

Original Research

# Dental sealants: knowledge, opinion, values and practice of portuguese dental hygienists



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## ABSTRACT

**Objectives:** The aim of this study is to characterize the sample of responders and to present the data obtained from the evaluation on the knowledge, opinion, values, and practice (KOVF) of dental hygienists in Portugal concerning pit and fissures sealants.

**Methods:** A non-probabilistic sample of 142 individuals was obtained from the members of the Portuguese Association of Dental Hygienists. Participants answered an online questionnaire composed of four demographic questions and 31 statements regarding KOVF about dental sealants, graded from 0 to 5, with 5 being the most agreement with the statement. The Wilcoxon matched-pairs sign ranks test, the Mann-Whitney test, the Kruskal-Wallis test, the Spearman's correlation, and the V-Cramer test were used to analyze the data.

**Results:** Portuguese dental hygienists present positive feedback about the use of dental sealants. The mean scores for each of the studied variables were: knowledge =  $3.63 \pm 0.29$ ; opinion =  $2.87 \pm 0.42$ ; value =  $2.92 \pm 0.44$ , and practice =  $3.76 \pm 0.46$ . Knowledge differed with years of experience ( $p < 0.01$ ), and opinion and practice both also differed with type of clinical practice ( $p < 0.01$  in both). Statistically positive significant correlations were found between knowledge and practice ( $p < 0.01$ ).

**Conclusions:** Portuguese dental hygienists have positive feelings about pit and fissure sealants. The positive correlation between knowledge and practice can be used to further increase the use of dental sealants in Portugal. (Rev Port Estomatol Med Dent Cir Maxilofac. 2020;61(4):155-161)

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## Selantes de fissuras: conhecimentos, opinião, valores e prática dos higienistas orais portugueses

### R E S U M O

#### Palavras-chave:

Higienistas orais  
Selantes de fissuras  
Saúde oral  
Prevenção

**Objetivos:** O objetivo deste estudo é o de caracterizar a amostra de participantes e o de apresentar os dados obtidos na avaliação do conhecimento, a opinião, os valores e a prática (KOVF) dos higienistas orais em Portugal sobre selantes de fissuras.

**Métodos:** Uma amostra não probabilística de 142 indivíduos foi obtida de entre os membros da Associação Portuguesa de Higienistas Orais. Os participantes responderam a um questionário on-line composto por 4 perguntas demográficas e pela classificação, de 31 afirmações sobre os KOVF sobre selantes de fissuras, numa escala de 0 a 5, sendo 5 a maior concordância com a afirmação. O teste de pares de sinais Wilcoxon, o teste de Mann-Whitney, o teste de Kruskal-Wallis, a correlação de Spearman e o teste V Cramer foram utilizados para analisar os dados.

**Resultados:** Os higienistas orais portugueses apresentam feedback positivo sobre o uso de selantes de fissuras. Os valores médios dos grupos, para cada uma das variáveis estudadas, foram: para conhecimento =  $3,63 \pm 0,29$ ; opinião =  $2,87 \pm 0,42$ ; valor =  $2,92 \pm 0,44$  e prática  $3,76 \pm 0,46$ . O conhecimento diferiu por anos de experiência ( $p < 0,01$ ), a opinião diferiu com o tipo de prática clínica ( $p < 0,01$ ) e a prática também diferiu com o tipo de prática clínica ( $p < 0,01$ ). Correlações positivas estatisticamente significativas foram encontradas entre conhecimento e prática ( $p < 0,01$ ).

**Conclusões:** Os higienistas orais portugueses têm sentimentos positivos em relação aos selantes de fissuras. A correlação positiva entre conhecimento e prática pode ser utilizada para aumentar o uso de selantes de fissuras em Portugal. (Rev Port Estomatol Med Dent Cir Maxilofac. 2020;61(4):155-161)

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## Introduction

Dental caries is a dental hard-tissue disease of multifactorial etiology that is strongly related to sugar fermentation by bacteria present in the oral cavity, mainly streptococci and lactobacilli.<sup>1</sup> Ninety percent of dental caries occur in the occlusal surfaces of the posterior teeth' pits,<sup>2</sup> where it is easier for the bacteria to build up.<sup>3</sup>

