

## Vocational training of dentistry students regarding knowledge of oral rinses with antiseptic

Formação profissional dos acadêmicos de Odontologia e o grau de conhecimento sobre enxaguatórios bucais com antissépticos

Danilo Barral de Araújo<sup>1</sup>, Elisângela de Jesus Campos<sup>1\*</sup>, Gabriela Botelho Martins<sup>2</sup>, Fabiana Paim Rosa<sup>3</sup>, Max José Pimenta Lima<sup>4</sup>, Maria Thereza Barral Araújo<sup>5</sup>

<sup>1</sup>Professor Adjunto de Bioquímica Oral – ICS, UFBA; <sup>2</sup>Professora Adjunta de Histologia Morfofuncional – ICS, UFBA; <sup>3</sup>Professora Adjunta de Patologia – ICS, UFBA; <sup>4</sup>Professor Assistente de Bioquímica – ICS, UFBA; <sup>5</sup>Professora Associada de Bioquímica Oral – ICS, UFBA

### Abstract

**Objective:** the indiscriminate use of mouthwash with antiseptic carries health risks because the active pharmacological ingredients and other components of these formulations are not innocuous. From this perspective, it is essential to add this knowledge to the vocational training curriculum for dental students. The objective of this study was to assess the level of knowledge acquired by dental students graduating in 2014 about mouthwash with antiseptic and to evaluate the university education in three public and three private institutions. **Methodology:** an investigative enforcement tool was used to collect information from graduating students in 2014 from six dentistry undergraduate institutions in the state of Bahia. **Results:** of the students in private institutions, 56% reported having studied the rinses during their program, while 67% of students in public institutions indicated that they had not. Respondents cited a range of course and disciplines that addressed the topic. Of the students surveyed, 53.1% from public institutions and 46.9% from private institutions reported that they use rinses on a daily basis and expressed a preference for Colgate (50.7%), Oral B (26.4%) and Listerine (16.4%). With regard to knowledge of the active ingredients, 81% students did not answer, despite having general knowledge of diluents. **Conclusion:** although mouthwash is often included in the course of study, the level of knowledge students achieved was not considered satisfactory, given the high percentage of blank answers regarding active ingredients and indications. **Keywords:** Oral Antiseptics. Cetylpyridinium Chloride. Chlorhexidine. Triclosan. Essential oils.

### Resumo

**Objetivo:** o uso indiscriminado dos enxaguatórios bucais com antissépticos por parte da população pode trazer riscos à saúde, uma vez que os princípios ativos e os demais componentes dessas formulações não são inócuos. Nessa perspectiva é essencial que se tenha o controle da formação profissional desde o ingresso dos estudantes nas universidades até a diplomação. O objetivo desse estudo foi avaliar o grau de conhecimento adquirido pelos acadêmicos de Odontologia formandos em 2014 sobre os enxaguatórios bucais com antissépticos, ao longo da formação universitária em 3 instituições públicas e 3 privadas. **Metodologia:** aplicação de um instrumento investigativo destinado à coleta de informações prestadas por estudantes concluintes em 2014 de seis cursos de Odontologia no estado da Bahia. **Resultados:** 56% dos acadêmicos procedentes de instituições privadas declaram ter estudado os enxaguatórios durante a graduação, enquanto que 67% com origem em instituições públicas se manifestaram contrariamente. Os entrevistados fizeram referência a um elenco variado de disciplinas que tratam deste tema. 53,1% dos concluintes das instituições públicas e 46,9% das privadas declararam fazer uso de enxaguatórios, sendo similares os percentuais de uso diário e o registro da preferência pelo Colgate (50,7%), Oral B (26,4%) e Listerine (16,4%). Com relação ao conhecimento sobre os princípios ativos, destaca-se 81% de respostas em branco, apesar do relativo conhecimento sobre os diluentes. **Conclusão:** muito embora o ensino do tema enxaguatório tenha sido considerado, o grau de conhecimento dos acadêmicos não é satisfatório, haja vista o elevado percentual de respostas em branco a respeito dos princípios ativos e suas indicações clínicas.

**Palavras-chave:** Antissépticos Buciais. Cloreto de Cetilpiridínio. Clorexidina. Triclosan. Óleos Essenciais.

### INTRODUCTION

Public health policy is integrated and universal in Brazil, and scientific and technological advances are essential elements to be considered when reviewing academic training, particularly for dentists.

In reviewing several educational proposals of undergraduate courses in dentistry, harmony was found between the programs and the standards established by the National Education Council (CNE) regarding the training of dentists.

