sup>24,25</sup>. Yap et al.<sup>24</sup> and Cao et al.<sup>25</sup> observed that doxycycline therapy in addition to mechanical therapy resulted in considerable improvement in periodontal indices.

Regarding the time when antibiotics should be suggested, most indicated that they should be prescribed before or after mechanical therapy (scraping). In addition, they rarely indicate the drug prescription without its realization. These results are also in line with what the literature suggests about the benefits of combination therapies. Since the amount of medication that reaches the gingival sulcus is very small and the biofilm formed on the surface of the teeth can resist the presence of antimicrobials, the use of antibiotics without performing the debridement of the area is not indicated to disorganize the tooth. biofilm<sup>1</sup>.



Around the world, the results observed regarding the prescription of antibiotics were controversial. Cope et al.<sup>14</sup> assessed the extent to which antibiotic prescribing in general dental practice conforms to clinical guidelines and to describe factors associated with antibiotic prescription in the absence of spreading infection or systemic involvement. A cross-sectional study of the management of adult patients with acute dental conditions was performed. The authors observed in United Kingdom a high level of inappropriate antibiotic prescribing was observed amongst the 45 general dental practitioners. Features of the healthcare environment, such as clinical time pressures, and patient-related characteristics, such as expectations for antibiotics and refusal of operative treatment, are associated with antibiotic prescribing in the absence of infection. They concluded that individuals responsible for the commissioning and delivery of dental services should seek to develop targeted interventions addressing these issues to ensure optimal antimicrobial stewardship within dentistry. Ong et al.<sup>13</sup> observed through an online questionnaire surveyed to 38 Australian periodontists that systemic antibiotics are widely used by the group of professionals with varying rates and patterns for different periodontal and peri-implant conditions. The authors concluded there is need for recommendations and guidelines in the prescription of antibiotics for periodontal and peri-implant conditions. Falkenstein et al.<sup>15</sup> obtained 407 reports in German to its survey that was the reference to the present study. They found positive trends regarding position-paper conform prescribing habits after applying the questionnaire to dental practitioners. The results corroborate those observed here. Twenty for percent of the professionals prescribed antibiotics prior to mechanical therapy, while most dentists followed the recommended sequence. They concluded continuing educational campaigns and strictly expressed real guidelines are needed once inappropriate prescriptions of antibiotics still remain conspicuous. Jaunay et al.<sup>16</sup> evaluated the prescribing habits of fifty-six general dental practitioners of South Australian. They have found appropriate level of knowledge of antibiotic prescription. However, there was a tendency toward over-prescription and a demonstrated lack of knowledge of the incidence of adverse reactions, development of multiresistant strains and prophylaxis against bacterial endocarditis. Conclusion was these issues must be discussed and the profession is urged to reconsider and re-educate itself on these challenges.

Considering the small number of studies carried out around the world and the controversial results among these studies, it is important to turn the attention of universities and dental schools to reinforce the importance of correct prescription of antibiotics and the clinical consequences of not doing so. Even in the studies concluded that professionals have adequate knowledge, the number of professionals evaluated was very small. Further research in this area may provide more information on the topic.

## CONCLUSION

Within the limits of the present study, it can be concluded that Brazilian dentists have knowledge about the correct prescription of antibiotics in periodontal therapy.

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## CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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