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Survey among Iraqi Dental Professionals about the Use of Antimicrobials for Periodontal Diseases

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Dedication

First and foremost, we must acknowledge our limitless thanks to **Allah**,

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To everyone help in this project….

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ABSTRACT

Periodontal disease is a biofilm infection with a mixed microbial etiology. Periodontal diseases are generally treated by non-surgical mechanical debridement and regular periodontal maintenance care. Periodontal surgery may be indicated for some patients to improve access to the root surface for mechanical debridement. A range of systemic antibiotics for treatment of periodontitis has been documented, with some studies showing superior clinical outcomes following adjunctive antibiotics while others do not. In the current survey, we tried to investigate the understanding and subscription among Iraqi dentists regarding (Babylon city) the use of antimicrobials for periodontal diseases. An online questionnaire was sent to dentists. A (417) dental practitioners responded and participated in the study. Among the interesting results that obtained from the current survey, only 30.4% of the participated dentists thinks that mechanical periodontal treatment alone without adjunctive antimicrobial therapy is adequate to resolve the clinical condition in most cases of periodontal diseases. In addition, the majority of dentists (81%, 71.7%. 84.1%) tends to prescribe more than one antibiotics (combination) in the treatment of aggressive, necrotizing periodontitis and periodontal abscess, respectively.

Keywords: Systemic antibiotics, periodontal disease, treatment.

INTRODUCTION

Periodontitis is an infection caused by bacteria residing in biofilms at or below the gingival margin .It is, therefore, not surprising that a wide range of systemic antibiotics have been used as part of periodontal treatment aimed at targeting potential pathogenic bacterial species within. The complex structure of the periodontal biofilm, consisting of multiple bacterial communities residing in a glycocalyx matrix, has been well described by Marsh (**Marsh, 2005).** It has been demonstrated that once bacteria attach to a tooth surface and reside within a mature biofilm structure they have a reduced susceptibility to antimicrobials compared to planktonic or free floating bacteria **(Eick et al., 2004).** Hence mechanical debridement is considered critical to disrupt the biofilm when using systemic antibiotics to treat periodontitis. The rationale for use of adjunctive systemic antimicrobials is to further reduce the bacterial load enabling resolution of the inflammation in the periodontal pocket.

The question as to whether antibiotics prescribed as a monotherapy, with no mechanical debridement, are efficacious in the treatment of periodontitis.

The majority of studies do not support the concept of monotherapy with inferior results in terms of probing depth reduction, clinical attachment level gain and reduction in bleeding compared with scaling and root planning **(Watts et al,. 1986)(Jenkins et al., 1989) (Berglundh et al., 1998).**

Furthermore, Topoll et al., reported development of multiple periodontal abscesses in patients with advanced periodontal disease who had been prescribed systemic antibiotic therapy without subgingival debridement. The patients had received broad-spectrum oral antibiotics (penicillin and tetracycline) one to three weeks prior to the development of abscesses.

It was concluded that in patients with advanced periodontal disease, systemic antibiotic therapy without subgingival debridement might change the composition of the subgingival microbiota, resulting in multiple .periodontal abscesses **(Topoll et al., 1990).**

Aim of study

This study aimed to investigate the knowledge and practices among dental practitioners in iraq regarding the use of antimicrobials for periodontal diseases. To understand the indications for which dental practitioners use antimicrobials in the treatment of periodontal diseases.

Literature review

1. Periodontal diseases

Periodontal diseases, encompassing gingivitis and periodontitis, are prevalent inflammatory conditions affecting the supporting structures of the teeth **(Kassebaum et al., 2014).** These diseases result from the interaction between pathogenic bacteria in dental plaque and the host immune response. Traditional management involves mechanical debridement, such as scaling and root planing, to remove bacterial biofilms and calculus. However, in certain cases, adjunctive antimicrobial therapy becomes necessary to enhance treatment outcomes.