Currently, one must question the vision of these professionals regarding the system and the curative vision, individualistic, clinical and elitist factors that historically have marked the training and professional activities in dentistry, with a goal of a more preventive design for the course of study.<sup>1</sup>

**Correspondente/Corresponding:** \* Elisângela de Jesus Campos – Endereço: Instituto de Ciências da Saúde -Laboratório de Bioquímica Oral – Sala 400/ 4º andar. Av. Reitor Miguel Calmon, s/n, Vale do Canela Salvador- BA CEP: 40110-902 – Tel.: (71) 99962-1730; (71) 3283-8891 / Fax: (71) 3283-8894 – E-mail: elis.campos@terra.com.br

In this regard, and taking into account the limitations of mechanical hygiene methods and the pharmacological efficacy of antimicrobial agents aiming at the prevention and treatment of oral infections, dental students need to be educated on the common and widespread use of mouthwash, also known as mouthwashes or rinses. The mouthwashes are the simplest way of delivering antiseptic substances.<sup>2</sup>

Adequate knowledge of the active ingredients can guide a dentist's recommendation of these agents, individually or in combination, based on different clinical situations. However, availability and nonregulated sales may lead to self-medication and with it the risk of side effects and other health concerns.<sup>3</sup>

Mouthwashes, which are the simplest method for the delivery and placement of antiseptic substances, facilitate the spread of active drug compounds for the treatment of specific conditions, such as caries and periodontal disease, and support mechanical brushing procedures.<sup>4,5,6</sup>

Knowing the composition of the various rinses, their mechanisms of action, the concentrations of active ingredients, the pharmacological properties and the side effects will allow dentists to select the most appropriate product for their patients for each clinical situation. Using a cross-sectional study conducted with 165 dentists, excluding periodontists, in the city of Fortaleza, Ceará<sup>7</sup>, it was found there is a lack of academic training regarding the indications for and prescription of rinses. The researchers further concluded that modifications made by manufacturers to the formulas hinder the correct prescription and that the scientific literature does not assess the knowledge of dentists about these chemicals that help to control biofilm.

In addition, mouthwashes, which are freely sold in supermarkets, drug stores and pharmacies, are influenced by the market and the media, both of which drive the price. This framework requires professionals to have knowledge about these drugs to help guide and regulate their use.

In this context, the present study seeks to provide important information on the degree of knowledge about these drug products, which is based on information collected from a representative sample of students who completed undergraduate degrees in dentistry in 2014.

## METHODOLOGY

This study, which is classified as descriptive, observational and analytical, was submitted to the Research Ethics Committee of the Institute of the Federal University of Bahia Health Sciences and approved by Opinion no. 1,043,946, CAAE 43685815.3.0000.5662. Participants were guaranteed strict confidentiality and given the right to decline participation at any stage of the process. Those who agreed to participate signed the consent form.

This research is based on the organization of information provided by a sample of graduating students from six undergraduate courses in dentistry in 2014; all institutions were located in the state of Bahia. An investigative tool was used to collect data from graduates of the

Federal University of Bahia (UFBA), the State University of Southwest Bahia (UESB), the State University of Feira de Santana (UEFS) School of Medicine and Public Health of Bahia (EBMSP), the Metropolitan Union for Education and Culture (UNIME), and the Faculty of Technology and Science (FTC). The tool was used to evaluate the degree of knowledge acquired by students about mouthwash with antiseptic during their course of study.

In addition to collecting demographic data, the study assessed whether mouthwashes were studied in the undergraduate curriculum in terms of the preference, frequency and personal choice for use; the clinical indications; the active ingredients and other integral components of the formulations and their concentrations and the risk that can arise from indiscriminate use without professional supervision, with an emphasis on formulations containing alcohol. The relative and absolute frequencies of categorical variables were estimated for age (in years) and of continuous variables for mean and standard deviation. The association between categorical variables was assessed using the Chi-square test or Fisher's exact test; for age, we used the t test for independent samples. The level of significance for all inferences was set at 5.0%. We used the statistical package R 1 Core Team (2014), version 3.1.2, to perform the analyses.

## RESULTS

The data in Table 1 characterize the profile of the graduating students of dentistry with regard to gender, age, nationality, and institution (public or private) according to the information provided.

**Table 1** – Gender, average age and nationality of the graduating students of dentistry by type of institution (private or public)

Variables	Type of Institution				Total	
	Private		Public			
	n	%	n	%	n	%
Sex (p-value = 0.8227) <sup>1</sup>						
Male	31	31.6	40	33.1	71	32.4
Female	67	68.4	81	66.9	148	67.6
Age <sup>3</sup> (years) (p-value = 0.0003) <sup>2</sup>	23.6 (2.4)		24.9 (2.6)		24.3 (2.6)	
Place of birth (p-value = 0.0003) <sup>1</sup>						
Salvador	50	56.2	35	32.1	85	42.9
Other municipalities in Bahia	31	34.8	69	63.3	100	50.5
Other states	8	9	5	4.6	13	6.6

n = number of observations in the sample.

