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Assessment of Knowledge and Practices of Dental Students and Dentists on Infective Endocarditis.

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Research Paper

ABSTRACT

The aim of this study was to evaluate the knowledge and self-perception of dentists and dental students about infective endocarditis (IE). This is a cross-sectional study, using an online questionnaire, which analyzed the knowledge and clinical conduct of professionals and students regarding IE and its risk factors. The sample consisted of 205 participants (101 dentists and 104 students), selected by convenience. Data were analyzed using descriptive statistics, Student's t-test, and chi-square test, with a significance level of 0.05. Most participants (87%) correctly defined IE, and the condition with the highest risk identified was heart valve disease (80%). The most frequently cited consequences were heart failure (75%) and generalized infection (68%). Regarding antibiotic prophylaxis, 68% indicated the correct definition and 93% correctly identified periodontal surgery as a procedure that requires prophylaxis. Although 86% answered correctly about medications and dosage, only 45% were able to indicate the minimum interval between consultations to prevent resistant microorganisms. It is concluded that, although there is good knowledge about IE and antibiotic prophylaxis, doubts persist about risk conditions, consequences, interval between consultations and procedures that require prophylaxis, which points to the need for greater dissemination of the subject in dentistry courses and continuous updating of professionals.

Keywords: Dentistry; Endocarditis, Bacterial; Students, Dental.

Avaliação do Conhecimento e das Práticas de Estudantes de Odontologia e Cirurgiões-Dentistas sobre Endocardite Infecciosa.

RESUMO

O objetivo deste estudo foi avaliar o conhecimento e a autopercepção de dentistas e alunos de odontologia sobre a endocardite infecciosa (EI). Trata-se de um estudo transversal, com aplicação de um questionário online, que analisou o conhecimento e as condutas clínicas de profissionais e estudantes em relação à EI e seus fatores de risco. A amostra foi composta por 205 participantes (101 dentistas e 104 estudantes), selecionados por conveniência. Os dados foram analisados por estatística descritiva, teste t de Student e teste qui-quadrado, com nível de significância de 0,05. A maioria dos participantes (87%) acertou a definição de EI, e a condição de maior risco identificada foi a doença de válvulas cardíacas (80%). As consequências mais citadas foram insuficiência cardíaca (75%) e infecção generalizada (68%). Em relação à profilaxia antibiótica, 68% indicaram a definição correta e 93% identificaram corretamente a cirurgia periodontal como procedimento que requer profilaxia. Embora 86% tenham respondido corretamente sobre medicamentos e posologia, apenas 45% souberam indicar o intervalo mínimo entre as consultas para prevenir microrganismos resistentes. Conclui-se que, embora haja bom conhecimento sobre a EI e profilaxia antibiótica, persistem dúvidas sobre condições de risco, consequências, intervalo entre consultas e procedimentos que necessitam de profilaxia, o que aponta para a necessidade de maior divulgação do tema em cursos de odontologia e atualização contínua dos profissionais.

Palavras-chave: Endocardite Bacteriana; Estudantes de Odontologia; Odontologia.

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INTRODUCTION

Infective Endocarditis (IE) is a rare, but typically severe and often fatal, inflammatory disease that affects the endocardial surface, native and prosthetic valves, or cardiac devices (Bumm & Folwaczny, 2021). The incidence of IE ranges from 3 to 15 cases per 100,000 in population-based studies. This variation is likely related to several factors, including the criteria used for defining cases (definite case, possible case, inclusion of IE with negative cultures), different sources, or the period analyzed, with reference to the publication of the guidelines (Sousa & Pinto, 2022). Despite ongoing advances in diagnosis, antimicrobial agents, and surgical therapy, IE remains a devastating disease. The development of effective strategies for preventing IE has been challenged by its relatively low incidence at the population level and the increasing heterogeneity of predisposing conditions that confer risk (Sun & O'Gara, 2018).