Dental sealants are the most common method to prevent dental caries on teeth' occlusal surfaces by creating a protective barrier on pits and fissures, therefore preventing the accumulation of bacteria responsible for the cariogenic process.<sup>4</sup> Despite the many studies supporting the use of dental sealants in non-cavitated occlusal surfaces of children, adolescents, and young adults,<sup>5</sup> in many countries, like Spain,<sup>2,6</sup> Greece,<sup>7,8</sup> Sweden,<sup>9</sup> Scotland,<sup>10</sup> and the United States of America,<sup>11</sup> this preventive method is little used. In Portugal, dental sealants were introduced in the late '90s, but only in 1999 did the Portuguese General Directorate of Health (Direção Geral de Saúde – DGS) release the first normative document to regulate the use of this technique.<sup>12</sup>

The National Oral Health Promotion Program (Programa Nacional de Promoção de Saúde Oral – PNPSO), implemented mostly by dental hygienists at health centers throughout Portugal, focuses mainly on reducing the incidence and prevalence of oral diseases in several population groups.<sup>13</sup> Aiming to prevent dental caries in children and teenagers, the PNPSO

established public-private partnerships to allow free oral health appointments for applying dental sealants.<sup>12,14</sup> Even though these partnerships exist, several studies show that dental sealants are little used in Portugal<sup>15,16</sup> and that there is still a long way to go before accomplishing the goal established by the World Health Organization (WHO) of having 80% of the 6-year-old children in the European Union caries-free.

Within a multidisciplinary work team, the dental hygienist has the highest responsibility to fight and prevent dental caries since their job focuses on preventing and stopping oral diseases and promoting oral health.<sup>17</sup> Therefore, the perception of dental hygienists regarding dental sealants should be assessed to settle which changes can and should be done to optimize the population's oral health.<sup>6</sup>

Attitudes and behaviors can affect the professional practice of dental hygienists. This study assembles an evaluation of their attitudes, defined as favorable or unfavorable provisions, and behaviors, defined as the tendency to act consistently with the attitude, concerning dental sealants. Moreover, the values concerning dental sealants' use were also evaluated to help predict clinical practice.<sup>6</sup> By linking these three previously mentioned factors with the opinions about dental sealants, it is possible to estimate the dental hygienists' willingness to use them and assess what can be changed to promote dental caries prevention.

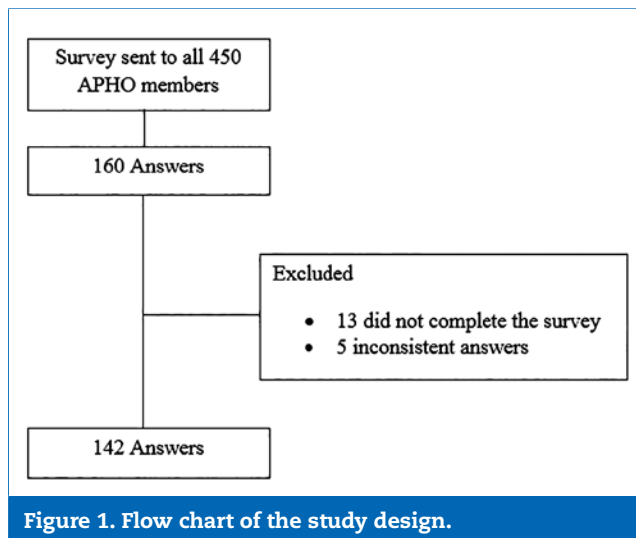
This study aims to characterize the sample of responders and present the data obtained from the evaluation on the

knowledge, opinion, values, and practice (KOV) of dental hygienists in Portugal concerning pit and fissure sealants.

## Material and methods

An observational cross-sectional study was conducted from December 2018 to June 2019 in dental hygienists from Portugal who were members of the Portuguese Association of Dental Hygienists (APHO). A non-probabilistic sample was obtained by emailing a survey to all contacts of APHO. The survey was sent twice, with a one-month interval, to increase the number of answers and, consequently, the sample size. One hundred and sixty members answered the survey, but 13 did not complete it, and five gave inconsistent answers. These 18 respondents were excluded from the study. The final sample was composed of 142 Portuguese dental hygienists (Figure 1).