During the past two decades, dentists and microbiologists have embraced periodontal antibiotic therapy as a powerful adjunct to conventional mechanical debridement for therapeutic management of the periodontal diseases, as the evidence for bacterial specificity in periodontitis has accumulated and strengthened**(Slots & Ting, 2002).** Antibiotics, are defined as naturally occurring or synthetic organic substances that, in low concentrations, inhibit or kill selective microorganisms **(Ellen & McCulloch, 1996).**

Antimicrobials play a crucial role in periodontal therapy by targeting and eliminating periodontal pathogens. They can be administered systemically or topically, depending on the severity and extent of the disease **(Herrera et al., 2002)**. Local antimicrobial agents, including mouth rinses, gels, and chips, offer targeted delivery to periodontal pockets, thereby enhancing efficacy while minimizing systemic side effects **(Slots, 2012).**The choice of antimicrobial agents in periodontal therapy depends on various factors, including the spectrum of activity against periodontal pathogens, safety profile, patient's medical history, and cost-effectiveness. Currently, SRP plus adjunctive local therapy could potentially be considered a new standard for non-surgical periodontal therapy **(Ciancio and Mariotti, 2018).**

1.1. Epidemiology

Periodontal diseases affect a substantial portion of the global population, with estimates suggesting that up to 50% of adults worldwide have some form of periodontitis **(Kassebaum et al., 2014).** The burden of periodontal diseases is particularly high in low- and middle-income countries, where access to preventive and treatment services may be limited **(Petersen & Ogawa, 2012).**

1.2. **classification**

The classification of periodontal diseases has evolved over time to provide a comprehensive framework for understanding and categorizing the various forms of periodontal conditions. The most widely accepted classification system is based on the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions.

1.2.1. **Aggressive periodontitis**

Aggressive periodontitis is a form of periodontitis where there is a rapid progression of disease in either a localized or generalized pattern affecting otherwise healthy individuals **(Armitage, 2000).** Aggressive periodontitis is frequently associated with the presence of high levels of subgingival Aggregatibacter actinomycetemcomitans, A.a (formerly Actinobacillus actinomycetemcomitans) and/or Porphyromonas gingivalis. It has been shown that adjunctive antibiotics may be required to eradicate or suppress these pathogens, which have the potential to invade the periodontal tissues. In the systematic review by Hererra et al. it was concluded that adjunctive systemic antibiotics should be considered in cases of aggressive periodontitis. A recent randomized clinical trial found that the adjunctive use of azithromycin has the potential to improve the treatment outcome in young patients with aggressive periodontitis compared to non-surgical debridement alone **(Haas et al., 2008**). Mounting evidence exists in support of using of an adjunctive antibacterial to give a more positive clinical response than mechanical therapy alone for the treatment of refractory,aggressive periodontitis and acute necrotizing ulcerative periodontitis **(Kapoor et al., 2012)(Barca et al., 2015).** Furthermore, antimicrobials have been shown to play a significant role in controlling what was previously categorized as aggressive periodontitis. The regimens of Metronidazole combined with Amoxicillin or Ciprofloxacin and Clindamycin are effective and are preferable to regimens containing Doxycycline.

1.2.2. **Periodontal abscess**

The periodontal abscess is a lesion with extensive periodontal breakdown occurring during a short period of time with localized accumulation of pus **(Hafstrom et al., 1994).** This condition may cause systemic involvement and the lesion generally has a large bacterial mass with a high prevalence of well-recognized periodontal pathogens. The periodontal abscess may occur in untreated periodontitis patients or in treated patients in maintenance therapy. The role of systemic antibiotics in the treatment of the periodontal abscess is controversial. Some authors advocate use of systemic antibiotics in combination with mechanical debridement or drainage **(Genco, 1991).** Others recommend systemic antibiotics only if a clear systemic involvement is present such as lymphadenopathy, fever or malaise or when the infection is not well localized**(Herrera, 2000).** Mechanical debridement and drainage through the periodontal pocket without antibiotics is usually effective in the management of the periodontal abscess.

1.2.3. **necrotizing periodontitis**

infections showing clinical signs of necrosis and ulceration of the gingival margin and interdental papilla. They are associated with pain, spontaneous gingival bleeding and halitosis. The predisposing factors associated with the onset and progression of necrotizing periodontal diseases include immunodeficiency, malnutrition, stress, smoking and poor oral hygiene **(Armitage, 2000).** Treatment involves debridement, oral rinses, oral hygiene and management of pain. When there are systemic manifestations such as fever or malaise metronidazole, targeting the gram negative anaerobes, should be prescribed in conjunction with mechanical debridement.

