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Administration of systemic adjunctive antibiotics in periodontology – a nationwide online survey

Introduction: For the last 30 years, the central pathomechanical path of periodontitis has been described as a polymicrobial infection by an oral biofilm containing specific pathogens. Consequently, a combination of microbiological tests followed by systemic antibiotics has been used as an adjunct to mechanical removal of the biofilm. According to current knowledge, however, conversion of the originally physiological and symbiotic biofilm into a dysbiotic biofilm is crucial for the pathogenicity. Hence, testing for the presence of specific microorganisms is of less clinical relevance. Systemic administration of antibiotics after prior mechanical debridement undeniably has an added benefit in severe manifestations of periodontitis. In light of this, it is unclear how the decision to administer systemic antibiotics as part of periodontitis therapy is made in dental practices. Evaluating this decision process was the subject of this study.

Methods: The preferences for prescribing adjunctive systemic antibiotics in periodontal therapy were determined with 29 question items using a web-based software (Unipark, Questback GmbH, Germany). The anonymous survey was advertised throughout Germany and conducted from May to October, 2018. Data organization, descriptive evaluation, and contingency analysis (Pearson's chi-squared test, Cramer's V) were performed with PASW Statistics 18 (SPSS Statistics 18, IBM, Chicago, USA). The significance level was defined as $p = 0.05$.

Results: The online survey was accessed by 5745 interested persons. Of these, 425 (7.4 %) completed the survey in full. Most frequently, these respondents reported prescribing antibiotics in periodontitis treatment in patients with rapidly progressive (aggressive) periodontitis (34 %), with necrotizing ulcerative gingivitis/periodontitis with pronounced general symptoms (56 %) and with acute periodontal abscesses with tendency to spread or with pronounced general symptoms (76 %). 58 % of respondents started with the antibiotic therapy prior to root surface instrumentation and 28 % indicated using a microbiological test. The group of survey participants with a specialization reported more frequent use of national statements/guidelines compared to dentists without a specialization (90 % vs. 77 %).

Discussion: According to the results, the majority of dentists participating in the survey used systemic antibiotics in periodontal therapy in a prudent and indication-related manner. However, this should not be generalized, since the study design with its unclear response rate is not sufficiently representative.

Conclusion: The results suggest that the available recommendations from professional associations have largely been implemented.

Keywords: periodontitis; antibiotics; guidelines; online survey

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Translation: mt-g medical translation GmbH & Co. KG

Citation: Graetz C, Conrad J, Dörfer CE, Sälzer S: Administration of systemic adjunctive antibiotics in periodontology – a nationwide online survey. Dtsch Zahnärztl Z Int 2019; 1: 222–231

Peer-reviewed article: submitted: 23.05.2019, revised version accepted: 14.10.2019

DOI.org/10.3238/dzz-int.2019.0222–0231

1. Background

Scientific statements and guidelines are the foundation on which dentists can make decisions for a particular patient that is based on current knowledge. This does assume, however, that the relevant publications are known to the practicing dentist, who carry the main load of dental care in Germany. Without doubt, the treatment of patients with advanced and complex periodontitis is a therapeutic challenge for the entire practice team. Even using the latest technology for mechanical subgingival biofilm removal, complete removal cannot be expected. Although it is not known precisely how much biofilm has to be removed to achieve healthy periodontal conditions, various adjunctive measures to improve the effectiveness are suggested. Along with antiseptics, these measures notably include prescribing adjunctive systemic antibiotics. The extent of the additional clinical effect is, however, the subject of vigorous debate. While some authors described significant clinical effects of systemic administration of adjunctive antibiotics and thus question the necessity of further periodontal surgery measures [23], such a clear treatment effect could not be confirmed in the German AB-PARO study [17]. In this randomized multi-center study, 402 patients were prospectively examined using a parallel group design. All subjects underwent mechanical biofilm treatment that was supplemented in the test group by additional administration of oral antibiotics (500 mg amoxicillin and 400 mg metronidazole). According to the clinical results, the patients in the test group developed less attachment loss in the follow-up observation period compared to the control group (test/control group: 5.3 %/7.8 % further attachment loss). On the other hand, this revealed just how efficient mechanical periodontitis therapy actually is and that only a minor additive effect was achieved by administering antibiotics. The clinical relevance of antibiotic therapy depends on when the antibiotics were taken [18], the parameters recorded, and the severity of the periodontitis [17]. For the practice, this means that without an adequate treatment concept adapted in each case to the particular patient's situation, not only will the long-term success of therapy fail to materialize but statistically verifiable additional benefits of adjunctive antibiotics in periodontitis therapy will also be brought into question [27]. This means that particularly those patients with only moderate periodontitis would gain very little in the way of benefit from antibiotic therapy [21]. Likewise, adverse drug reactions associated with the administration of antibiotics must also be viewed critically [29] because any additional benefits are contrasted with the potentially severe adverse reactions to the antibiotics as well as the significant issue of the development of antibiotic resistance. Many authors therefore recommend restricted handling of adjunctive systemic antibiotics, reserving them for the most severe cases of rapidly progressive periodontitis [17, 21, 27].

