

Dentist's preferences on vital and nonvital tooth bleaching: findings from a Guatemalan survey

Víctor Ernesto Villagrán Colón¹, Mirna Oldemia Calderón Márquez¹, Ricardo Alfredo Carrillo-Cotto¹, Flávio Fernando Demarco² , Luiz Alexandre Chisini^{2,3,*} 

¹ Graduate Program in Dentistry, School of Dentistry, University of San Carlos of Guatemala, Guatemala City, Guatemala.

² Graduate Program in Dentistry, School of Dentistry, Federal University of Pelotas, Pelotas, Brazil.

³ Graduate Program in Dentistry, School of Dentistry, University of Vale do Taquari (Univates), Lajeado, Brazil.

***Corresponding author:**

Luiz Alexandre Chisini
University of Vale do Taquari
Avelino Talini St. 171
Lajeado, Rio Grande do Sul, 95914-014, Brazil
Tel: + 55 53 981121141
E-mail: alexandrechisini@gmail.com

Received for publication: October 26, 2020

Accepted: December 9, 2020

Aim: The present study aimed to investigate if the Guatemalan dentist's options on tooth bleaching could be influenced by their time in clinical practice, the level of specialization or their working place. **Methods:** A representative sample of dentists working in clinical practice in Guatemala was selected. Data were collected using a self-administered questionnaire with information related to gender, professional characteristics (time since graduation in years and working place) and preferences regarding vital (at-home or in-office; type and concentration of bleaching agent) and the nonvital tooth bleaching (bleaching agent used). The analysis was performed and the association between preference for bleaching technique and independent variables were investigated using Fisher's exact test. **Results:** 200 dentists were interviewed. More than half of dentists were male (57.0%) with time since graduation between 11 and 20 years ($n= 64$; 32.3%). Dentists mostly (60.5%) preferred in-office technique for vital bleaching, with 10-20% Carbamide peroxide (CP) as the preferred agent (50%). For nonvital teeth, the preferred agent (46.8%) was 37% Hydrogen Peroxide (HP). About the associations, younger dentists (< 20 years of graduation) selected mostly in-office technique, while those with more than 20 years indicated more the at-home technique. Also, the dentists working in private practice chose more frequently in-office technique. Thus, the in-office technique was more popular among Guatemalan dentists, with 10-20% CP and 37% HP selected as favorite bleaching agents for vital and nonvital techniques, respectively. **Conclusion:** The time of clinical practice and working place influenced some choices.

Keywords: Tooth bleaching agents. Cross-sectional studies. Practice Patterns, Dentist's. Surveys and questionnaires.



Introduction

Esthetics plays a pivotal role in modern society. Discolored or darkened teeth could impair individuals' social life and negatively impact the oral health-related quality of life (OHRqO)¹. Whiter and aligned teeth are considered central requirements for satisfaction with teeth appearance²⁻⁵. Aesthetic dental treatments are highly desired for individuals in several studies^{6,7}. A survey with university students observed that 74% of them desired to carry out an esthetic treatment in their teeth and 16% have already bleached their teeth at least once in their lives⁷. Similar results were observed in a population study in adults, where 86% desired to bleach their teeth⁶.

Indeed, tooth bleaching is one of the treatments most popular in dental clinics. There are different bleaching agents with variate concentrations (generally ranging from 10 to 37%) available for professional use. These products are mainly based on hydrogen peroxide (HP) or carbamide peroxide (CP), which breaks down into HP and urea. These oxidizing chemical agents can be used for vital or nonvital tooth bleaching; while sodium perborate (SP) is used exclusively for nonvital tooth bleaching⁸⁻¹⁰. Moreover, low concentration agents [10-22% CP and 6% HP] are used at home by the patients under professional supervision, which is defined as an at-home technique; and high concentrations [$>30\%$ CP or HP] are applied only in the dental office by the dentist in the so-called in-office technique¹¹.