1.3. **Use of Antimicrobials for Periodontal Diseases**

Both systemic and topical antibiotics are increasingly used in the management of periodontal infections. Whilst these drugs are used mostly on an empirical basis, some contend that rational use of antibiotics should be the norm due to their wide abuse and consequential global emergence of antibiotic resistance organisms.

The available data indicate, in general, that mechanical periodontal treatment alone is adequate to ameliorate or resolve the clinical condition in most cases, but adjunctive antimicrobial agents, delivered either locally or systemically, can enhance the effect of therapy in specific situations.

This is particularly true for aggressive (early onset) periodontitis, in patients with generalized systemic disease that may affect host resistance and in case of poor response to conventional mechanical therapy. Locally delivered antibiotics together with mechanical debridement are indicated for non-responding sites of focal infection or in localised recurrent disease. After resolution of the periodontal infection, the patient should be placed on an individually tailored maintenance care programme **(Mombelli et al., 2004).**

A recent systematic review and meta-analysis concluded that the adjunctive use of systemic antibiotics in periodontal therapy resulted in significant benefits in clinical outcomes but with frequent adverse complications. Metronidazole alone or azithromycin alone yielded significant improvements in pocket depth reduction, clinical attachment level gain, bleeding on probing, pocket closure and frequency of residual pockets, however, the most favorable outcomes were found with the combination of amoxicillin with metronidazole **(Teughels et ali., 2020).** Since the putative microorganisms in the periodontal pocket respond differently to different classes of antibiotics, then one should consider the advantage of drug combinations. The combination of Amoxicillin (250 mg q8h) with Metronidazole (250 mg q8h) for 8 days is a common practice for young and middle-aged patients with severe forms of periodontitis. On the other hand, older patients as well as patients with penicillin allergies are prescribed Ciprofloxacin (500 mg q12h) with Metronidazole (500 mg q12h) for 8 days. These combinations of systemic antibiotics are effective against the major periodontopathic bacteria **(slots, 2020).**

Materials and Methods

This was a descriptive study using an online questionnaire. The study was conducted in 2023/2024 academic year as a part of the undergraduate students projects at College of Dentistry, University of Babylon, Iraq. The study targeted general dental practitioners (GDP) and dental specialists (Periodontists), who were working that time in private or public dental clinics in Babylon/Iraq. A questionnaire was sent online by email or on social media. In order to be specific, the authors sent the link to many dental professional groups that they were currently joining via social media. Further, the authors asked the members of these groups to share the link with their colleagues. The link included, besides the questionnaire and an invitation to participate, a message introducing the purpose of the study and assuring anonymity of the survey. Only those who chose "Agree to participate" were allowed to complete the questionnaire. The questionnaire was adopted from a previous study with modifications **(Al-Ak'hali et al., 2023).** It consisted of two parts. The first part covered demographic data (age, gender, qualification/specialty (interns GDP, periodontists), duration of practice after graduation, number of patients per week, and place of work (public or private). The second part covered the following: use of systemic antimicrobial therapy in the treatment of periodontal diseases (antimicrobials prescription for various clinical periodontal signs and/or symptoms).

The following clinical situations were included: severe pain, gingival bleeding, gingival enlargement, generalized gingival recession, deep localized periodontal pocket, tooth mobility, periodontal abscess, , chronic periodontitis, aggressive periodontitis, post-periodontal surgery, acute necrotizing periodontal disease (ANUP), and for maintenance therapy. The preferred antimicrobial (Amoxicillin, Augmentin, Spiramycin, Azithromycin, Clindamycin, Tetracycline, Doxycycline, Metronidazole, Ciprofloxacin, Minocycline, or Erythromycin) and duration of use were also reported in the context of treatment of aggressive periodontitis, necrotizing periodontal disease, and periodontal abscess.

Results

Table 1: Gender distribution among research participants.

Gender	Number	Percentage
Male	261	62.5%
Female	156	37.5%

Table 2: Qualifications of participants.

Qualifications	Number	Percentage
GDP	234	56.1%
Periodontists	101	24.2
Other specialties	82	19.6%

Table 3: Years of experience for the participants.