<sup>1</sup> p-value (chi-square test of Pearson).

<sup>2</sup> p-value (t test for independent samples).

<sup>3</sup> For the variable of age (years), the estimated mean and standard deviation are shown in brackets.

Note: Differences in the subtotals are due to lost data (data not reported).

The chi-square test of Pearson found no association between nationality and the type of educational institution ( $p$ -value = 0.0003), and the  $t$  test found that the average age of graduates of public institutions was higher than that of private institutions ( $p$ -value = 0.0003). There was no statistically significant difference between genders.

According to the academic time spent in public and private institutions (the five-year program requires proportionally fewer hours than the four-year program) the results indicates that 65.7% ( $n=65$ ) of students from private institutions and 27% ( $n=33$ ) from public institutions spent nine semesters in the course. However 34,3% ( $n=34$ ) and 73% ( $n=89$ ) from private and public institutions, respectively, spent ten semesters in the course. The data show that 55.7% of the students completed their course in 10 semesters, while 44.3% did so in nine semesters. According to the chi-square test ( $p$ -value < 0.0001), private and public institutions differ in the number of required semesters.

The students' responses to the question of whether mouthwashes are part in the curriculum by institution type shows that in private institutions, 56% of students answered affirmatively, while 67% of students from public institutions answered negatively, indicating an association between education regarding mouthwashes and type of institution (private or public) ( $p$ -value = 0.0006).

The investigation about the Courses that include mouthwash in the curriculum, based on the dental students surveyed shows that most of the disciplines from private or public institutions, antiseptic mouthwashes were included in the curriculum. Students could indicate more than one discipline if applicable. The results show that the students indicated 28 different disciplines that addressed the subject. The disciplines most indicated by the students were: periodontics (11.6%), cariology (10.1%), integrated clinic in primary (6.1%), social and collective dentistry (6.1%), morphofunctional dentistry (5.2%), microbiology (4.6%), oral biochemistry (3.2%) and dentistry (3.2%).

Based on the products that are available commercially, and taking into account that the criteria were of a personal nature, students were asked about their own use, frequency and the individual preference of mouthwashes. The percentages of students who indicated that they used mouthwash did not vary significantly by type of institution, with 53.1% of students from public institutions and 46.9% from private institutions confirming their use of such products. Likewise 62.8% of the students at public institutions and 37.2% of the students from private institution respond no to this question. Pearson's chi-square test was used to determine the association between the use of mouthwashes and the type of institution (private or public) ( $p$ -value = 0.2501).

When participants were asked about the frequency of their use of mouthwash it is noteworthy that the per-

centages of students reporting "frequent" use indicated by students coming from public (50.6%) and private institutions (49.4%) was practically equal. However, a significantly higher percentage of students from private institutions reported that they rarely use mouthwashes (73%). Otherwise, only 27% from students at private institutions reported the same. The percentage of students reporting daily use was 56.9% at private institutions and 43.1% at public institutions. No correlation between frequency of use and type of institution (private or public) was found ( $p$ -value = 0.0542).

The Table 2 shows the mouthwash students' preference by the type of institution.

**Table 2** – Product preference by type of institution (private or public)

Mouthwashes	Type of institution				Total	
	Private		Public			
	n	%	n	%	n	%
Colgate	62	52.5	80	49.4	142	50.7
Oral B	24	20.3	50	30.9	74	26.4
Listerine	22	18.6	24	14.8	46	16.4
Sensodyne	2	1.7	1	0.6	3	1.1
Periogard	7	5.9	6	3.7	13	4.6
Cepacol	1	0.8	1	0.6	2	0.7
TOTAL	118	100	162	100	280	100

$n$  = number of observations in the sample.

$p$ -value (Fisher's exact test) = 0.3316.

Note: Differences in the subtotals are due to lost data (data not reported).

When consulted on their product preference, students selected only six products even though more options were available. Students selected "Colgate" (50.7% of respondents), "Oral B" (26.4%), Listerine (16.4%), Periogard (4.6%), Sensodyne (1.1%), and Cepacol (0.7%). An association between product preference and type of institution (private or public) was found ( $p$ -value = 0.3316).

Information related to knowledge of the active ingredients in mouthwashes was analyzed based on type of institution. A total of 83 students (9.2%) from private institutions answered the questions correctly, while 28 (3.1%) answered incorrectly. From public institutions, 189 students (17.2%) answered the questions correctly, while 97 (8.8%) answered incorrectly (Table 3).

Note that the highest percentages correspond to blank responses, i.e., 87.7% and 74% for private (789) and public (812) institutions, respectively (Table 3).