Because of the controversies mentioned regarding the assessment of benefits and adverse reactions, an evidence-based guideline (S3) [4] based on a systematic literature review with concrete instructions for the administration of antibiotics as part of periodontitis therapy was initiated to determine the indications for and implementation of adjunctive systemic antibiotic administration. It does raise the question, however, of how decisions regarding the systemic administration of antibiotics as part of systematic periodontitis therapy are made in practice. Evaluating the decision-making process was the subject of this online survey.

2. Method

To determine the procedure used by German dentists when prescribing adjunctive systemic antibiotics as part of periodontitis therapy, 29 relevant question items were developed in a dental focus group. Along with 9 questions aimed at specifically describing the participant, 20 questions were asked to determine the prescribing practices in the dental practice and to subsequently compare the responses with the evidence confirmed in studies on the benefits of systemic adjunctive administration of antibiotics after mechanical biofilm removal. These specific technical questions were classified by indication regarding the type and severity of the periodontitis, the presence of comorbidities, the point of antibiotic prescription, and the specific choice of antibiotic. The design of the questions was based on the recommendations made in the Kiel treatment concept [26], which is characterized by restrictive use of adjunctive antibiotic prescriptions and is comparable to the Göteburg concept [28]. Both concepts assume that ultimately only a few patients would benefit significantly from adjunctive antimicrobial measures whereas the primary therapy is infection control and non-/surgical root instrumentation. Furthermore, the current findings from the ABPARO study [17] and other studies on the adjunctive use of antibiotics in non-surgical periodontitis therapy [27] as well as the statement by the DGZMK from 2003, which was still available at the time of the survey [7], were incorporated into the preparation of the questions.

All the questions were converted to an anonymous online survey using a web-based software (Unipark, QuestBack GmbH). After a positive vote on the research project by the ethics committee of the Faculty of Medicine of the Christian Albrechts University in Kiel (ref.: 452/18), the first version of the online survey was validated by 28 practicing dentists from various federals states of Germany and analyzed using the test/retest method for its reliability. According to the results of this pretest and the comments made by the participants, the survey was modified slightly in terms of its content and formulation. The final version included inclusion and exclusion criteria used at the start of the survey to ensure that only dentists who are employed in a dental practice and treat patients with periodontitis participated in the survey. The first 7 questions related to specific personal parameters relating to age group, sex, German federa state, location of the practice, specialization, university education, and the use of guidelines. These were followed by 20 specific technical questions. The online survey was advertised throughout Germany

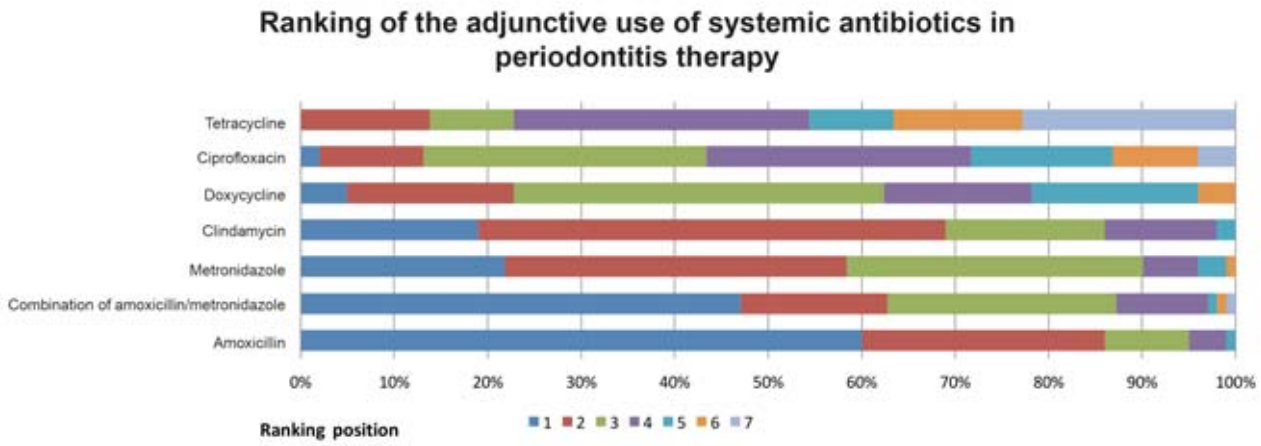

Figure 1 Ranking of the adjunctive use of systemic antibiotics in periodontitis therapy (the participants arranged the possible options according to their frequency of use).

using various advertisements and brief notifications in cross-regional dental journals, newsletters from state dental regulatory bodies and professional associations, lectures and email distribution lists from state dental regulatory bodies over 5 months between May 28 and October 31, 2018.

The calls for participants and the introductory text for the survey briefly explained the research project and assured anonymous participation. No financial incentives or gifts were offered for participating in the survey.