The study authors translated to Portuguese and culturally adapted to Portugal a Spanish KOVP questionnaire<sup>2</sup> to evaluate the dental hygienists' KOVP regarding dental sealants. Two experts in the area verified the adapted survey. Facial validity was checked by three dental hygiene and dentistry students from the Faculty of Dental Medicine of the University of Lisbon.



The questionnaire was divided into two parts. The first one had 31 five-point Likert-scale statements (1 = strongly disagree; 5 = strongly agree) to evaluate KOVP organized in four categories. The second part had four questions on the respondents' demographics by the following metrics: sex, years of experience ( $\leq 3$  years, 4-15 years,  $\geq 16$  years), place of work (urban, suburban, both), and sector of work (public, private, both). By submitting their answers, all participants agreed with the terms and conditions of this study.

For the statistical analysis, the IBM SPSS 25 (Statistical Package for the Social Sciences) was used to determine frequency distribution, mean, and standard deviation of the Likert scale for each of the 31 survey statements and each of the four assessment domains (knowledge, opinion, values, and practice). The Wilcoxon matched-pairs signed-ranks test, the Mann-Whitney test, the Kruskal-Wallis test, the Spearman's correlation, and the V-Cramer test were used for data analysis. All data were analyzed with a significance level of 0.05.

## Results

A sample of 142 Portuguese dental hygienists, 86.6% female ( $n=123$ ) and 13.4% male ( $n=19$ ), participated in this study. The mean ( $\pm$  SD) years of experience were  $10.84 \pm 8.3$  (range 1-32). Regarding practice location, 69.0% ( $n=98$ ) worked in urban regions, 9.9% ( $n=14$ ) in suburban regions, and 21.1% ( $n=30$ ) in both. (Table 1)

The KOVP groups' (four groups: knowledge, opinion, value, and practice) results were analyzed and then associated with demographics (namely, sex, years of experience, sector of work, and place of work). The KOVP results, on a scale of 0 to 5, were as follows: knowledge =  $3.63 \pm 0.29$ ; value =  $2.92 \pm 0.44$ ; opinion =  $2.87 \pm 0.42$ ; and practice =  $3.76 \pm 0.46$ . The four KOVP statements were associated with the demographics, generating 16 metrics that ranged from 2.80 to 4.14 (1 = strongly disagree; 5 = strongly agree), indicating a positive impression of dental sealants.

Table 2 shows that 98.6% of dental hygienists were familiarized with the technique of pit and fissure sealants and believed they should be evaluated after placement. In total, 9.1% of the respondents stated that materials used for placing seal-

Table 1. Demographics of the study sample.

	Sex						
	Male			Female			
	n	Mean $\pm$ SD	n	%	Mean $\pm$ SD	n	%
<b>Years of experience</b>	142	14.32 $\pm$ 8.71	19	13.4	10.30 $\pm$ 8.13	123	86.6
<b>Sector</b>							
Public	27		3	15.8		24	19.5
Private	100		14	73.7		86	69.9
Both	15		2	10.5		13	10.6
<b>Place of work</b>							
Urban	98		14	73.7		84	68.3
Suburban	14		0	0		14	11.4
Both	30		5	26.3		25	20.3