Virtually any pathogen can cause IE, but the most frequent are Gram-positive bacteria, primarily *Staphylococcus* and *Streptococcus*, and more recently, *Enterococcus*. Among *Streptococcus* spp., the most common is *Streptococcus viridans* (a common pathogen of the oral mucosa) (Sousa & Pinto, 2022). Infections caused by the viridans group streptococci (e.g., *S. mutans*, *S. mitis*, *S. anguinis*) account for almost 20% of cases of infective endocarditis. Traumatic lesions of the mucosa or gums, as part of physiological processes such as chewing or oral hygiene, but also particularly in diseases like dental caries or periodontitis and their secondary symptoms, can inevitably lead to the transfer of bacterial pathogens from the oral cavity into the bloodstream, resulting in bacteremia. Persistent odontogenic infections, especially those undetected, and their secondary symptoms, as well as various therapeutic measures for prevention and treatment, can lead to bacterial transfer from the oral cavity into the bloodstream, ultimately allowing bacterial adherence to endocardial surfaces, thus promoting infective endocarditis. Good oral and dental health should be emphasized as an important factor in the prevention of infectious diseases (Bumm & Folwaczny, 2021).

The therapy for IE with antimicrobials is typically long and parenteral. The administration of antibiotics over an extended period is the norm, ranging from two to four weeks for oral *Streptococcus* in native valve IE, to six weeks for *Enterococcus*

infection, with prosthetic valve IE requiring a six-week treatment period. Additionally, surgery plays a crucial role in IE. Several observational studies have concluded that surgery has a protective effect during the active phase of IE. Observational studies have shown a reduction in hospital mortality with early surgery, and a meta-analysis conducted in 2016 also demonstrated a protective role of early surgery on prognosis (Sousa & Pinto, 2022).

The prevention of IE in at-risk individuals has been the focus of international guidelines since the American Heart Association (AHA) first advocated for antibiotic prophylaxis (AP) before invasive medical and dental procedures in 1955 (Thornhill et al., 2018). The rationale behind the use of AP before dental procedures is that circulating doses of antibiotics would prevent the development of transient bacteremia caused by oral streptococci, thus preventing these bacteria from attaching to the endocardium and causing IE (Bergadà-Pijuan et al., 2023). However, there has never been a trial to define the efficacy of AP. This, along with concerns about the risk of adverse reactions and the development of antibiotic resistance, has led to a reduction in the populations targeted for AP. In 2007, the AHA recommended that AP be restricted to those at high risk of IE and its complications undergoing invasive dental procedures. The European Society of Cardiology (ESC) published similar guidelines in 2009, while the National Institute for Health and Care Excellence (NICE) in the UK recommended the complete cessation of AP in 2008 (Thornhill et al., 2018).

The updated guidelines of the ESC in 2015 and the AHA in 2017 reaffirmed their recommendation for antibiotic prophylaxis before invasive dental procedures in patients at increased risk for IE and those at high risk of adverse IE outcomes (Bumm & Folwaczny, 2021). In this context, knowledge of infective endocarditis, as well as an understanding of the risk a patient faces in contracting it, is of utmost importance for dental surgeons to be prepared to appropriately prescribe (or not) antibiotic prophylaxis depending on the procedure being performed. Furthermore, it is relevant that students are also well-informed on the subject, so that they can become well-prepared professionals for such occasions, given the severity of the disease. The aim of this research project is to assess whether dental professionals and students possess the appropriate knowledge and practice when dealing with infective endocarditis.

METHODOLOGY

This research consisted of a cross-sectional observational study. Ethical approval was obtained from the Research Ethics Committee involving Human Beings at the Federal University of Juiz de Fora – UFJF (CAAE: 74068823.1.0000.5147; approval number: 6.730.688). A virtual questionnaire was created using Google Forms, and all participants consented to participate after being presented with the Informed Consent Form (ICF), which was provided prior to the start of the questions.