The collected data were automatically saved in the software-specific database (Unipark, QuestBack GmbH, Berlin, Germany) and exported for further data organization as an SPSS dataset (SPSS Statistics 18, IBM, Chicago, USA). A plausibility check of the data was followed by a descriptive analysis in which each question was considered separately along with question-related contingency analyses (Pearson's chi-squared test, Cramer's V). The level of significance was defined as $p = 0.05$.

3. Results

3.1. Population data

The first page of the online survey with the introductory text and a brief explanation of the research project was accessed by 5745 interested persons. Because it was not compulsory to answer every question, the number of responses obtained for each question varied across all questions between 512 and 397. The sociodemographic and professional characteristics of the survey participants are described in Table 1.

3.2 Specific technical questions

The analyses of the specific technical questions on the indication and procedure for periodontitis treatment are shown in Tables 2 and 3. According to the information from the online survey, antibiotics were most commonly prescribed in periodontitis treatment for patients with acute periodontal abscesses with a tendency to spread to adjacent regions, pronounced general symptoms such as fever and/or pronounced general symptoms (75 %), necrotizing ulcerative gingivitis or periodontitis with pronounced general symptoms such as fever and/or pronounced lymphadenopathy (56 %), and rapidly progressive (aggressive) periodontitis (34 %). A microbiological test was used by 28 % of the survey participants to select the antibiotic. Fifty-eight percent of the survey respondents already start the antibiotic therapy before carrying out the root surface instrumentation.

3.3 Choice of antibiotic

In the ranking of adjunctive use (multiple answers possible) the antibiotic amoxicillin took first place. It was listed by 60 % of the respondents as the preferred antibiotic. It was followed by the combination of amoxicillin and metronidazole, which was cited by 48 % of respondents as their first choice. Metronidazole (22 %), clindamycin (19 %), doxycycline (5 %), and ciprofloxacin (2 %) followed. Tetracycline was not named by any of those surveyed as the antibiotic of first choice (see Fig. 1).

In the ranking of the sources of information, most participants (65 %) indicated that they use antibiotics in periodontitis therapy on the basis of scientific statements, national guidelines, or directives (Fig. 2). A dentist's own experience (35 %), the results of clinical trials (24 %), systematic reviews (metaanalyses) (19 %), and narrative reviews (6 %) were cited considerably less often as primary sources of information.

3.4 Relationship between indication/therapeutic procedure and clinicians with specific characteristics

The contingency analyses using Pearson's chisquared test and subsequent Cramer's V test yielded a highly significant association with weak manifestation between the group of survey respondents specializing in an area of dentistry (all specialisms consolidated) and the behavior relating to the use of national statements/guidelines for therapy (planning) (χ^2 (1) = 10.69, $p < 0.001$ and Cramer's V = 0.156, $p = 0.001$).

The analysis of associations between one or no specialization and the specific technical questions about

behavior regarding the use of antibiotics by the survey respondents yielded a significant result in the following cases.

- Clinicians who indicated having one specialization tended to use supportive antibiotic therapy more often/always in patients with rapidly progressive (aggressive) periodontitis (χ^2 (1) = 6.77, p = 0.009 and Cramer's V = 0.122, p = 0.009)
- Clinicians who indicated not having any specialization tended to use supportive antibiotic therapy more often/always in patients with acute periodontal abscesses with a tendency to spread to adjacent regions (χ^2 (1) = 4.71, p = 0.03 and Cramer's V = 0.106, p = 0.03) but never/rarely for patients with multiple teeth with probing pocket depths > 6 mm (χ^2 (1) = 3.99, p = 0.046 and Cramer's V = 0.099, p = 0.046). Likewise, they tended to never/rarely use a microbiological test (χ^2 [1] = 4.44, p = 0.035 and Cramer's V = 0.105, p = 0.035).

A general analysis of the associations between the use or not of statements/guidelines and the specific technical questions about behavior regarding the use of antibiotics by the survey respondents yielded a significant result in the following cases:

- There is a significant association with weak manifestation between the use of guidelines/statements and the application of supportive antibiotic therapy in patients with therapy-resistant periodontitis (χ^2 [1] = 4.52, p = 0.03 and Cramer's V = 0.101, p = 0.03). Clinicians who used statements/guidelines tended to use antibiotic therapy more often/always.
- There is a significant association with weak manifestation between the use of guidelines/statements and the application of supportive antibiotic therapy in patients with periodontitis and diabetes mellitus (χ^2 [1] = 5.01, p = 0.02 and Cramer's V = 0.110, p = 0.02). Clinicians who used statements/guidelines tended to use antibiotic therapy less often/never.
- There is a significant association with weak manifestation between the use of guidelines/statements