**Table 2. Percentage and mean  $\pm$  standard deviation of the statements' scores.**

Questions	Percentage					Mean $\pm$ SD
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
<b>Knowledge</b>						
<b>K1</b> I think that the effectiveness of fissure sealants is strongly supported by scientific evidence.	0	9.9	13.4	42.3	34.5	4.01 $\pm$ 0.93
<b>K2</b> There is scientific evidence for the use of dental sealants on initial caries.	4.2	16.2	28.2	36.3	14.8	3.42 $\pm$ 1.06
<b>K3</b> I am familiarized with the technique of placing dental sealants.	0.7	0	0.7	19	79.6	4.77 $\pm$ 0.52
<b>K4</b> I believe that dental sealants should be reviewed after placement.	0	0	1.4	17.6	81	4.80 $\pm$ 0.43
<b>K6</b> I think that sealants should only be used in newly erupted teeth.	25.4	40.1	13.4	16.2	4.9	2.35 $\pm$ 1.16
<b>K7</b> I think that sealants wear out easily.	12.7	35.9	31	13.2	4.2	2.63 $\pm$ 1.03
<b>K8</b> I believe that a caries risk assessment must be performed to prevent overtreatment.	0.7	5.6	13.4	33.1	47.2	4.20 $\pm$ 0.92
<b>K9</b> Pit and fissure sealants have adverse effects.	19.7	34.5	23.2	16.2	6.3	2.55 $\pm$ 1.16
<b>K10</b> I believe the technique of applying a sealant is the most important aspect for the success of the treatment.	0.7	7	13.4	39.4	39.4	4.10 $\pm$ 0.93
<b>K11</b> I agree that resin sealants are more effective than glass ionomer sealants.	6.3	12	64.8	10.6	6.3	2.99 $\pm$ 0.85
<b>K12</b> The most important factor for adhesion in sealant placement is proper acid etching.	9.9	28.9	33.2	30.3	7.7	2.97 $\pm$ 1.14
<b>Value</b>						
<b>V1</b> I think this technique takes time to do correctly.	6.3	28.2	17.6	38.7	9.2	3.16 $\pm$ 1.12
<b>V2</b> The materials used for sealant placement are very expensive.	7.7	35.2	47.9	7.7	1.4	2.60 $\pm$ 0.79
<b>V3</b> I do not use sealants very often as a preventive method because their effect is short-lived.	32.4	45.1	15.5	4.9	2.1	1.99 $\pm$ 0.93
<b>V4</b> Dental sealants are used less than they should be.	7.7	16.2	32.4	32.4	11.3	3.23 $\pm$ 1.09
<b>V5</b> The oral health team at my clinic communicates the importance of using sealants to the patients.	7.7	8.5	21.1	36.6	26.1	3.65 $\pm$ 1.18
<b>Opinion</b>						
<b>O2</b> It is difficult to justify the cost of sealants to patients.	21.8	45.8	19.7	11.3	1.4	2.25 $\pm$ 0.96
<b>O3</b> I think my patients understand the benefits of using sealants.	0.7	1.4	7	57	33.8	4.22 $\pm$ 0.69
<b>O4</b> It is necessary to promote the use of sealants amongst dentists and dental educators.	2.1	8.5	21.8	44.4	23.2	3.78 $\pm$ 0.96
<b>O5</b> I apply dental sealants because the General Directorate of Health has instructed me to.	26.1	28.2	26.8	11.3	7.7	2.46 $\pm$ 1.21
<b>O6</b> I use dental sealants in the oral public sector because they are easy to apply and patients find them comfortable.	9.2	18.3	54.2	12	6.3	2.88 $\pm$ 0.95
<b>O7</b> Since working in the oral health public community, I have a greater belief in sealants' effectiveness.	10.6	13.4	56.3	13.4	6.3	2.99 $\pm$ 0.97
<b>Practice</b>						
<b>P1</b> Sometimes, I avoid dental sealants for sealing over caries.	13.4	3.1	13.4	32.4	9.9	2.94 $\pm$ 1.25
<b>P2</b> I think sealants, besides being a preventive method, can also have a restorative effect and can be used on incipient caries.	12.7	21.1	28.4	32.4	4.9	2.96 $\pm$ 1.11
<b>P3</b> This sealing technique, when used alongside fluoride application, may reduce the decay rate more significantly.	0	5.6	8.5	45.1	40.8	4.21 $\pm$ 0.82
<b>P4</b> In the case of a partial or total loss of sealant, I would recommend reapplication.	2.1	3.5	6.7	45.8	42.3	4.23 $\pm$ 0.87
<b>P5</b> The most important factor for adhesion in sealants is proper isolation.	0	0.7	6.3	39.4	53.5	4.46 $\pm$ 0.64
<b>P7</b> The benefits of using sealants should be considered regarding the patient's risk of caries, and clinicians should follow specific guidelines.	0.7	3.5	10.6	48.8	44.4	4.25 $\pm$ 0.83