The sampling in this study was convenience-based, comprising dentists, either general practitioners or specialists in any area, who are currently engaged in clinical practice, and dental students duly enrolled in Brazilian universities recognized by the Ministry of Education (MEC), both private and public, and who are undertaking clinical practical courses. The research was disseminated virtually through social media platforms such as Instagram and WhatsApp.

The questionnaire was divided into three sections. The first section collected participant identification, indicating whether they were a dentist or a student. The second section consisted of 8 questions, the first of which was a self-assessment of the participant's knowledge regarding Infective Endocarditis (IE), with the remaining questions addressing the disease, including its definition, high-risk conditions, consequences of IE, antibiotic prophylaxis, and antibiotic therapy for IE. The third section included 4 questions regarding the participants' self-perception of the topic and the relevance of the research.

Data Analysis

Descriptive and inferential analyses were performed, in which the responses were compiled and the data entered Microsoft Excel software. Descriptive data analysis was calculated, and the variables were reported as means, standard deviations, frequencies, and percentages, using Jamovi software. To compare the distributions and mean results between two independent groups—dental students and dentists—the Student's t-test was applied, with a significance level (p-value) set at 0.05. For comparison of questions with categorical variables (correct/incorrect), the chi-square

test was used (significant p-value < 0.050). The analysis of questions with metric variables (number of correct answers) was conducted using non-parametric tests, such as the Mann-Whitney and Kruskal-Wallis tests (significant p-value < 0.050). Additionally, the Shapiro-Wilk test was used to verify the assumption of normality, and the Levene's test was employed to assess the assumption of homogeneity.

RESULTS

205 responses were obtained, 104 students (50.7%) and 101 dentists (49.3%).

Self-assessment of knowledge of infectious endocarditis

Regarding the participants' self-assessment (Table 1), a scale of 1 to 5 was used (1 - Very bad; 2 - Bad; 3 - Average; 4 - Good and 5 - Very good). Most dentists (48) classified themselves at level 3, with a considerable number (37) at level 4, while few classified themselves at level 1 (1) or 5 (7). Among the dentistry students, there was a wider distribution, with the majority at level 3 (46), and a relatively high number at levels 2 (23) and 1 (18), with a low number at levels 4 (13) and 5 (4). From the Chi-square (χ^2) tests, it was possible to see that there is a significant difference in the self-assessment of knowledge about Infectious Endocarditis between dentists and dentistry students.

Table 1 - Self -assessment of knowledge about infectious endocarditis

	1	2	3	4	5	Total	P*
Dental Surgeon	1	8	48	37	7	101	
Dentist Student	18	23	46	13	4	104	
Total	19	31	94	50	11	205	<.001

* Chi-square test (p≤0.05)

Evaluation of the concept of infectious endocarditis

In the first question, participants were asked about the concept of Infectious Endocarditis (Table 2), to assess what students and dentists understand this disease to be. The majority (179) chose the correct alternative.

Table 2 - Evaluation of the concept of infectious endocarditis

	Dentist Student (N total = 104)		Dental Surgeon (N total = 101)		
Among the alternatives below, which best describes infectious endocarditis (IS)?	**N**	**%**	**N**	**%**	**Total**
It is a rare disease, characterized by being an endocardial infection caused by bacteria that invade the bloodstream and reach the heart, lodging on endocardic surfaces or heart valves.	89	86%	90	89%	179
It is an inflammation of the endocardial surface of the heart and can be caused by infectious agents from invasive heart surgery.	11	11%	5	5%	16
It is a rare disease, caused by bacteria that are already in the heart.	0	0%	1	1%	1
It is a chronic condition in which patients with heart failure are more predisposed to develop.	4	4%	5	5%	9

Assessment of knowledge about high-risk conditions for infectious endocarditis

Table 3 shows the responses related to the risk conditions for IE, where "N" represents the number of times the alternative was marked, and not the number of participants who marked it. This is because participants could choose to mark more than one alternative, with the first 5 being the correct ones. Heart valve disease was the most chosen by dentists (86) and history of previous infective endocarditis by students (81). These were the two most selected in total (165 and 164, respectively), followed by previous heart valve surgery (140), congenital heart disease (122) and intravenous drug use (79). These alternatives were the most marked and consisted of those that were, in fact, correct. The other alternatives (morbid obesity, hypertension, acute infarction and diabetes) were also chosen by a reasonable number of participants.