Sociodemographic and professional characteristics		Number (proportion as %)
Do you work in a dental practice?		
	Yes	496 (97 %)
	No	16 (3 %)
Do you carry out periodontitis treatments in your practice / for your patients?		
	Yes	500 (98 %)
	No	12 (2 %)
How old are you?		
	< 40 years	190 (40 %)
	40–50 years	95 (20 %)
	51–68 years	185 (39 %)
	> 68 years	5 (1 %)
Please indicate your sex:		
	Female	217 (46 %)
	Male	257 (54 %)
In which urban environment do you work?		
	Baden-Württemberg	40 (8.4%)
	Bavaria	63 (13.2%)
	Berlin	10 (2.1%)
	Brandenburg	6 (1.3%)
	Bremen	2 (0.4%)
	Hamburg	32 (6.7%)
	Hesse	21 (4.4%)
	Mecklenburg-Western Pomerania	20 (4.2%)
	Lower Saxony	16 (3.4%)
	North Rhine-Westphalia	47 (9.9%)
	Rhineland-Palatinate	9 (1.9%)
	Saarland	2 (0.4%)
	Saxony	11 (2.3%)

	Saxony-Anhalt	8 (1.7%)
	Schleswig-Holstein	183 (38.4%)
	Thuringia	7 (1.6%)
Do you have one of the following specializations/fields? (If several, please select only those most relevant to your current employment.)		
	None	339 (71.2%)
	Endodontics	28 (5.9%)
	Orthodontics	2 (0.4%)
	Pediatric dentistry	9 (1.9%)
	Oral and maxillofacial surgery	1 (0.2%)
	Oral surgery	21 (4.4%)
	Public health	0 (0%)
	Periodontology	63 (13.2%)
	Prosthetics	13 (2.7%)
Do you regularly use national statements and guidelines for your therapy (planning)?		
	Yes	382 (81 %)
	No	89 (19 %)

Table 1 Sociodemographic and professional characteristics of survey participants

and the application of supportive antibiotic therapy in patients with periodontitis who smoke or consume nicotine/drugs in another form (χ^2 [1] = 6.32, p = 0.01 and Cramer's V = 0.124, p = 0.01). Clinicians who used statements/guidelines tended to use antibiotic therapy less often/never.

- There is a significant association with weak manifestation between the use of guidelines/statements and carrying out full-mouth scaling (FMS) (χ^2 [1] = 6.05, p = 0.014 and Cramer's V = 0.123, p = 0.01). Clinicians who used statements/guidelines tended to carry out root surface instrumentation in the form of FMS more often/always.
- There is a significant association with weak manifestation between the use of guidelines/statements and the use of a microbiological analysis of the subgingival plaque ("microbiological test") (χ^2 [1] = 5.16, p = 0.02 and Cramer's V = 0.113, p = 0.02). Respondents who indicated that they use national statements or guidelines used a "microbiological test" less often or never.

4. Discussion

The results of this study show clearly that most of the responding dentists, who tend to belong to urban service areas, despite having a balanced age structure and practices located across all German federal states (with a focus on northern Germany), take a cautious and indication-focused approach to the use of adjunctive systemic antibiotics in periodontitis therapy. However, or precisely because of this, the results should not be generalized because the study design with its unclear responder rate means that a representative participant group cannot be assumed. It is also apparent that respondents who indicated having a specialization tended to use national statements and guidelines in their therapy (planning). It was also observed that all the options used to design the questions in this survey do not make any claim in terms of completeness or in any event, the questions reflect the opinion of the authors. It must be emphasized in particular that the scientific statement from 2003 [7] was available on various portals at the time of the survey but had never been updated since its publication. An S3 guideline on the adjunctive application of systemic antibiotics in periodontitis therapy only appeared at the end of 2018 after the survey period for this study had closed [4]. Unlike the guidelines that are now issued, there was no obligation for previously established scientific statements to be updated at least every 5 years.

4.1 Periodontitis and adjunctive systemic antibiotics administration – theory and practice

Based on the current understanding of periodontal pathogenesis as a manifestation of a proinflammatory bacterial dysbiosis in the oral biofilm, the indication for adjunctive systemic antibiotics in periodontitis therapy is rather restricted. Effectiveness against Gram-negative bacteria is only assumed if the protective biofilm has first been mechanically destroyed. This explains one of the requirements of the current guidelines on adjunctive use of systemic antibiotics in periodontitis therapy [4] that the quantity of bacteria on the teeth must be reduced by regular professional and at-home cleaning. Nevertheless, to increase the effectiveness of this mechanical therapy,