**Table 3 – Level of knowledge of the active ingredients in mouthwashes by type of institution (public or private)**

Drug Evaluation	Type of institution												
	Private						Public						
	Right		Wrong		No information		Right		Wrong		No information		
n	%	n	%	n	%	n	%	n	%	n	%		
Cepacol	12	14.4	9	32.1	79	10.0	19	10.1	12	10.5	91	11.4	
Colgate Plax	11	13.3	2	7.1	87	11.0	35	18.5	26	27.4	61	7.5	
Listerine	15	18.1	4	14.3	81	10.3	15	7.9	17	17.9	90	11.1	
Malvatricin	0	---	4	14.3	96	12.2	1	0.5	6	6.3	115	14.1	
Noplax	1	1.2	1	3.6	98	12.4	7	3.7	5	5.3	110	13.5	
Oral B	3	3.6	3	10.7	94	11.9	7	3.7	18	18.9	97	11.9	
Parodontax	1	1.2	1	3.6	98	12.4	7	3.7	4	4.2	111	13.7	
Periogard	40	48.2	3	10.7	57	7.2	98	51.9	2	2.1	22	2.7	
Sensodyne	0	---	1	3.6	99	12.6	0	---	7	7.4	115	14.1	
<b>SUBTOTAL 1</b>	83		28		789		189		97		812		
<b>SUBTOTAL 2</b>			900				1.098						
<b>TOTAL</b>							1.998						

n = number of observations in the sample.

Comparing the level of knowledge acquired by graduating students about the active ingredients of mouthwashes, according to the nature of the institution, public or private, the results show that 74.8% (n=83 of total n=111) from private institution and 66.1% (n=189 of total n=286) from public institution provided the right answers. Otherwise 25.2% (n=28) and 33.9% (n=97) from private and public institution, respectively, gave the incorrect answers.

Although the numerical difference was not verified by the chi-square test, there was an association between the answers, correct or otherwise, about the active ingredients of mouthwashes and the type of institution (private or public) (p = 0.0943). It should be noted that there was a difference of 8.7% for correct answers and just 8.7% for incorrect answers.

The data regarding the level of knowledge about the diluents in the mouthwashes by type of institution

express that 26.7% (n=27) from private institution and 23.8% (n=29) from public recognized the alcohol as a diluent. Otherwise 38.6% (n=39) and 43.5% (n=53) from private and public institutions, respectively, recognized the water as a diluent. The results showed that a total of 25.2% of students were aware of water as a vehicle of mouthwashes, while 41.4% had knowledge of alcohol. According to the chi-square test, there was no association between knowledge about diluents and type of institution (p-value = 0.6042).

Table 4 shows the various clinical indications for the use of mouthwashes provided by the students who were surveyed. Despite known clinical conditions that could justify the use of mouthwash, according to share of dental students, many conditions were not selected in this survey (indicated by blanks).

**Table 4 – Clinical indications suggest that the prescription for the use of mouthwash by institution.**

Indications	Institution						Total
	FTC	EBMSP	UNIME	UFBA	UESB	UEFS	
Pericoronary abscess	–	–	–	–	1	–	1
High activity and risk of caries	1	1	3	10	2	3	20
Candidiasis and sensitivity to nystatin	–	–	–	–	–	1	1
Tooth whitening	–	–	1	–	–	–	1
Supporting brushing	3	–	–	10	–	3	16
Supplementary oral hygiene	–	9	7	–	11	–	27

Indications	Institution						Total
	FTC	EBMSP	UNIME	UFBA	UESB	UEFS	
Infection control	–	1	–	–	–	3	4
Control of oral bacterial flora	–	–	–	–	–	1	1
Plaque control	12	5	14	23	7	17	78
Chemical disinfection		1		–		–	1
Difficulty of cleaning	1	8	6	25	3	9	52
Fluortherapie	–	1	–	–	–	2	3
Fungus in prostheses	–	–	–	–	–	2	2
Gingivitis	–	1	5	5	4	3	18
Halitosis	–	4	7	14	8	14	47
Irritation of the mouth and oropharynx	–	–	–	–	–	1	1
Maintenance of neutral pH	–	–	1	–	–	–	1
Special patients	–	1	–	–	–	–	1
Periodontitis	–	5	6	16	3	8	38
Pre- and post-surgical	3	7	14	19	12	20	75
Susceptibility to caries	–	–	–	–	–	2	2
Presence of carious lesions	–	–	–	–	–	2	2
Prevention of oral diseases	–	1	–	–	–	–	1
Remineralization of white spot	–	1	2	–	–	–	3
Plaque removal	–	1	–	–	–	–	1
Dentin hypersensitivity	–	–	–	–	–	1	1
Use of braces	2	1	–	8	1	1	13
Prosthesis use	–	–	–	–	–	4	4
No reason for prescribing	–	–	1	3	–	–	4
Other	–	8	–	5	–	1	14
TOTAL	22	56	67	138	52	98	433