**Table 3. General values table for knowledge, values, opinion, and practice.**

	Knowledge K1-K12	Values V1-V2	Opinion O1-O7	Practice P1-P7	Total
<b>Sex</b>					
Male n = 19	3.59 ± 0.28	3.05 ± 0.38	4.85 ± 0.49	3.70 ± 0.35	3.36 ± 0.27
Female n = 123	3.63 ± 0.30	2.90 ± 0.45	2.87 ± 0.46	3.76 ± 0.46	3.37 ± 0.26
Total n = 142	3.63 ± 0.29	2.92 ± 0.44	2.87 ± 0.46	3.76 ± 0.46	3.37 ± 0.26
p <sup>a</sup>	0.461	0.187	0.575	0.481	0.723
<b>Years of experience</b>					
≤ 3 years n = 33	3.47 ± 0.30*	2.80 ± 0.44	2.85 ± 0.49	3.62 ± 0.49	3.26 ± 0.25*
4-15 years n = 64	3.70 ± 0.27*	2.99 ± 0.42	2.82 ± 0.42	3.75 ± 0.42	3.40 ± 0.24
≥ 16 years n = 45	3.64 ± 0.28	2.92 ± 0.46	2.95 ± 0.48	3.87 ± 0.49	3.42 ± 0.26*
p <sup>b</sup>	< 0.01*	0.221	0.608	0.126	0.020*
<b>Sector</b>					
Public	3.61 ± 0.26	3.00 ± 0.47	3.20 ± 0.44*	3.77 ± 0.39	3.45 ± 0.22
Private	3.62 ± 0.31	2.91 ± 0.42	2.77 ± 0.42*	3.69 ± 0.46*	3.33 ± 0.25*
Both	3.69 ± 0.26	2.86 ± 0.53	2.98 ± 0.46	4.14 ± 0.48*	3.50 ± 0.28*
p <sup>b</sup>	0.778	0.722	< 0.01*	< 0.01*	0.047*
<b>Place</b>					
Urban	3.62 ± 0.30	2.92 ± 0.43	2.82 ± 0.43	3.71 ± 0.46	3.35 ± 0.25
Suburban	3.64 ± 0.23	3.02 ± 0.35	3.06 ± 0.44	3.81 ± 0.48	3.45 ± 0.24
Both	3.64 ± 0.32	2.88 ± 0.55	2.96 ± 0.53	2.87 ± 0.46	3.42 ± 0.29
p <sup>b</sup>	0.966	0.469	0.155	0.183	0.277

\* Statistically significant; <sup>a</sup> Mann-Whitney test; <sup>b</sup> Kruskal Wallis test

**Table 4. Relationship between mean, knowledge, values, opinions, and practice (Spearman's correlation).**

	Knowledge	Values	Opinion	Practice
<b>Spearman's correlation</b>				
<b>Knowledge</b>	1	0.002 p = 0.980	0.098 p = 0.247	0.459 p < 0.01*
<b>Values</b>	0.002 p = 0.980	1	0.272 p < 0.01*	0.137 p = 0.105
<b>Opinion</b>	0.098 p = 0.247	0.272 p < 0.01*	1	0.200 p = 0.017*
<b>Practice</b>	0.459 p < 0.01*	0.137 p = 0.105	0.200 p = 0.017*	1

\* Statistically significant

ants were very expensive, and 7% that their effect was not long-lasting. A total of 12.7% of dental hygienists found it difficult to justify the costs of sealants to patients, and 67.6% thought the use of sealants should be promoted among dentists and dental hygienists.

Table 3 shows a statistically significant difference when comparing knowledge between years of experience. The group of 4–15 years of experience (3.70 ± 0.27) presented better scores

on knowledge than the group with ≤3 years of experience (3.47 ± 0.30) (p < 0.01).

When comparing opinions between sectors of work, workers in public clinics (3.20 ± 0.44) had a better opinion on dental sealants than those in private clinics (2.77 ± 0.42) (p < 0.01). Also, professionals working in both public and private clinics (4.14 ± 0.48) had higher scores for opinion than those working only in private clinics (3.69 ± 0.46) (p < 0.01).