Specific technical questions about the indication				
	Number (proportion as %)			
	Never	Rarely	Often	Always
I use supportive antibiotic therapy in periodontitis treatment in my practice / for my patients:				
... with rapidly progressive (aggressive) periodontitis	18 (4%)	114 (25%)	171 (37%)	158 (34%)
... with severe, slowly progressive (chronic) periodontitis	82 (18%)	245 (54%)	103 (22%)	103 (6%)
... with therapy-resistant periodontitis (recurrent or progressive attachment loss despite previously adequate treatment)	38 (8%)	152 (34%)	187 (41%)	75 (17%)
... with submucosal, acute periodontal abscesses with no tendency to spread or pronounced general symptoms such as fever	163 (37%)	156 (36%)	76 (17%)	46 (10%)
... with moderate to severe periodontitis associated with systemic diseases or conditions that impair the function of the immune system	25 (6%)	143 (33%)	180 (42%)	82 (19%)
... with periodontitis who are older than 60 years	148 (34%)	243 (57%)	29 (7%)	10 (2%)
... with necrotizing ulcerative gingivitis or periodontitis with pronounced general symptoms such as fever and/or pronounced lymphadenopathy	13 (3%)	45 (11%)	129 (30%)	236 (56%)
... with acute periodontal abscesses with a tendency to spread to adjacent regions, with pronounced general symptoms such as fever and/or pronounced lymphadenopathy	4 (1%)	19 (5%)	80 (19%)	318 (75%)
... with plaque-associated gingivitis (systematically healthy)	398 (94%)	17 (4%)	5 (1%)	2 (1%)
... with mild or moderate periodontitis (systematically healthy)	322 (77%)	78 (18%)	12 (3%)	7 (2%)
... with periodontitis who are younger than 35 years and have deep periodontal pockets	85 (20%)	197 (47%)	104 (25%)	31 (8%)
... with periodontitis in which pus is found in the gingival pockets	72 (17%)	229 (55%)	90 (22%)	26 (6%)
... with periodontitis and diabetes mellitus	86 (21%)	239 (58%)	71 (17%)	19 (4%)
... with periodontitis who smoke or consume nicotine/drugs in another form	187 (45%)	187 (45%)	32 (8%)	10 (2%)
... with multiple teeth with probing pocket depths > 6 mm	77 (19%)	232 (56%)	74 (18%)	30 (7%)

Table 2 Descriptive evaluation of the subject-specific questions concerning the indication

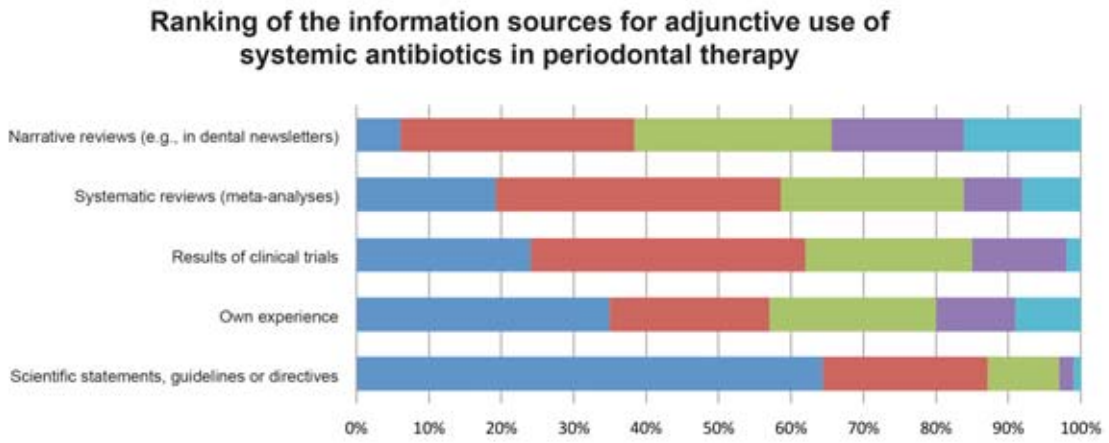

Figure 2 Ranking of the information sources used for the adjunctive use of antibiotics in periodontal therapy (the participants arranged the possible options according to their frequency of use).

adjunctive administration of systemic antibiotics is established for deep gingival pockets and rapidly progressive forms of periodontitis. Their effectiveness is, however, considerably increased if they are taken after mechanical biofilm removal and microorganisms penetrating the surrounding soft tissues are to be treated [11, 18]. The practical implementation of this knowledge was the subject of this study. Interestingly, 58 % of the survey respondents used an antibiotic as an adjunct before the actual mechanical biofilm disintegration and not after. This approach is possibly analogous to that described in the recommendations for endocarditis prophylaxis [13] or even pre-operative administration as part of oral implantation procedures or measures [2]. Although this is not explicitly described, it can be assumed that during the mechanical biofilm removal an adequate level of active substance is already present in the target tissues. For the current issue within periodontology, it must therefore be emphasized that the antibiotic must be administered shortly before or after mechanical disintegration of the biofilm in order to achieve an adjunctive effect. What is critical is the concentration of the active substance in the periodontium. Studies conducted by Sedlacek and Walker [30] also showed that biofilm-mediated antibiotic resistance can rise dramatically again just 24 h after initial bacterial colonization of surfaces and therefore temporal proximity to subgingival instrumentation is essential [18]. On the other hand, however, there is a significant, albeit weak, association between those respondents who indicated that they regularly use national statements and guidelines and those who tend to carry out fullmouth scaling (FMS), that is, mechanical treatment of all exposed root surfaces, within 24 h. This should assure the temporal proximity between the antibiotics administration and the mechanical destruction of the biofilm. The systematic analysis of all available data did not reveal any evidence of a significant difference between a quadrant-based procedure and FMS [14]. In the practice, therefore, both the patient's desires as well as the logistics of making appointments can also be considered when choosing the procedure.