Table 3 - Knowledge evaluation on high-risk conditions for IS.

	Dentist Student		Dental Surgeon		
Among the conditions below, mark high risk to infectious endocarditis.	**N**	**%**	**N**	**%**	**Total (N)**

Heart valve disease	79	76%	86	85%	165
Anterior heart valve surgery	69	66%	71	70%	140
Congenital heart disease	60	58%	62	61%	122
Use of intravenous drugs	49	47%	30	30%	79
History of Infectious Endocarditis Preview	81	78%	83	82%	164
Morbid Obesity	22	21%	15	15%	37
Hypertension	30	29%	17	17%	47
Acute infarction	28	27%	31	31%	59
Diabetes	31	30%	30	30%	61

Assessment of knowledge about the consequences of infectious endocarditis

Table 4 - Knowledge evaluation on consequences of infectious endocarditis.

	Dentist Student		**Dental Surgeon**		
Among the following conditions, mark which (s) (m) can be consequence (s) of infectious endocarditis:	**N**	**%**	**N**	**%**	**Total (N)**
Cerebrovascular accident	50	48%	35	35%	85
Transient ischemic attack	26	25%	31	31%	57
Intracerebral hemorrhage	13	13%	11	11%	24
Heart failure	83	80%	73	72%	156
Renal failure	16	15%	18	18%	34
Widespread infection	72	69%	69	68%	141
Cardiac arrhythmia	52	50%	34	34%	86

As in the previous question, in Table 4 “N” represents the number of times the alternative was marked, since more than one option was correct. In this question, all alternatives are correct. Heart failure was the alternative most selected by both groups (156), followed by Generalized infection (141). Approximately half of the students also chose Stroke and half chose Cardiac arrhythmia. The two least marked alternatives were Renal failure (34) and Intracerebral hemorrhage (24).

Assessment of knowledge about antibiotic therapy for infectious endocarditis

Regarding knowledge about antibiotic therapy, this study presented 4 questions. The first of these (Table 5) aimed to verify the participants' knowledge about the correct indication of antibiotic prophylaxis for IE. The correct answer was marked by 63% of the students (65) and by 74% of the dentists (75), totaling 140 correct answers.

The second (Table 6) aimed to investigate the procedures by which dentists and students would prescribe antibiotic prophylaxis in patients with IE. Thus, there were 6 correct options and, considering that the participants could mark more than one, in the table mentioned, "N" represents the number of times the alternative was marked. The options selected most often correspond to the correct ones. Many dentists and students are aware that for procedures involving mucosal perforation or manipulation of gingival tissue, such as tooth extraction, periodontal surgery, implants, paraendodontic surgery, and scaling and root planing, it is necessary to perform antibiotic prophylaxis. Regarding the incorrect alternatives (intraoral radiography, non-intraligamentary local anesthesia, prosthesis placement, restorative procedures, topical application of fluoride, and absolute isolation), the number of appointments was minimal.