Bleaching agents seem to be able to improve tooth color for vital and nonvital teeth¹². The bleaching effect is also capable to positively impact in the OHRQoL¹³. When comparing at-home and in-office vital bleaching protocols, a systematic review found similar results between both techniques¹⁴. These techniques have also been reported to exhibit similar side effects: tooth sensitivity and gingival irritation¹⁵. Considering the large number of products available in the market and the different techniques, most of the time the choice of bleaching technique and agents relies on the professional opinion. In fact, a survey with Brazilian dentists showed that the decision for vital or nonvital bleaching protocols was impacted by the post-graduation training, time since graduation and working place¹⁶.

There is none study in Central America evaluating the preference of dentists regarding the vital and nonvital bleaching techniques and materials. Therefore, the present study aimed at the Guatemalan dentist's options for vital or nonvital tooth bleaching and additionally to investigate if their choices could be influenced by dentists characteristics (the time in clinical practice, the level of specialization or their working place).

Materials and Methods

The present study was reported following the STROBE guideline (Strengthening the Reporting of Observational Studies in Epidemiology).

Study design, setting and study size

The present self-administered survey was carried out in Guatemala, a country located in Central America with a population of around 17.3 million. Guatemalan dentists are registered in the "*Colegio Estomatológico de Guatemala*", which maintains actualized

the respective dentist's address and telephones. In 2015, 2,258 dentists were registered being distributed in all Guatemalan territory. A representative sample of this population was calculated considering an α error of 5%, power of 80% and a prevalence of 50% (unknown) of the outcome. Thus, a sample of 181 individuals was estimated. Considering potential losses and refusals, we added around 20% to the initial sample, thus comprising 220 individuals. Dentists were designated systematically, selecting at random the first position in the list. Subsequent individuals were selected by calculating the sample interval. Selected dentists were initially contacted by cell-phone and invited to participate. Individuals that agreed to participate scheduled a meeting to deliver and complete the self-administered questionnaire. The questionnaires were personally delivered and collected after filling in by the participant. They have included only active graduated dentists that carry out clinical practice in the Republic of Guatemala.

Data were collected using a self-administered questionnaire including 12 questions related to demographic information (sex), professional characteristics (time since graduation in years), and information regarding bleaching techniques. All participants that agreed to participate in the study signed an informed consent form. All data collection was performed during May of 2016.

Independent Variables

Independent variables were collected regarding the gender of participants, time since graduation was continuously collected and then categorized in a) ≤ 10 ; b) 11 to 20; c) 21 to 30; d) >30 ¹⁶. Dentists were also asked about their level of specialization and categorized in general practitioners (no post-graduation) and specialists (with post-graduation training)¹⁷. The place of work was also assessed by the question "Where do you get your professional clinical practice from most of the time?" The answers were categorized as "private" and "public/university".

Outcome

The outcomes of present studies were the choice of the vital bleaching technique and the materials used in vital and nonvital tooth bleaching¹⁶.

1. Considering vital teeth, "What is your favorite protocol to bleach vital teeth?". Two possible answers were possible: a) at-home; b) in-office
2. In cases of vital teeth "What is your first choice to bleach discolored vital teeth?": a) 10% carbamide peroxide (CP); b) 15 to 22% CP; c) 37% of CP; d) 37% of HP or e) over-the-counter (OTC) products;
3. In cases of nonvital teeth "What is your first choice to bleach discolored nonvital teeth?" a) 10% to 22% CP; b) 37% CP; c) 37% HP; d) sodium perborate (SP) + water/or HP.

Statistical methods

Data were tabulated in Excel™ (Microsoft Corporation) software. Descriptive analysis was performed and the association between outcome and independent variables was investigated using Fisher's exact test. All the analyses were done with

Stata 12.0 (StataCorp, College Station, TX, USA) software package. Confidence intervals of 95% were calculated and a level of significance of a ≤ 0.05 was used for the analyses.