Years of experience:	Number	Percentage
>5	173	41.4%
5-10	169	40.2%
<10	75	17.5%

Table 4: Estimated number of patients that treated by participants.

Number of Patients/Week:	Number	Percentage
<5 week	191	45.8%
5–15/week	146	35%
>15/week	80	19.1%

The majority of dentist that participated in this survey attend to prescribe antibiotics for patients with severe pain and post periodontal surgery (61.8, 62.5%), respectively. While the periodontal abscess, deep periodontal pocket and chronic periodontitis came in the second place, in which near half of the dentist prescribe antibiotics. Furthermore, the dentists prescribe antibiotics for the other periodontal condition in lesser degree as it clearly shown in table 5.

Table 5: Indications for which participants used antimicrobials (Yes, NO):

Clinical signs or Disease	Number of participants with Yes answer	Percentage
Severe pain	258	61.8%
Gingival bleeding	161	38.6%
Gingival enlargement	151	36.2%
Generalized gingival recession	104	24.9%
Deep localized periodontal pocket	197	46%

Tooth/teeth mobility Periodontal abscess	198	47.2%
Furcation involvement	96	23%
Chronic periodontitis	176	42.2%
Gingival tumors	92	22%
Post-periodontal surgery	261	62.5%

Table 6: Do you think that mechanical periodontal treatment alone without adjunctive antimicrobial therapy is adequate to resolve the clinical condition in most cases of periodontal diseases?

	Number	Percentage
Yes	125	30.4%
No	292	70%

This survey also try to address the preferred periods for describing antibiotics in the treatment of different periodontal disease. Table 7 showed that 56.3% of dentist prefer to prescribe antibiotics for short periods (3-5 days). On the other hands, only 2.15% of dentist preferred long duration (1 month) for antibiotic prescription.

Table 7: What is the duration of using systemic antibiotics usually you prescribe for periodontal treatment?

	Number	Percentage
3-5 days	235	56.3%
One week	107	25.6%
2-3 week	43	10.3%
1 mouth	9	2.15%

Table 8: When do you think systemic antibiotics is prescribing in surgical periodontal therapy?

	Number	Percentage
Before surgery	26	6.2%
After surgery	112	26.8%
Before and After	264	63.3%
No need	15	3.5%

Table 9, 10 and 11 demonstrate the response of the participated dentists to the use of antibiotics for different periodontal disease. Its clearly shown in those tables that the majority of dentists (81%, 71.7%. 84.1%) tends to prescribe more than one antibiotics (combination) in the treatment of aggressive, necrotizing periodontitis and periodontal abscess, respectively. Moreover, Augmentin, amoxicillin and metronidazole came in the first place according to the dentist's selection in treatment of the above-mentioned periodontal disease.

Table 9: Antimicrobials used for Aggressive periodontitis (Yes, No):

	Number	Percentage
Amoxicillin	180	43.1%
Augmentin	156	37.4%
Spiramycin	68	16.3%
Azithromycin	78	18.7%
Clindamycin	117	28%
Tetracycline	169	40.5%

Doxycycline	65	15.5%
Metronidazole	130	31.1%
Ciprofloxacin	29	6.9%
Minocycline	78	18.7%
Erythromycin	52	12.4%
Combination of two antibiotics	338	81%

Table 10: Antimicrobials used for necrotizing ulcerative periodontal disease (Yes, No):

	Number	Percentage
Amoxicillin	73	17.5%
Augmentin	273	65.4%
Spiramycin	33	7.9%
Azithromycin	104	24.9%
Clindamycin	117	28%
Tetracycline	169	40.5%
Doxycycline	78	18.7%
Metronidazole	182	43.6%
Ciprofloxacin	141	33.8%
Minocycline	83	19.9%
Erythromycin	59	14.1%
Combination of two antibiotics	299	71.7%

Table 11: Antimicrobials used for periodontal abscess (Yes, No):

	Number	Percentage
Amoxicillin	131	31.4%
Augmentin	338	81%
Spiramycin	41	9.8%
Azithromycin	117	28%
Clindamycin	156	37.4%
Tetracycline	91	21.8%
Doxycycline	26	6.2%
Metronidazole	208	49.8%
Ciprofloxacin	78	18.7%
Minocycline	19	4.5%
Erythromycin	27	6.5%
Combination of two antibiotics	351	84.1%