Table 5 - Knowledge Evaluation of Antibiotic therapy for Infectious Endocarditis

	Dentist Student (N total = 104)		**Dental Surgeon (N total = 101)**		
Regarding antibiotic prophylaxis for infectious endocarditis, check the correct option:	**N**	**%**	**N**	**%**	**Total**
Antibiotic prophylaxis is indicated only for patients with greater risk of IE to reduce the risk of developing it. These include procedures that involve manipulation of gingival tissue or periapical region of the teeth or drilling the oral mucosa.	65	63%	75	74%	140
Antibiotic prophylaxis to prevent dental procedures should be employed in any dental procedure, even if it does not involve the handling or perforation of the tissues.	6	6%	3	3%	9
Antibiotic prophylaxis should never be employed in dental procedures as it can corroborate the bacterial resistance and may generate a greater problem for the patient.	2	2%	0	0%	2

Antibiotic prophylaxis, in adequate dosage, should be used for any patient who will perform procedures with oral tissues, regardless of their condition, as this will prevent IE.	31	30%	23	23%	54

The third question, which focused on knowledge about antibiotics (Table 7), received 177 correct answers (86%), 85 from students and 92 from dentists. Finally, the last question, which assesses participants' knowledge on the subject (Table 8), investigates, in their opinion, what should be the minimum interval between consultations to avoid the emergence of microorganisms resistant to the antibiotic used. 49 students and 44 dentists answered correctly, totaling 93 correct answers (45%).

Table 6 - Knowledge evaluation of antibiotic therapy for infectious endocarditis.

	Dentist Student		**Dental Surgeon**		
Among the procedures listed below, mark which you would prescribe prophylactic antibiotic therapy for IE.	**N**	**%**	**N**	**%**	**Total (N)**
Intraoral radiography	3	3%	1	1%	4
Dental extraction	90	87%	99	98%	189
Scraping and root straightening	59	57%	74	73%	133
Periodontal surgery	95	91%	98	97%	193
Dental Implants	90	87%	98	97%	188
Paraendodontic surgery	79	76%	96	95%	175
Intraligament local anesthesias	17	16%	25	25%	42
Non-intraliganiating local anesthesias	10	10%	13	13%	23
Placement of prostheses	9	9%	3	3%	12
Restorative Procedures	6	6%	5	5%	11
Fluoride topical application	4	4%	1	1%	5
Absolute isolation	6	6%	11	11%	17

Table 7 - Knowledge evaluation of antibiotic therapy for infectious endocarditis

	Dentist Student (N total = 104)	**Dental Surgeon (N total = 101)**

Regarding antibiotics and their dosage, mark the correct alternative: I. The antibiotic should be used in a single dose of 30 to 60 minutes before the dental procedure. II. The first-choice antibiotic is amoxicillin - 2g for adults and 50mg/kg for children. III. There should be no concern about the administered dose, because the higher the dose, the lower the chance of occurrence of the disease, which is more important than bacterial resistance. IV. For allergic patients with penicillins, azithromycin or clarithromycin-500mg for adults or 15mg/kg for children can be used. V. Penicillin allergy contraindicates the realization of antibiotic prophylaxis.	**N**	**%**	**N**	**%**	**Total**
Only I is correct.	14	13%	8	8%	22
I, II and IV are correct.	85	82%	92	91%	177
All are correct.	3	3%	1	1%	4
III and V are correct.	0	0%	0	0%	0

Table 8 - Knowledge evaluation of antibiotic therapy for infectious endocarditis.

	Dentist Student (N total = 104)		**Dental Surgeon (N total = 101)**		
For patients with high risk of infectious endocarditis, what should be the minimum interval between consultations to avoid the emergence of resistant antibiotic microorganisms used?	**N**	**%**	**N**	**%**	**Total**
10 days	49	47%	44	44%	93
30 days	31	30%	35	35%	66
5 days	19	18%	17	17%	36
1 day	5	5%	5	5%	10

Self-perception on the topic

The last group of questions in this survey consisted of 4 questions about the participant's self-perception. Table 9 shows that 97% of the participants (199) consider that classes on infective endocarditis in college are scarce and that it should be a subject that is addressed more frequently. In Table 10, 195 participants out of the total 205 felt that this study made them more aware of the subject. According to Table 11, most dentists (75) feel qualified to treat a patient who has had or has high-risk conditions for

infective endocarditis, while, on the contrary, most students (73) do not feel comfortable treating a patient in these conditions. Finally, 194 participants reported that the survey contributed in some way to their knowledge about oh the topic.