Results

A total of 200 dentists participated of present study, which were mainly in the Guatemala City (n=135; 67.5%) followed by Sacatepéquez (n=18; 9.0%) and Chimaltenango (n=16; 8.0%). while 20 (9.1 %) of dentists declined to participate. More than half of dentists were male (n= 114; 57.0%) with time since graduation between 11 and 20 years (n= 64; 32.3%) followed by individual with less than ten years since graduation (n=48; 24.2%) (Table 1). Most of the dentists worked in private practice (n=170; 92.9%).

Table 1. Descriptive analyses of the studied variables among Guatemalan dentists (n=200). Guatemala, 2016

Variable/Category	N=200	% (IC 95%)
Gender		
Male	114	57.0 (49.8 – 64.0)
Female	86	43.0 (36.0 – 50.2)
Time since graduation (years)*		
≤ 10	59	29.8 (23.5 – 36.7)
11 to 20	64	32.3 (25.8 – 39.3)
21 to 30	48	24.2 (18.5 – 31.0)
>30	27	13.6 (3.1 – 43.7)
Post-graduation training*		
Yes	64	32.7 (26.2 – 39.7)
No	135	67.8 (60.8 – 74.3)
Working place		
Private	170	92.9 (88.2 – 96.2)
Public/university	13	7.1 (3.8 – 11.8)
Vital Bleaching technique (vital teeth)* ^A		
At-home	62	39.5 (31.8 – 47.6)
In-office	95	60.5 (52.4 – 68.2)
Vital Bleaching* ^B		
CP 10-22%	88	50.0 (52.4 – 57.6)
CP 37%	38	21.6 (15.7 – 28.4)
HP 37%	50	28.4 (21.9 – 35.7)
Nonvital Bleaching* ^C		
CP 10-22%	15	10.8 (6.2 – 17.2)
CP 37%	38	27.3 (20.1 – 35.5)
HP 37%	65	46.8 (38.3 – 55.4)
SP + water or HP	21	15.1 (0.9 – 22.2)

*Number of valid answers. ^A 19 (10.8%) dentists replied that they do not perform tooth whitening on this issue. ^B 18 (9.3%) dentists replied that they do not perform tooth whitening on this issue. ^C 57 (29.1%) dentist replied that they do not perform tooth whitening on this issue

Regarding the technique for bleaching vital teeth, 10.8% of dentists reported not to perform vital bleaching. Considering only those participants who performed tooth bleaching, most of the dentists (n=95; 60.5%) carried out the in-office technique. The bleaching agent of choice by most Guatemalan dentists was the carbamide peroxide between 10-22% (n=88; 50.0%). Regarding nonvital bleaching, hydrogen peroxide was the material used by 46.8% (n=65) of the surveyed dentists.

Table 2 shows the association between the choice of the vital bleaching technique and independent variables. An association was found between the time since graduation and the type of vital bleaching technique (p=0.017). Younger dentists (<20 years) indicate more in-office technique while dentists with more than 30 years since graduation indicate more at-home. Although post-graduation training did not was associated with vital bleaching therapy (p=0.194), the place of work was a factor that influenced the choice of professionals (p=0.021). Dentists in public/university place work choose more at-home vital bleaching compared with individuals that work in private practice, which preferred mostly in-office.

Table 2. Association between the choice of the vital bleaching technique (at-home or in-office) and the independent variables

Variable/Category	Vital Bleaching technique		p-value
	At-home	in-office	
	n (%)	n (%)	
Time since graduation (years)			
≤ 10	27 (45.8)	32 (54.2)	0.017*
11 to 20	28 (43.8)	36 (56.3)	
21 to 30	31 (64.6)	17 (35.4)	
>30	19 (73.1)	7 (26.9)	
Post-graduation training			
Yes	76 (56.7)	58 (43.3)	0.194
No	30 (46.9)	34 (53.1)	
Working place			
Private	87 (51.5)	82 (48.5)	0.021*
Public/university	11 (84.6)	2 (15.4)	

Regarding the association between the materials used for nonvital tooth bleaching (table 3), no association was observed with time since graduation (p=0.319), post-graduation training (p=0.714) and place of work (p=0.447). Similarly, no association was observed between the choice of vital bleaching materials and time since graduation (p=0.271), post-graduation training (p=0.085) and place of work (p=0.911).