4.2 Periodontitis and adjunctive systemic antibiotics administration – when?

It is undisputed that for determining the indication and selecting an antibiotic certain clinical and microbiological aspects should be noted but in particular the benefits and drawbacks of antibiotic therapy for the patient must be weighed up [21]. Although most studies showed that the adjunctive administration of systemic antibiotics achieved a significant reduction in the probing pocket depths compared to mechanical periodontitis therapy alone, the clinical relevance of this slight difference is nevertheless questionable [27]. In particular, for only mild to moderately periodontitis the relevance is considered highly controversial in light of the adverse reactions associated with systemic antibiotic therapy and the development of bacterial resistance [31, 32]. Clinically, the extent of this additional change is highly dependent on the age of the patient and the severity of the characteristics of the disease [17]. These aspects were not adequately discussed in the statement available at the time of this survey [7] but encouragingly the prescribing practices largely correspond to the current state of knowledge according to the results presented here. Only a small percentage of the respondents (2 %) regularly prescribed adjunctive antibiotics in patients over 60 years of age, whereas 8 % of all respondents indicated that they prescribe antibiotics for periodontitis patients younger than 35 years with deep gingival pockets (≥ 5 mm). The latter corresponds explicitly to the current guideline-compliant procedure [4]. This implies that particularly younger patients under 35 years and with aggressive periodontitis [1], that is, based on a recent classification of periodontal diseases rather with moderate to rapid progression (grade B–C) [25], and patients younger than 56 years who have a probing pocket depth of ≥ 5 mm at more than 35 %

Specific technical questions about the procedure				
	Number (proportion as %)			
	Never	Rarely	Often	Always
I carry out root surface treatment using fullmouth scaling (FMS):	30 (8 %)	74 (18 %)	107 (26 %)	195 (48 %)
When selecting an antibiotic for periodontitis treatment, I use a microbiological analysis of the subgingival plaque ("microbial test"):	111 (27 %)	115 (28 %)	68 (17 %)	112 (28 %)

	Number (proportion as %)
I use supportive antibiotic therapy in periodontitis treatment in my practice / for my patients:	
– immediately before the root surface instrumentation	229 (58 %)
– upon completion of the root surface instrumentation	168 (42 %)

Table 3 Descriptive evaluation of the subject-specific questions regarding the procedure for the treatment of periodontitis

of all measured sites would benefit from adjunctive antibiotic administration after subgingival instrumentation. In contrast, there was no evidence of additional benefits for patients who are older than 56 years and/or have a smaller proportion of periodontal lesions, for which reason treatment should be primarily without adjunctive antibiotics.

The studies relating to specific indications in patients with diabetes or who smoke is described as inadequate or too heterogeneous to enable a specific recommendation for adjunctive antibiotic use [27]. Encouragingly, this fact is again reflected in the current results on prescribing practices. Those clinicians who used guidelines/statements tended to prescribe adjunctive antibiotic therapy less often/never for patients who smoke or have diabetes ($p = 0.02$).

4.3 Periodontitis and microbiological diagnostics before adjunctive systemic antibiotic administration – necessary or not?

Survey respondents who did not indicate having any specialization as well as those who indicated that they base their treatments on national statements/guidelines never or rarely carried out microbiological diagnostics. They thus acted counter to the national scientific statement from 2003 [7] available at the time of the survey, which endorsed microbiological testing. However, this statement had also never been updated and would not be considered valid according to current criteria. Over the past few years in all continuing education programs the current state of knowledge and the resulting changes to the diagnostic procedure have been rigorously discussed, meaning it can be assumed that this professional group is generally closely involved in the development of the discipline. The point must be made here, however, that those persons interested in this issue participated in the survey, which will certainly have influenced the results and therefore the representativeness of the study, an issue that will be addressed in the final section.

The aim of the microbiological analysis should be to select antibiotics specifically in accordance with the complex of periodontal pathogens present [8]. Even though in comparison to other odontogenic infections specific microorganisms may be more commonly associated with periodontitis [12], only a fraction of these are detected using a commercial microbiological test. The pathological relevance of other bacteria that cannot be identified using these tests has not yet been clarified. The therapeutic benefits of a commercial microbiological analysis as part of systematic periodontitis therapy has thus increasingly been questioned over the last 10 years or so and adjunctive antibiotic treatment is no longer considered useful for the indication [10, 24]. Based on our current understanding, the decision for the indication should be made based on the clinical symptoms. A specific microbiological diagnostic can, however, be recommended in case of complications of odontogenic infections with a tendency to spread after previous therapy with aminopenicillin as the treatment of choice [3], which does not involve a primarily periodontological indication.