**DISCUSSION**

*In our study, cetylpyridinium chloride stands out among the active ingredients in mouthwash. This drug, widely studied by its signal<sup>8</sup>, can be found in isolation or associated with essential oils and gantrez triclosan. It is worth mentioning that rinses with a cetylpyridinium chloride base are the most commonly chosen based on three factors: professional recommendation, price and medicinal properties.<sup>9</sup>*

*Even though 0.12% chlorhexidine gluconate is considered a reference antiseptic due to its strong clinical indication in the control of bacterial plaque<sup>10</sup>, the number of recommended rinses is restricted.*

*Typically, mouthwashes containing essential oils contain 0.042% menthol, 0.092% eucalyptol, 0.064% thymol or 0.06% methyl salicylate<sup>11</sup>; however, certain*

*pharmacological products do not label their concentrations or indicate the portions of these components that are independent of oils regardless of whether they are associated with other antiseptics.*

*Rinses containing alcohol are widely available, despite the contraindication that has gradually been disseminated to society about this vehicle. Several mouthwashes contain high concentrations of alcohol, ranging from 18% to 26%, or more than the percentage found in some alcohols made for drinking<sup>12, 13</sup>. Using a model of experimental gingivitis<sup>14</sup>, the influence of alcohol rinses with 0.15% triclosan and zinc chloride were tested. The results indicated that alcohol does not influence the efficacy of antiseptic against the development of gingivitis and the formation of supragingival plaque.*

According to the American Dental Association, mouth rinses “containing more than 25 percent alcohol can increase the risk of cancer of the mouth and pharynx by approximately 50 percent,” although more clinical evidence is required to support this claim<sup>12</sup>. However, it is unquestionable that the continued use of alcohol in mouthwashes can cause dryness of the oral mucosa, increase desquamation of the soft tissues of the mouth and inhibit the salivary glands, which may involve the installation of xerostomia and halitosis.

We conclude, therefore, that all rinses with anti-septic for oral use containing alcohol as a preservative should be avoided, except for those who are under the supervision of a qualified professional. It can therefore be stated that an exclusively aqueous medium is considered the most suitable, based on the safety of deionized water as a diluent.

Consumption of rinses by patients is high, and the role of the dentist in the patient’s choice, however discreet, is recognized. The choice is driven by advertising and marketing of products with a strong cosmetic value<sup>15</sup>. Moreover, the lack of regulation and control of these drugs to the general population, coupled with the lack of professional knowledge and the limited specificity regarding guidelines that should be provided on the labels, are variables that enhance the appearance of side effects, undermine the effectiveness of the product and endanger people’s health.<sup>3</sup>

Faced with this evidence, dental professionals must be aware of the need for prescriptions, established doses, recommendations for duration of use and frequency of application in view of the fact that mouthwash with antiseptic contains a list of chemicals that can adversely affect one’s health. Therefore, attention should be given to the chemical properties of each component of mouthwash based on available scientific literature.

We used two institutions, UFBA and UEFS, as references in this study because they provide undergraduate courses in dentistry in the state of Bahia. From a brief analysis of the professional profiles in educational projects at UFBA<sup>16</sup> and UEFS<sup>17</sup>, it appears that both are in accordance with the provisions of the National Curriculum Guidelines for undergraduate education in dentistry, particularly Article 3.

Considering all of the institutions included in this study, the average age of the sample of 222 dentistry graduates was 24.3 (2.6) years, which is compatible with the time required for primary, secondary and higher education. The average ages of graduates from public and private institutions (24.9 (2.6) years 23.6 (2.4) years, respectively) are very similar, but once the *t* test was applied, the average age of graduates of public institutions was higher than that of private institution graduates, and the difference was statistically significant (*p*-value = 0.0003) (Table 1). However, there was no significant difference between the mean ages, with an average age difference of only 1.6 years.

The rationale for this finding lies in the students’ residence time in their undergraduate courses, i.e., 73% of students coming from public institutions complete the curriculum in ten semesters, while those at private institutions complete it in nine semesters. The framework outlined so far is indicative of the variable length of the curriculum and the variable age, which are possible differences in the trajectory of the curriculum or, in certain cases, of the need to comply with parallel working hours that affect course progression.