Table 3. Association between materials used for vital and nonvital tooth bleaching therapies and the independent variables

Variable/Category	Non- vital tooth bleaching				p-value
	10-22%CP	37%CP	37% HP	SP	
	n (%)	n (%)	n (%)	n(%)	
Time since graduation (years)					
≤ 10	5 (12.5)	7 (17.5)	26 (60.0)	4 (10.0)	0.319
11 to 20	4 (8.2)	13 (26.5)	24 (49.0)	8 (16.3)	
21 to 30	3 (9.1)	11 (33.33)	11 (33.3)	8 (24.2)	
>30	3 (18.6)	6 (37.50)	6 (37.5)	1 (6.25)	
Post-graduation training					
Yes	5 (10.9)	13 (28.3)	19 (41.3)	9 (19.6)	0.714
No	10 (10.75)	25 (26.9)	46 (49.5)	12 (12.9)	
Working place					
Private	13 (10.7)	33 (27.0)	57 (46.7)	19 (15.6)	0.447
Public/university	0 (0.0)	3 (50.0)	3 (50.0)	0 (0.0)	
Vital tooth bleaching					
Time since graduation (years)					
≤ 10	23 (41.8)	18 (32.7)	14 (25.4)		0.271
11 to 20	27 (49.1)	12 (21.8)	16 (29.1)		
21 to 30	25 (56.8)	6 (13.6)	13 (29.5)		
>30	12 (57.1)	2 (9.5)	7 (33.3)		
Post-graduation training					
Yes	21 (37.5)	15 (26.8)	20 (35.7)		0.085
No	66 (55.5)	23 (19.3)	30 (25.2)		
Working place					
Private	75 (48.7)	36 (23.4)	43 (27.9)		0.911
Public/university	5 (55.6)	2 (22.2)	2 (22.2)		

Discussion

The overall results of the present questionnaire-based survey showed that professionals' characteristics such as place of work and time since graduation influenced the dentist's decision concerning indication of at-home or in-office vital tooth bleaching. To investigate the opinion of dentists is a useful tool to understand what is happening in the dental clinic in real life for different procedures, including the preferences for tooth bleaching^{17,18}.

In this study, in-office dental bleaching was largely preferred (60.5%) by Guatemalan dentists over at-home (39.5%) for vital tooth bleaching. A systematic review showed that both techniques are effective in bleaching capacity¹⁴. Although the literature showed that while different concentration agents exhibit similar efficacy¹², the use of therapies with lower peroxide concentration has been recommended as the first choice because they usually are associated with less sensitivity during treatment¹⁹. Moreover, an *in vitro* study showed that higher concentrations of peroxide in bleaching materials can degrade more easily than peroxides with lower concentrations and thus affect its effectiveness⁸. In fact, 60.5% of dentists choose the in-office protocol,

of which 50% indicated CP 37% or HP 37% and 10.5% indicated the CP 10-22%, concentrations used to at-home. This result could be explained due to possible higher sensitivity indices observed at higher concentrations. However, it is important to note that the use of CP in low concentrations (10-22%) is indicated only in the at-home technique. The choice of approach to tooth vital bleaching of Guatemalan dentists was different from those reported by Demarco et al.¹⁶ (2013), which investigated dentists in the south of Brazil. In this study, Brazilian dentists preferred more (78.1%) at-home than in-office bleaching¹⁶. Also, the main dentist characteristic associated with the indication of bleaching treatments was the post-graduation training and younger dentists¹⁶. Dentists with post-graduation preferred to indicate at-home bleaching, like as younger dentists¹⁶. In our study, we have not observed any influence of post-graduation training in the choice of vital bleaching technique. However, the place of work was an important factor associated with dentist preferences. Thus, a dentist that works in public or university prefers more an at-home approach compared that in-office. The choice for this kind of treatment in private practice could be related to the higher control of the treatment for the dentist or related to the belief that in-office could produce a faster or more strong bleaching effect, which is not demonstrated by a systematic review comparing at-home and in-office treatments¹⁴. Moreover, we identify that time since graduation was another factor that influences the indication of vital bleaching technique. Older dentists (between 21 and 30 and more than 30 years since graduation) prefer more at-home tooth bleaching to the vital tooth. These results do not corroborate with Brazilian dentists, were younger dentists indicate more at-home than older dentists¹⁶.