Discussion

This study investigated the trends in antibiotic prescription among dentists working in various dental colleges of Babylon, city, Iraq. A total of 417 participated in the study. Among the study participants 31.8% of them had a private practice. In general, this study shows the inappropriate practice of dental professionals regarding the prescription of systemic antimicrobials in the context of periodontal disease. About (47.2%) of participants reported prescribing antimicrobials for the treatment of a periodontal abscess. comparable results (88.1%)(84.3%) were obtained by Naveen et al and Al-Ak'hali respectively **(Naveen et al., 2015)(Al-Ak'hali et al., 2023).** However, this is not an appropriate practice. Basically, antimicrobials are indicated for the treatment of a periodontal abscess when there are signs and symptoms of systemic involvement. In our study, the prescription of systemic antimicrobials for the treatment of chronic periodontitis was (42.2%) in our study compared to the Naveen et al. (47.5%) **(Naveen et al., 2015)**.

study's participants reported prescribing antimicrobials in the context of gingival enlargement/tumors, a deep localized periodontal pocket. However, the evidence-based practice is against the prescription of antimicrobials for the above-mentioned scenarios.

The most prescribed antimicrobials by participants in our study were Augmentin, Amoxicillin, Metronidazole and Azithromycin as monotherapy. In study in turkey was Penicillins, especially amoxicillin and amoxicillin clavulonate were commonly preferred among dentists in Istanbul **(Şermet et al., 2011).** Clinical study by Magnusson on patients with refractory periodontitis showed 2mm of attachment gains and decrease in probing depths when treated with RSI and Augmentin **(Magnusson et al., 1989**). Metronidazole alone or azithromycin alone yielded significant improvements in pocket depth reduction, clinical attachment level gain, bleeding on probing, pocket closure and frequency of residual pockets**(Teughels et ali., 2020).**

in our study was about 80% of participants preferred Combination of two antibiotics. the most favorable outcomes were found with the combination of amoxicillin with metronidazole **(Teughels et ali., 2020).** Since the putative microorganisms in the periodontal pocket respond differently to different classes of antibiotics, then one should consider the advantage of drug combinations.

in other study in Australia, Azithromycin, the combination of Amoxicillin and Metronidazole, and Amoxicillin, were the three most commonly prescribed systemic antibiotics **(Ong et al., 2019).**

Only 30.4% of participants in our study accepted that mechanical periodontal treatment alone without adjunctive antimicrobial therapy is adequate to resolve the clinical condition in most cases of periodontal diseases. On the other hand, Mechanical periodontal treatment alone is adequate to meliorate or resolve the clinical condition in most cases, but adjunctive antimicrobial agents, delivered either locally or systemically, can enhance the effect of therapy in specific situations. Systemic antibiotics have a useful role as adjuncts to mechanical treat- ment particularly in progressive adult and early onset periodontitis. Patients with generalized systemic disease that may affect host resistance may also benefit from systemic antibiotics together with mechanical oral hygiene procedures **(Mombelli, and Samaranayake, 2004).** The prescription of systemic antimicrobials before and after surgical periodontal therapy was reported by (63.3%), before only(6.2%) , after only (26.8%) of participants. No need Only (3.5%). It was determined that the participants tended to use antibiotics more frequently before and after surgical periodontal treatment. in a recent study by Rajendran et al reported that starting antibiotic treatment 6 days before periodontal treatment stimulates post-treatment recovery by reducing IL-1B and Th17 (**Rajendran et al., 2019**.

while in other study in turkey, the Turkish periodontists prescribed before and after surgical periodontal therapy (30.1%), before only(3.6%) , after only (66.3%) of participants. No need Only (22.2%) **(Yıldız et al., 2023)**.

Conclusion

This study demonstrate the inadequate understanding and practices of dental practitioners regarding the prescription of antibiotics in the treatment of periodontal disease. It is possible to enhance prescribing procedures by increasing dental practitioners' knowledge of the appropriate criteria for the prescription of antibiotics. In the past and present time, antibiotic usage can enhance the oral microflora antibiotic resistance when used for all diseases. Antibiotic abuse is spreading globally leading to microbial antibiotic resistance.

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