The results are compatible with differences in nationality based on the socioeconomic, cultural and family profiles of 417 students who graduated from the Faculty of Dentistry of Araraquara (UNESP) in 2001, 2002 and 2003<sup>18</sup>. The authors of this study found that the average ages of enrolling students and graduates were 19.7 and 22.5 years, respectively; that the average ages of students approved in the selection process in 2001 for both the evening course and the full course were similar, at 19.7 and 20.9 years, respectively; and that the average age for graduates was 22.5 years. These results were confirmed by a survey of 253 students from private institutions in João Pessoa (Paraíba), where the average age was 21.9 ± 3.6 years.<sup>19</sup>

Regarding gender, there were significantly more females (148) than males (71), even when institutions were analyzed separately (Table 1). Again, the results appear to reflect the international reality, i.e., a previously mentioned sample that consisted of 253 students from private institution in João Pessoa (Paraíba) was 70% female (19 students), while a three-year survey of 417 freshmen students and graduates in an undergraduate course in dentistry in Araraquara, São Paulo also revealed a predominantly female demographic for both incoming students and graduates<sup>18</sup>. It should be noted that these studies were conducted in different regions of Brazil, specifically the Northeast and Southeast, respectively. However, after applying the chi-square test of Pearson to verify the association between the type of educational institution and the characteristics of the study population, particularly in terms of gender, we found no statistically significant differences (*p* = 0.8227) (Table 1).

Two of the six institutions in this study are located in cities in the state of Bahia (Feira de Santana and Jequié), and of the remaining four, only one is located in a municipality that incorporates the metropolitan region of Salvador City (Lauro de Freitas), the highest percentage of students comes from cities within the state, i.e., 50.5% vs. 42.9% in the rest of the country (Table 1). However, it is relevant that most indigenous graduating scholars in the capital complete their undergraduate courses at private institutions (56.2%), while natives of other municipalities in Bahia study at public institutions (63.3%). The analysis of the results show that four students who were natives of Salvador City enrolled at UEFS, which, although headquartered in the state, is a public institution.

When the factors of origin in other cities and states and the choice of private institutions by indigenous

graduating students of the city of Salvador (Table 1) are excluded, it may be questioned whether the fact that two of the three public institutions in this study are located in inland districts the state of Bahia justifies that only native scholars of those municipalities have enrollment preference for those institutions. Moreover, it must be considered whether any of the three top private educational institutions in the city of Salvador are selected because more academics were born in this capital the courses have a more attractive curriculum design, or because the schedules offered by those colleges allow students combine study with work.

There is, therefore, a clear reversal of percentages when the type of institution is considered, and becomes evident that with Salvador, while just over half of the students had some training in private schools, most graduated from public schools.

Taking into consideration the five-year minimum set for the curriculum, it can be seen in this study that 55.7% of the students completed their course in 10 semesters, while 44.3% did so in nine semesters, as was previously shown. According to Resolution No. 2/2007, CNE/CES<sup>20</sup>, a minimum workload of 4000 hours for an undergraduate dentistry course is specified by Article 2 of that resolution.

Analysis of the data show that both nine- and ten-semester dentistry courses comply fully with the law. Graduation numbers assigned to the six educational institutions in this study reveal that a ten-semester academic course at both public and private institutions is equivalent to the nine-semester course other institutions. Even though the length of the curriculum varies between nine and ten semesters, higher education institutions meet the requirements set forth by Resolution No. 2/2007, CNE/CES.<sup>20</sup>

Based on online consultations, we found that the political-pedagogical projects (PPP) of the undergraduate dentistry courses at from several private and institutions, as well as at public federal, state, community and denominational universities, university centers and isolated faculties set a limit of 9:12 semesters for payment, but the consensus is for 10 semesters. As mentioned previously, the reasons for these differences may lie in a more flexible curriculum, the design of which allows each student to schedule their academic career to be compatible with their working hours and to take into account prerequisite credits.

The association between the number of semesters and the type of institution, whether private or public, was statistically significant ( $p$ -value  $< 0.0001$ ).

When asked about the study of mouthwash with antiseptic during their course of study, 67% of students at public institutions reported not having received specific information. In contrast, 56% of students at private institutions indicated that the subject was covered in their coursework. In view of these results, it can be assumed that the coursework at public institutions does not place enough emphasis on mouthwashes, but rather treating them as auxiliary pharmacological products for dental prevention. This study proved the association between

education regarding mouthwashes and the type of institution (private or public) ( $p$ -value = 0.0006).

Certainly, the subject of antiseptic mouthwashes should be discussed at various stages of the undergraduate dentistry course, particularly during courses of the prevention disciplines. The evaluation of data shows the diversification of disciplines that address the subject, according to the students who were interviewed. Given the freedom to provide that information, students indicated 28 different disciplines that addressed the subject.

Considered the limits of a minimum 16 and a maximum of 40 quotes, students indicated that the use of mouthwashes was addressed the following disciplines: periodontics (11.6%), cariology (10.1%), integrated clinic in primary (6.1%), social and collective dentistry (6.1%), morphofunctional dentistry (5.2%) and microbiology (4.6%). The assessment of these findings indicated: 1) the possibility of a correlation between antiseptic chlorhexidine and scientific knowledge of periodontics because that substance is considered the "gold standard" in effective bacterial combat of antiplaque and antigingivitis control, with a substantivity of up to 12 hours; 2) a consolidated percentage of 43.7% of the most cited disciplines (almost half), which is an indicator directly related to prescription mouthwashes that are aimed at the prevention of caries and gum inflammation; and 3) that although 26.9% of graduating students did not respond to this question, there is the lack of consensus of opinion among the students at the Graduate Course in Dentistry, UEFS.