Concerning the nonvital bleaching, 37% hydrogen peroxide was the favorite bleaching agent in this present study. Indeed, this agent has been largely been used to carry out bleaching treatments in nonvital teeth for more than 70 years²⁰. Hydrogen peroxide is no longer indicated for application in nonvital bleaching into the pulp chamber due to the risk of external cervical resorption. Therefore, Sodium Perborate can be a safer alternative to hydrogen peroxide as an intracoronal bleaching agent. Some studies have also suggested that 35% carbamide peroxide present similar efficacy of 35% hydrogen peroxide even as is more safety^{21,22}. Also, in the Brazilian study, above 30% Hydrogen Peroxide was the preferred bleaching agent for nonvital treatments¹⁵. Considering the materials used by Guatemalan dentists, we did not observe any association regarding time since graduation, post-graduation training or place of work, both to vital as nonvital tooth bleaching. These results corroborate with a study carried out in Brazil, which did not found an association between materials used for nonvital tooth bleaching and dentist's characteristics¹⁶. A possible explanation for differences between the studies that evaluated dentists' preferences can be linked to differences in dental schools. A study investigated the attitudes of the final-year students from three European dental schools towards bleaching²³, and found important differences between these schools (concerning confidence, teaching received in bleaching and attitudes to provision of bleaching and recommendations to patients). Students declared to feel more confident about providing nonvital bleaching than vital bleaching. Besides, the complete understanding of mechanisms that professional decision making is a hard task and can englobe several levels of comprehension, beginning in the professional knowledge^{17,24}, influenced by the school of dentistry

and, also, can be influenced by patients' characteristics²⁵⁻²⁷. Some patient's characteristics could influence the decision making of health professionals²⁵⁻²⁷. Moreover, it was observed that competition affected the clinical decision-making of dentists in Canada²⁸. Dentists located in regions with competitive pressure from other dentists presented an odds 63% higher to indicate a more aggressive approach than dentists located in medium competitive regions. Also, the dentist in very low competitive areas presented an odds 31% higher to indicate aggressive dentistry treatments when compared with medium density regions²⁸. Therefore, considering the Brazilian and Guatemalan distribution of dental schools and Dentists we found some differences that could help us. The dentist labor market in Brazilian is very competitive in capitals and this decreases considering interior country²⁹; similarly, dentist Guatemalan distribution is concentrated (around 75%) in the capital.

Moreover, some straight points must be highlight. Practice-based studies carried out in dentists' clinical practice have paramount relevance to understanding factors influencing the clinician's preference of a specific technique/material over another. Yet, we included dentists from all regions of Guatemala through a representative sample of all countries. Moreover, some limitations could also be emphasized. There were more than 9.1 % of the dentists included in the initial sample size that refused to participate in the study. Also, considering that we applied a self-applied questionnaire, some dentists did not answer all the questions, making the numbers of respondents different for each question.

Thus, the present findings demonstrated that the place of work and the time in the clinical practice affected dentists' choices for vital tooth bleaching techniques. In-office bleaching using carbamide peroxide at lower concentrations is preferred by the Guatemalan dentists.