Table 9 - Self-Perception on the approach of the subject in colleges

	Dentist Student (N total = 104)		Dental Surgeon (N total = 101)		
Do you consider that the subject about infectious endocarditis should be more approached in college -specific classes and disciplines?	**N**	**%**	**N**	**%**	**Total**
Yes.	102	98%	97	96%	199
No.	2	2%	4	4%	6

Table 10 - Research self-perception

	Dentist Student (N total = 104)		Dental Surgeon (N total = 101)		
Do you consider that this research made you more alerted about infectious endocarditis and high -risk patients for this condition?	**N**	**%**	**N**	**%**	**Total**
Yes.	100	96%	95	94%	195
No.	4	4%	6	6%	10

Table 11 - Self -perception on the care of patients with IE

	Dentist Student (N total = 104)		Dental Surgeon (N total = 101)		
If a patient reports that he has had infectious endocarditis or has high-risk conditions for the disease, would you feel able to serve you?	**N**	**%**	**N**	**%**	**Total**
Yes.	31	30%	75	74%	106
No.	73	70%	26	26%	99

Table 12 - Self -perception on IE knowledge after research

	Dentist Student (N total = 104)		Dental Surgeon (N total = 101)		
Do you consider that this research contributes to your knowledge of infectious endocarditis?	**N**	**%**	**N**	**%**	**Total**
Yes.	100	96%	94	93%	194

No.	4	4%	7	7%	11	

Comparison between dentistry students and dentists – statistical analysis

Questions 1, 4, 6 and 7 (shown in tables 2, 5, 7 and 8, respectively) were separated because they presented only one correct alternative and, therefore, it was possible to perform a statistical comparison between the responses of students and dentists. From the Shapiro-Wilk normality test, it was observed that the data did not present a normal distribution ($p<0.001$) and therefore the comparison was made using the Mann-Whitney test. Despite the differences in the means and variability of the responses, the statistical analysis did not find statistically significant differences between the groups of dentists and dentistry students in the questions analyzed (table 13). This suggests that, in general, both groups have a similar level of knowledge about IE and its prophylaxis practices.

Table 13 - Descriptive and comparative analysis of dental surgeons and dental students for the questions of Tables 2, 5, 7 and 8).

	Group	N	Mean	Average	SD	Standard-error	P*
Question 1	Dental Surgeon	101	0.891	1.00	0.313	0.0312	0.450
	Dentist Student	104	0.856	1.00	0.353	0.0346	
Question 4	Dental Surgeon	101	0.743	1.00	0.439	0.0437	0.071
	Dentist Student	104	0.625	1.00	0.486	0.0477	
Question 6	Dental Surgeon	101	0.911	1.00	0.286	0.0285	0.052
	Dentist Student	104	0.817	1.00	0.388	0.0381	
Question 7	Dental Surgeon	101	0.436	0.00	0.498	0.0496	0.611
	Dentist Student	104	0.471	0.00	0.502	0.0492	

* Mann-Whitney test ($p \leq 0.05$)

To evaluate questions 2, 3 and 5 (shown, respectively, in tables 3, 4 and 6) and compare the results between the groups, a value of 1 was given to each alternative marked correctly and -0.25 to each error. Thus, considering that the participants could choose more than one option, this comparative statistical analysis could be performed between both groups. From the Shapiro-Wilk normality test, it was observed that the data did not present a normal distribution ($p< 0.001$) and therefore the comparison was

made using the Mann-Whitney test. The descriptive data and comparison between the groups are presented in table 14.

Table 14-Descriptive data and comparison of the correct response values of dental surgeon and dental student.