When asked whether they used mouthwashes themselves, 46.9% of the students at private institutions said yes, vs 37.2% who said no. These percentages are similar to those of students at public institutions, of whom 53.1% responded yes and 62.8%, responded no. These data are consistent with the percentages recorded in the previous tables and already discussed. It can therefore be assumed that the emphasis on prevention during academic training is reflected in personal habits and health care. To check for an association between the personal use of mouthwashes and the type of institution, the chi-square test of Pearson was applied, and no statistically significant association was found ( $p = 0.2501$ ).

This same phenomenon was repeated when participants were asked about the frequency of their use of mouthwash. The percentage of students reporting daily use was 56.9% at private institutions and 43.1% at public institutions. However, 73% of students at public institutions and 27% at private institutions reported rare use. The percentages of students reporting "frequent" use were almost the same, at 50.6% and 49.4%, respectively, despite the relatively subjective nature of that expression. Once again, the Chi-square test of Pearson was applied to verify the likely association between the frequency of the use and the type of institution. The results indicated no significant association ( $p$ -value = 0.0542).

Taking into account the minimum and maximum parameters of 22 and 80 votes for the three mouthwashes de-

clared as preferred by graduating students from public and private institutions (Table 2), we can accept this result as extremely limited due to the number of products available and freedom of choice. Using Fisher's exact test to verify the association between product preference and type of institution, no association was observed ( $p$ -value = 0.3316).

When asked about the antiseptics present in commonly marketed formulations, Periogard was cited 98 times by students at public institutions (51.9%) and by 40 students (48.2%) students at private institutions (Table 3), i.e., João Pessoa similar values. It should be noted, however, that this antiseptic was only cited 13 times compared to 298 citations in response to product preference. The assessment of these results suggests that respondents felt that chlorhexidine should be used in special clinical situations. This understanding is supported by other responses but to a lesser degree, including Cepacol, Colgate Plax and Listerine mouthwashes with a cetylpyridinium chloride base that can be linked, less often, to essential oils.

The recognition of the efficacy of chlorhexidine has been the subject of several studies. An investigative questionnaire given to 165 dentists in the city of Fortaleza, Ceará<sup>7</sup>, showed that the most suitable mouthwash was Periogard, which was reported by 55 professionals (33.3%), 132 (80%) considered chlorhexidine the more active ingredient. Regarding the treatment regimen of this drug, 73 professionals (44.2%) did not answer, while 29 (17.6%) answered correctly. Similar outcomes resulted from the were found from a semi-structured questionnaire to teachers of three dentistry courses in the city of Salvador, Bahia. The majority of respondents indicated a preference for rinses with chlorhexidine.<sup>21</sup>

Asked about the active principle components of Cepacol commercial products, Colgate Plax, Listerine, Malvatricin, Noplax, Oral B, Parodontax, Periogard and Sensodyne (with the possibility of adding other rinses), 189 students from public institutions responded correctly and 97 responded incorrectly, compared to 83 and 28 at private institutions, respectively. However, the relevance of this investigation is the number of blank response, i.e., 812 and 789 respectively. The evaluation of these findings leads us to conclude that, although we recorded 1,998 responses, only 272 (13.6%) were correct while 125 (6.3%) were wrong. As a result of increased expression there are the 1601 responses, i.e., 80.1% of the 1,998 possible answers were given (Table 3).

The chi-square test of Pearson found no association between the answers, correct or otherwise, about the active ingredients of mouthwashes and the type of institution ( $p$ -value = 0.0943). Therefore, it is concluded that regardless of the type of institution, the graduating students, although they are aware of the active ingredients that make up the rinses, do not relate these principles to marketed products.

Considering the importance of dentists to have comprehensive knowledge of the chemical composition of various rinses, particularly the diluent used, in view of the

risks that may threaten health, students were questioned on this topic. The collected results showed that 25.2% of students were aware of water as a vehicle of mouthwashes, while 41.4% had knowledge of alcohol. Ideally, these percentages should be reversed, despite the justification for the inclusion of alcohol in mouthwashes to ensure stability and the dissolution of certain active ingredients present in the formulations, provide a refreshing feeling, prevent contamination by microorganisms and increase the shelf life.<sup>12, 13, 22</sup> One cannot lose sight of the side effects caused by alcohol, such as dryness and flaking of the soft tissues of the mouth or even the potential for tissue damage from mouthwashes containing alcohol. Our results showed greater cytotoxicity from rinsing with alcohol compared to rinses with water.<sup>23</sup>

It is worth mentioning that we found no association between knowledge about the vehicles of mouthwashes and the type of institution ( $p$ -value = 0.6042).