References

1. Larsson P, Bondemark L, Haggman-Henrikson B. The impact of oro-facial appearance on oral health-related quality of life: A systematic review. *J Oral Rehabil.* 2020 Mar 20. doi: 10.1111/joor.12965.
2. Silvola AS, Varimo M, Tolvanen M, Rusanen J, Lahti S, Pirttiniemi P. Dental esthetics and quality of life in adults with severe malocclusion before and after treatment. *Angle Orthod.* 2014 Jul;84(4):594-9. doi: 10.2319/060213-417.1.
3. Johal A, Alyaqoobi I, Patel R, Cox S. The impact of orthodontic treatment on quality of life and self-esteem in adult patients. 2015 Jun;37(3):233-7. doi: 10.1093/ejo/cju047.
4. Tin-Oo MM, Saddki N, Hassan N. Factors influencing patient satisfaction with dental appearance and treatments they desire to improve aesthetics. *BMC Oral Health.* 2011 Feb 23;11:6. doi: 10.1186/1472-6831-11-6.
5. Gonzalez MJ, Romero M, Penacoba C. Psychosocial dental impact in adult orthodontic patients: what about health competence? *Health Qual Life Outcomes.* 2019 Jun 26;17(1):110. doi: 10.1186/s12955-019-1179-9.
6. Silva FBD, Chisini LA, Demarco FF, Horta BL, Correa MB. Desire for tooth bleaching and treatment performed in Brazilian adults: findings from a birth cohort. *Braz Oral Res.* 2018 Mar 8;32:e12. doi: 10.1590/1807-3107bor-2018.vol32.0012.

7. Chisini LA, Cademartori MG, Collares K, Pires ALC, Azevedo MS, Correa MB, et al. Desire of university students for esthetic treatment and tooth bleaching: a cross-sectional study. *Braz J Oral Sci.* 2019;18:e191648. doi: 10.20396/bjos.v18i0.8657267.
8. Chisini LA, Conde MCM, Meireles SS, Dantas RVF, Sarmento HR, Della Bona A, et al. Effect of temperature and storage time on dental bleaching effectiveness. *J Esthet Restor Dent.* 2019 Jan;31(1):93-7. doi: 10.1111/jerd.12439.
9. Maran BM, Ziegelmann PK, Burey A, de Paris Matos T, Loguercio AD, Reis A. Different light-activation systems associated with dental bleaching: a systematic review and a network meta-analysis. *Clin Oral Investig.* 2019 Apr;23(4):1499-512. doi: 10.1007/s00784-019-02835-x.
10. Santos L, Chisini LA, Springmann CG, Souza BDM, Pappen FG, Demarco FF, et al. Alternative to avoid tooth discoloration after regenerative endodontic procedure: a systematic review. *Braz Dent J.* 2018;29(5):409-18. doi: 10.1590/0103-6440201802132.
11. Meireles SS, Heckmann SS, Leida FL, dos Santos Ida S, Della Bona A, Demarco FF. Efficacy and safety of 10% and 16% carbamide peroxide tooth-whitening gels: a randomized clinical trial. *Oper Dent.* 2008 Nov-Dec;33(6):606-12. doi: 10.2341/07-150.
12. Pontes M, Gomes J, Lemos C, Leao RS, Moraes S, Vasconcelos B, et al. Effect of bleaching gel concentration on tooth color and sensitivity: a systematic review and meta-analysis. *Oper Dent.* 2020 May/Jun;45(3):265-75. doi: 10.2341/17-376-L.
13. Meireles SS, Goetts ML, Dantas RV, Bona ÁD, Santos IS, Demarco FF. Changes in oral health related quality of life after dental bleaching in a double-blind randomized clinical trial. *J Dent.* 2014 Feb;42(2):114-21. doi: 10.1016/j.jdent.2013.11.022.
14. de Geus JL, Wambier LM, Kossatz S, Loguercio AD, Reis A. At-home vs In-office Bleaching: A Systematic Review and Meta-analysis. *Oper Dent.* 016 Jul-Aug;41(4):341-56. doi: 10.2341/15-287-LIT.
15. Eachempati P, Kumbargere Nagraj S, Kiran Kumar Krishanappa S, Gupta P, Yaylali IE. Home-based chemically-induced whitening (bleaching) of teeth in adults. *Cochrane Database Syst Rev.* 2018 Dec 18;12(12):CD006202. doi: 10.1002/14651858.CD006202.pub2.
16. Demarco FF, Conde MC, Ely C, Torre EN, Costa JR, Fernandez MR, et al. Preferences on vital and nonvital tooth bleaching: a survey among dentists from a city of southern Brazil. *Braz Dent J.* 2013;24(5):527-31.
17. Chisini LA, Conde MC, Correa MB, Dantas RV, Silva AF, Pappen FG, et al. Vital pulp therapies in clinical practice: findings from a survey with dentist in southern Brazil. *Braz Dent J.* 2015;26(6):566-71. doi: 10.1590/0103-6440201300409.
18. Sarkis-Onofre R, Pereira-Cenci T, Opdam NJ, Demarco FF. Preference for using posts to restore endodontically treated teeth: findings from a survey with dentists. *Braz Oral Res.* 2015;29:1-6. doi: 10.1590/1807-3107bor-2015.vol29.0001.
19. Meireles SS, Heckmann SS, Santos IS, Della Bona A, Demarco FF. A double blind randomized clinical trial of at-home tooth bleaching using two carbamide peroxide concentrations: 6-month follow-up. *J Dent.* 2008 Nov;36(11):878-84. doi: 10.1016/j.jdent.2008.07.002.
20. Meireles SS, Demarco FF, Tarquinio SB. Nonvital tooth bleaching with halogen light-activated agents: case reports and discussion. *Gen Dent.* 2009 Jul-Aug;57(4):398-401.
21. Lim KC. Considerations in intracoronal bleaching. *Aust Endod J.* 2004 Aug;30(2):69-73. doi: 10.1111/j.1747-4477.2004.tb00186.x.
22. Chng HK. Update on materials used in intracoronal bleaching. *Ann R Australas Coll Dent Surg.* 2002 Oct;16:147-50.
23. Hatherell S, Lynch CD, Burke FM, Ericson D, Gilmour AS. Attitudes of final-year dental students to bleaching of vital and non-vital teeth in Cardiff, Cork, and Malmo. *J Oral Rehabil.* 2011 Apr;38(4):263-9. doi: 10.1111/j.1365-2842.2010.02155.x.