	Grupo	N	Mean	Average	SD	Standard-error	P*
Question 2	Dental Surgeon	101	3.00	3.00	1.254	0.1248	
	Dentist Student	104	2.89	3.13	1.59	0.156	0,943
Question 3	Dental Surgeon	101	2.65	2.00	1.431	0.1424	
	Dentist Student	104	2.98	3.00	1.43	0.140	0,071
Question 5	Dental Surgeon	101	4.77	5.00	0.803	0.0799	
	Dentist Student	104	4.04	4.00	1.36	0.133	< 0,001

* Mann-Whitney test (p≤0.05)

Regarding questions 2 and 3, despite the differences in the means, there are no statistically significant differences between dentists and dental students ($p > 0.05$). On the other hand, for question 5, there is a statistically significant difference between the groups, with dentists showing a better performance compared to dental students.

DISCUSSIONS

The present study aimed to evaluate the knowledge of dentists and dental students regarding infective endocarditis (IE), high-risk conditions, and antibiotic prophylaxis for the disease, as well as to assess their practices and compare the knowledge between the two groups.

Of the 104 students who participated in the research, many self-assessed their knowledge of IE at low levels (18 at level 1 and 23 at level 2), few at higher levels (13 at level 4 and 4 at level 5), and nearly half at a median level (46). On the other hand, of the 101 dentists, most self-assessed their knowledge at higher levels (48 at level 3 and 37 at level 4), while few rated themselves at low levels (1 at level 1 and 8 at level 2). The results revealed that dentists tend to have a higher self-assessment of their knowledge of IE compared to dental students, with statistically significant differences between the two

groups. This may be related to the fact that dentists have more experience than students and feel more confident about certain topics. Furthermore, only 7 dentists and 4 students self-assessed themselves at level 5, indicating that the subject should be more widely disseminated in the dental field.

The results of this study showed that 86% of students and 89% of dentists correctly answered the question regarding the concept of infective endocarditis. These findings are relatively higher than those found by Gangá et al. (2020), where 63.4% of dentists and 47% of students answered questions about the definition of IE correctly. This is also more satisfactory than the findings of Rocha et al. (2008), where 78% of dentists and 44% of students answered correctly about the definition of IE. Albuquerque et al. (2013), assessing the knowledge of final-year dental students at a university in João Pessoa, reported that just over 83% answered correctly about the concept of IE, which also supports the present study. Therefore, it can be suggested that there has been an improvement in both students' and dentists' knowledge regarding what IE entails.

According to the updated 2017 AHA guidelines, antibiotic prophylaxis is only indicated for patients at high risk for IE. It is therefore relevant to assess the participants' knowledge about this, as both professionals and future professionals in dentistry must know when to administer or withhold antibiotic prophylaxis for IE. In this regard, the results showed that most questions answered correctly by both students and dentists were related to high-risk conditions for IE. Among 205 responses, 165 selected “heart valve diseases,” 164 selected “History of previous infective endocarditis” – corroborating the findings of Albuquerque et al. (2013) –, 140 selected “Previous heart valve surgery,” 122 selected “congenital heart disease,” and 79 selected “Intravenous drug use.” However, a considerable number of incorrect choices were made, such as “Diabetes” (61), “Acute myocardial infarction” (59), “Hypertension” (47), and “Morbid obesity” (37). These conditions are not considered high-risk for IE, and therefore patients with these conditions do not require antibiotic prophylaxis for IE.

Infective endocarditis is a rare disease capable of causing severe sequelae and even death if not treated promptly (Araújo-Júnior et al., 2019). Given the severity of the disease, it is important for dental students and dentists to be aware of the consequences the disease can cause. Based on this assumption, the results of the present study

revealed that many participants are not fully aware of the possible consequences of the disease. “Heart failure” was selected by 76% of participants and “Sepsis” by 68%, indicating some level of agreement, as most were aware that IE is related to the heart and bacteremia. However, the responses also revealed that many were unaware of the other consequences that the disease can cause, as all alternatives were correct, with few selections for “Renal failure” (34) and “Intracerebral hemorrhage” (24), for example. Therefore, it suggests a lack of knowledge among students and dentists regarding the consequences of IE.