4.4 Periodontitis and adjunctive systemic antibiotic administration – which one?

According to a study by Hussein et al. [19] that was based on pseudonym-

ized calculation data from statutory insured persons from 2013, clindamycin is prescribed in Germany in more than half of cases of dental treatments with an antibiotic. Furthermore, in the report from the Drug Commission, dentists accounted for the highest proportion of reportable adverse drug reactions (ADR) for antibiotics with 25 cases for clindamycin in 2017, and it is particularly noteworthy that almost 60 % of all clindamycin therapies were prescribed by dentists in Germany [16]. This runs counter to current recommendations for odontogenic infections that describe aminopenicillin with beta-lactamase inhibitor, where applicable, as the treatment of choice [3] and clindamycin is considered to have less therapeutic relevance. In other European countries the proportion of prescribed clindamycin is less than 10 % with a few exceptions such as Spain where it makes up to 38 % of all prescriptions [15]. According to the results of this survey, clindamycin is fortunately only prescribed by 19 % of the respondents as part of periodontitis therapy. There was also no significant association found between participants who indicated that they carry out a microbiological test and a preference for clindamycin as the treatment of choice.

It should be remembered, however, that an evidence-based statement about possible therapeutic superiority of a specific antibiotic or a specific combination of antibiotics cannot currently be made [27]. The greatest evidence is available for the combination of amoxicillin and metronidazole, metronidazole alone, or azithromycin. Even though from a pharmacological perspective they may be favorable therapeutic options, there is up to date no marketing authorization available for either azithromycin or the combination of ampicillin/sulbactam for the dental sector.

According to the S3 guideline published after the survey, with an appropriate indication the dosage should be 500 mg amoxicillin and 400 mg metronidazole 3 times a day for 7 days. In case of penicillin allergy and/or drug exanthema, administering metronidazole alone is recommended [4].

4.5 Representativeness

This study is not representative according to traditional methods in which a random sample of the population to be investigated is generated using a register of all possible survey participants. Due to the non-specific recruitment of the participants over the internet, the current survey, like all online surveys, is affected by distortions [9]. On one hand, any dentists without internet access would not be able to participate in this survey. This is likely to be a relatively small proportion of dentists because as of 2016 93 % of all Germans with a university degree used the internet [20] and in addition all dental practices in Germany will also be connected to the internet as part of the current rollout of the telematics infrastructure. Certainly what is more critical here therefore is distortion of the results due to self-selection (self-selection bias) by the participating dentists. Experience shows that persons take part in voluntary online surveys are interested in the subject, which can positively affect the results. It must therefore be noted that the largest group of the participants (13 %) with a specialization in this survey were specialized in periodontology and as part of their specialization have been trained considerably more intensively in the handling of scientific evidence and its necessity than is possible under the current conditions in education.

4.6 Implementation of scientific evidence in practice

Evidence-based medicine has increasingly gained importance in recent years in the discussion of the quality of medical and dental care. Nevertheless, its implementation in practice is still lagging [5]. For example, a survey in French-speaking Switzerland indicated that only 14 % of those surveyed regularly considered scientific evidence in their therapy decision (pharmacists 12 %, nurses 22 %, physicians 36 %) [22]. Barriers to application include a lack of knowledge and skills as well as a lack of time [6].

According to the current survey, about 81 % of the participants encouragingly made regular use of national statements and guidelines for therapy (planning). This proportion appears relatively high in light of the previous remarks. For this reason, it will be interesting to observe how quickly the new information in the guideline published after the survey for the indication regarding the use of microbiological diagnostics and adjunctive systemic antibiotic therapy and its choice as part of periodontitis therapy are implemented in practice.

Conflict of interest:
The authors state that they have no conflict of interest as defined by the guidelines of the International Committee of Medical Journal Editors.

References

1. Armitage GC: Development of a classification system for periodontal diseases and conditions. Ann Periodontol 1999; 4: 1–6

2. AWMF (2016): S3-Leitlinie: Die Behandlung periimplantärer Infektionen an Zahnimplantaten, 23.4.2019. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF)

3. AWMF (2016): S3-Leitlinie: Odontogene Infektionen, 23.4.2019. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF)

4. AWMF (2018): S3-Leitlinie: Adjuvante systemische Antibiotikagabe bei subgingivaler Instrumentierung im Rahmen der systematischen Parodontitistherapie, 23.4.2019. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF)

5. Baethge C: Evidenzbasierte Medizin: In der Versorgung angekommen, aber noch nicht heimisch. Dtsch Arztebl Int 2014; 111: A-1636 / B-1416 / C-1348

6. Barzkar F, Baradaran HR, Koohpayehzadeh J: Knowledge, attitudes and practice of physicians toward evidence-based medicine: A systematic review. J Evid Based Med 2018;11:246–251

7. Beikler T, Karch H, Flemmig TF: Adjuvante Antibiotika in der Parodontitistherapie. Gemeinsame Stellungnahme der Deutschen Gesellschaft für Zahn-, Mund- und Kieferkrankheiten (DGZMK) und der Deutschen Gesellschaft für Parodontologie (DGP). Dtsch Zahnärztl Z 2003; 58: 263–265