24. Schwendicke F, Meyer-Lueckel H, Dorfer C, Paris S. Attitudes and behaviour regarding deep dentin caries removal: a survey among German dentists. *Caries Res.* 2013;47(6):566-73. doi: 10.1159/000351662.
25. Chisini LA, Noronha TG, Ramos EC, Dos Santos-Junior RB, Sampaio KH, Faria ESAL, et al. Does the skin color of patients influence the treatment decision-making of dentists? A randomized questionnaire-based study. *Clin Oral Investig.* 2019 Mar;23(3):1023-30. doi: 10.1007/s00784-018-2526-7.
26. Chisini LA, Collares K, Bastos JLD, Peres KG, Peres MA, Horta BL, et al. Skin color affect the replacement of amalgam for composite in posterior restorations: a birth-cohort study. *Braz Oral Res.* 2019 Jul 29;33:e54. doi: 10.1590/1807-3107bor-2019.vol33.0054.
27. Cabral ED, Caldas Jr AF, Cabral HA. Influence of the patient's race on the dentist's decision to extract or retain a decayed tooth. *Community Dent Oral Epidemiol.* 2005 Dec;33(6):461-6. doi: 10.1111/j.1600-0528.2005.00255.x.
28. Ghoneim A, Yu B, Lawrence HP, Glogauer M, Shankardass K, Quinonez C. Does competition affect the clinical decision-making of dentists? A geospatial analysis. *Community Dent Oral Epidemiol.* 2020 Apr;48(2):152-62. doi: 10.1111/cdoe.12514.
29. San Martin AS, Chisini LA, Martelli S, Sartori LRM, Ramos EC, Demarco FF. Distribution of dental schools and dentists in Brazil: an overview of the labor market. *Rev Abeno.* 2018; 18(1):63-73. doi: 10.30979/rev.abeno.v18i1.399.