Regarding antibiotic prophylaxis, 68% of participants selected the option that correctly describes its indication according to the AHA. Dentists (74%) performed better than students (63%). Knowing that prophylactic antibiotic therapy should only be administered to patients at high risk for IE undergoing invasive dental procedures, participants were asked which procedures they would prescribe antibiotic prophylaxis for. The most selected option was “Periodontal surgeries” (94%). In line with what was observed by Rocha et al. (2008), where 96% of dentists marked “Tooth extraction,” this study found a slightly higher number (98%); on the other hand, in Rocha et al. (2008), 86% of dentists marked “Scaling and root planning,q” while in this study, 73% selected this option. Overall, the results of this question were satisfactory, as the most selected procedures indeed require antibiotic prophylaxis, reflecting participants' knowledge of proper conduct regarding IE. It was also observed that dentists prescribe more antibiotic prophylaxis than students, following the same pattern found in Rocha et al. (2008).

Regarding antibiotics and their dosages, the results were satisfactory, as 86% of participants answered correctly, which also indicates proper conduct. These findings are better than those of Albuquerque et al. (2013), where only 13.6% answered the correct protocol, Rocha et al. (2008), where only half answered correctly regarding the medication and dosage, and Gangá et al. (2020), where less than half answered correctly. However, in the studies, participants had to describe the protocol, while in the present study, they only needed to select the correct option.

When multiple dental procedures are necessary for patients at risk for IE, a minimum interval of 10 days between clinical sessions should be maintained to avoid the selection of resistant microorganisms (Rocha et al., 2008). Only 47% of students and 44% of

dentists selected the correct option, indicating a lack of knowledge on this matter. This relatively low number of correct answers is consistent with the findings of Gangá et al. (2020).

The self-perception questions regarding the topic were designed to prompt the participants to reflect on IE. It was observed that 97% considered it necessary for the topic to be more widely addressed in university classes. This high number likely relates to the emergence of doubts among participants during the survey about one or more questions, as they lacked full knowledge of the subject due to insufficient related classes. Additionally, 95% felt that the research made them more aware of the topic. This is a satisfactory result from this study, as it shows participants that greater knowledge about this disease, although rare, is indispensable. Regarding their ability to treat a patient with IE, dentists felt more capable. While only 30% of students responded “Yes,” 74% of dentists reported feeling prepared. This finding is likely related to the confidence that dentists have due to their greater experience with patient care. Finally, 94% of participants stated that the research contributed to their knowledge of infective endocarditis, which is also a satisfactory result for this study.

Furthermore, this study revealed that there was no statistically significant difference between dentists and students regarding their knowledge of IE. Only in the question regarding procedures where participants would consider the need for antibiotic prophylaxis was there a difference, with better performance from the professionals. Thus, it can be concluded that, in general, both groups demonstrated a similar performance in their responses. Finally, the importance of conducting more studies assessing the self-assessment of dental professionals and students is highlighted, given the scarcity of such information in literature.

FINAL CONSIDERATIONS

It is concluded that among the dentistry students and dentists surveyed, the majority were aware of the concept of infective endocarditis, antibiotic prophylaxis, high-risk conditions for the disease, procedures that require AP for IE, as well as medications and their dosages for the prevention of IE. However, there are still some doubts about the consequences of the disease and the interval of days necessary to

avoid the selection of resistant microorganisms. In addition, it was observed that there was no statistically significant difference between dentists and students in relation to knowledge of IE. Therefore, it is necessary to have a greater focus on the subject in educational institutions and for professionals to remain up to date, ensuring sufficient information for safe professional practice.

DATA AVAILABILITY

All data analyzed during this study are available from the corresponding author upon reasonable request.

DISCLAIMER OF LIABILITY AND DISCLOSURE

All data analyzed during this study are available from the corresponding author upon reasonable request. The authors report no conflicts of interest regarding any of the products or companies discussed in this article.

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