8. Beikler T, Prior K, Ehmke B, Flemmig TF: Specific antibiotics in the treatment

of periodontitis – a proposed strategy. J Periodontol 2004; 75: 169–175

9. Bethlehem J: Selection Bias in Web Surveys. International Statistical Review 2010; 78: 161–188

10. Cionca N, Giannopoulou C, Ugolotti G, Mombelli A: Microbiologic testing and outcomes of full-mouth scaling and root planing with or without amoxicillin/-metronidazole in chronic periodontitis. J Periodontol 2010; 81: 15–23

11. Darveau RP, Tanner A, Page RC: The microbial challenge in periodontitis. Periodontol 2000 1997; 14: 12–32

12. Dewhirst FE, Chen T, Izard J et al.: The human oral microbiome. J Bacteriol 2010; 192: 5002–5017

13. DGK: Positionspapier: Prophylaxe der infektiösen Endokarditis., 1 edn. Kardiologe 2007; 4: 243–250: Deutsche Gesellschaft für Kardiologie – Herz- und Kreislaufforschung

14. Eberhard J, Jepsen S, Jervoe-Storm PM, Needleman I, Worthington HV: Full-mouth treatment modalities (within 24 hours) for chronic periodontitis in adults. Cochrane Database Syst Rev 2015; CD004622

15. Gonzalez-Martinez R, Cortell-Ballester I, Herraez-Vilas JM, Arnau-de Bolos JM, Gay-Escoda C: Antibiotic prescription in the treatment of odontogenic infection by health professionals: a factor to consensus. Med Oral Patol Oral Cir Bucal 2012; 17: e452–e456

16. Halling F: Update der zahnärztlichen Pharmakologie. KZV aktuell 2018; 5: 8–21

17. Harks I, Koch R, Eickholz P et al.: Is progression of periodontitis relevantly influenced by systemic antibiotics? A clinical randomized trial. J Clin Periodontol 2015; 42: 832–842

18. Herrera D, Alonso B, Leon R, Roldan S, Sanz M: Antimicrobial therapy in periodontitis: the use of systemic antimicrobials against the subgingival biofilm. J Clin Periodontol 2008; 35: 45–66

19. Hussein RJ, Krohn R, Wilms J: Systemische adjuvante Antibiotikagabe bei Wurzelkanalbehandlungen, Zahnextraktionen und Notfallleistungen. Dtsch Zahnärztl Z 2018; 73: 22–28

20. Initiative D21 eV: Digital-Index 2016. Jährliches Lagebild zur Digitalen Gesellschaft, zuletzt geprüft am 03.01.2018

21. Jepsen K, Jepsen S: Antibiotics/antimicrobials: systemic and local administration in the therapy of mild to moderately advanced periodontitis. Periodontol 2000 2016; 71: 82–112

22. Lafuente-Lafuente C, Leitao C, Kilani I et al.: Knowledge and use of evidence-based medicine in daily practice by health professionals: a cross-sectional survey. BMJ Open 2019; 9: e025224

23. Mombelli A, Cionca N, Almaghlouth A: Does adjunctive antimicrobial therapy reduce the perceived need for periodontal surgery? Periodontol 2000 2011; 55: 205–216

24. Mombelli A, Cionca N, Almaghlouth A, Decaillet F, Courvoisier DS, Giannopoulou C: Are there specific benefits of amoxicillin plus metronidazole in Aggregatibacter actinomycetemcomitans-associated periodontitis? Double-masked, randomized clinical trial of efficacy and safety. J Periodontol 2013; 84: 715–724

25. Papapanou PN, Sanz M, Buduneli N et al.; Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol 2018; 45 (Suppl 20): S162–S170

26. Plagmann HC: Medikamentöse und antimikrobielle Behandlung der Gingivitis und Parodontitis. In: Plagmann HC (Hrsg): Lehrbuch der Parodontologie. Hanser, München, Wien 1998, 580–603

27. Pretzl B, Saelzer S, Ehmke B et al.: Administration of systemic antibiotics during non-surgical periodontal therapy – a consensus report. Clin Oral Investig 2019; 23: 3073–3085

28. Schaller D: Adjuvante systemische Antibiotika in der Parodontitistherapie. Das Konzept Göteborg. Parodontologie 2016; 27: 141–148

29. Schumacher C, Nagaba J, Schindler C: Die Arzneimittelkommsion Zahnärzte informiert: UAW-Meldungen zu Clindamycin wieder zunehmend. ZM 2019; 109: 36–43

30. Sedlacek MJ, Walker C: Antibiotic resistance in an in vitro subgingival biofilm model. Oral Microbiol Immunol 2007; 22: 333–339

31. Sgolastra F, Petrucci A, Gatto R, Monaco A: Effectiveness of systemic amoxicillin/metronidazole as an adjunctive therapy to full-mouth scaling and root planing in the treatment of aggressive periodontitis: a systematic review and meta-analysis. J Periodontol 2012; 83: 731–743

32. Smiley CJ, Tracy SL, Abt E et al.: Systematic review and meta-analysis on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts. J Am Dent Assoc 2015; 146: 508–524.e5

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