Mouthwashes have significant pharmacological action on the chemical control of plaque and the intervention of inflammatory processes in the oropharyngeal area.<sup>24</sup> When asked how they justify the prescription of mouthwash, 77.8% of respondents reported motives directly related to the prevention or intervention of the drug in inflammatory and infectious processes. Thus, based on the minimum (20) and maximum (78) reference parameters of the mentioned clinical indications, the following percentages were calculated: control of bacterial plaque, 18%; pre-and post-surgical indication, 17.3%; difficulty in cleaning, 12%; halitosis, 10.9%; periodontitis, 8.8%; completion of oral hygiene; high activity, 6.2%; and risk of caries, 4.6% (Table 4). It is very likely that life experiences alone could explain the prescription mouthwash as an alternative therapy for the treatment of coronary abscess (0.2%), control of oral bacterial flora (0.2%), candidiasis (0.2%), use of a prosthesis (0.9%) and braces (3.0%), and prevention of oral diseases (0.2%) (Table 4).

Moreover, when invited to comment on the reasons that justify the prescription of mouthwash-based antiseptics, students who interpreted this requisite ambiguously or inaccurately suggested the use of these products to remineralize white spots (0.7%), promote dentinal desensitization (0.2%) or provide preventive support for patients who have special limitations in performing oral hygiene (0.2%). Certainly, the success of the treatment of these medical conditions is met by prescribing fluoride rinses<sup>25</sup> (Table 4).

Finally, indications that reveal the absolute disinformation students have about the pharmacological potential of these medicinal products should be noted, including the following clinical interventions: tooth whitening (0.2%), chemical disinfection (0.2%), fluoroterapia (0.7%), fungus in prostheses (0.5%), infection control (0.9%), maintenance of neutral pH (0.2%) and plaque removal (0.2%), among others. Although 2% is low, we cannot ignore that the above provisions were proposed by graduating students of undergraduate courses in dentistry (Table 4).



It is critical to understand that there are no reasons that justify the prescription of mouthwashes based on the position taken by four students (0.9%). However, 14 students shunned their responsibility to provide information (3.2%), which can only be interpreted as a lack of knowledge of the matter. The sum of these two percentages (4.1%) is troubling, particularly because these dental students will, in a few days, be providing professional services to the community (Table 4).

Referring to the evaluation of the results obtained in this study, it appears that the Brazilian market has an extensive range of mouthwashes available. It is possible that the consumption of these products by the population is relatively high and is contraindicated in many situations because such consumption depends on the participation of the dentist and because the most appropriate choice is often driven by media propaganda.

Regarding the degree of knowledge of the students entering the labor market each year, and considering the information collected in this study, it is recommended that the boards of graduate courses in dentistry revise their teaching strategies to reaffirm the importance of mouthwash with antiseptic, a product whose main advantage lies in the ability of these drugs reach all accessible surfaces in the mouth, including the interproximal surfaces and soft and hard tissue, and to remain active for long periods, according to the scientific literature.<sup>4,26</sup>

Attention should be paid by the boards of graduate dentistry courses to teaching strategies that can be referenced in the results recorded by Andreolli (2004) on the design of dentistry graduate teachers in higher education institution in the state of São Paulo regarding didactic and pedagogical training. The results of this research revealed that these professionals "are characterized as experts in their area of expertise and who are hired for demonstrating dental expertise, regardless of preparation for teaching, which can lead to difficulties in teaching practice, as refers to train professionals citizens, towards a broader view, comprehensive and integrated society, as advocated in the National Curriculum Guidelines". Finally, the results of this study indicate the need for democratic pedagogical mechanisms that encourage critical teaching combined with self-criticism so that dental students can become legitimate regulators of the teaching-learning process in the face of economic and financial interests of the market and the immediacy of action.<sup>27</sup>

Therefore, it can be stated that when recommending a preferred choice of a mouthwash with antiseptic, the dentist should take into account the active ingredient and the concentration, as well the type of diluent used by the manufacturer, the daily dosage and the duration of treatment.

## CONCLUSION

According to the methodology adopted in this study, it can be concluded that students from public and private institutions who graduated from undergraduate courses

in dentistry in 2014 do not have satisfactory scientific knowledge about mouthwashes with antiseptic, even though they recognize that the specific knowledge of these drug products is provided during classes in the various disciplines that make up the curriculum framework; that scientific limitations revealed by most scholars, regardless institution type, encompass knowledge of the active ingredients, such as cetylpyridinium chloride, essential oils, chlorhexidine gluconate and gantrez triclosan; and that other components that make up the formulations, the concentrations, diluents, and clinical indication and can cause the health risks with indiscriminate use.

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