Table 4 shows the correlation between knowledge, opinion, values, and practice. A moderate positive linear correlation between knowledge and practice was found ( $p < 0.01$ ), and the other variables showed weak positive linear correlations among themselves ( $p > 0.05$ ). There was no negative correlation between the variables.

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## Discussion

The lack of previous similar studies in Portugal regarding oral health professionals' KOVP on dental sealants does not allow for comparisons. However, this study was based on a prior one done in Spain,<sup>2</sup> allowing a comparison between two neighboring countries.

This study's findings show that Portuguese dental hygienists have a positive KOVP regarding pit and fissure sealants. The statistical findings for KOVP associated with the demographics showed that knowledge was significantly associated with years of experience. Dental hygienists with 4-15 years of experience obtained significantly better scores on knowledge than those with  $\leq 3$  years of experience. This finding results from more years of experience enhancing practice, which improves knowledge. On the other hand, the data from the Spanish study<sup>2</sup> showed that fewer years of experience assured better scores on knowledge; yet, this was not evidence-based knowledge but instead research knowledge obtained during the professionals' studies. Accordingly, several studies show that some countries also lack professional/personal evidence-based knowledge. A study from 2010 conducted in the USA indicated that dentists used dental sealants as a preventive routine but had poor evidence-based knowledge.<sup>11</sup> A more recent study from 2018 indicated that dental students in India had enough knowledge about pit and fissure sealants but lacked evidence-based knowledge about this practice.<sup>18</sup>

This multivariate analysis from Portugal found statistical differences when comparing sectors of clinical practice regarding practice. However, this was not detected in Spain,<sup>2</sup> where all dental hygienists, regardless of where they worked, had similar scores on practice. Both studies showed significant differences when associating the sector of clinical practice with opinions. While Portuguese data showed that opinions were higher in professionals working in public clinics than those working in private ones, Spanish data<sup>2</sup> showed that professionals working in both sectors of clinics were the ones with the highest scores on opinions. Studies that evaluate models for behavior change suggest that legal and economic issues affect changes in the sector of clinical practice greatly.<sup>10,19</sup> This rationale may explain why Portuguese dental hygienists working in public clinics, where the state covers the sealants' expense without affecting their salary, have significantly higher opinion scores than those working in private clinics. In private clinics, some workers might be influenced to not apply as many sealants as they should because the clinic has to support the costs of the treatment or because their salary might change depending on the treatments given, therefore opting for other techniques that may benefit their income.

The positive linear correlation between knowledge and practice found can be important for future decisions by the government to apply more measures to improve the use of dental sealants, as it is already known that, by stimulating the knowledge of this technique, we will have more positive practice.

When comparing the data obtained in this study with the data obtained in a previous study in Spain,<sup>2</sup> Portuguese dental hygienists' results tended to be better: Spanish dental hygienists had neutral-to-positive feelings and lower scores in all four categories (knowledge =  $3.57 \pm 0.41$ ; value =  $2.58 \pm 0.77$ ; opinion =  $2.17 \pm 0.42$ ; practice =  $3.56 \pm 0.46$ ).

This study's practice score indicates that Portuguese dental hygienists have good practices regarding dental sealants, which are better than in other countries. In Spain, a study to evaluate the dentists' KOVP showed that these professionals were aware of the effectiveness and had neutral-to-positive impressions of dental sealants but underused them.<sup>6</sup> Two studies from 2010 and 2011 conducted in Greece indicated that dentists in this country believed in and applied prevention measures, but only 1/3 of them used fissure sealants in their clinical practice, indicating a low use of dental sealants.<sup>7,8</sup>

This study's sample represents a limitation. This non-probabilistic sample of 142 dental hygienists from a population of approximately 520 active dental hygienists in Portugal (27.3% of dental hygienists) compromises its external validity and limits the extrapolation of data to all dental hygienists in Portugal. Also, the fact that the survey was sent by email may have limited the number of responses, as it was only available to those with Internet access.

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## Conclusions

Portuguese dental hygienists have positive ideas, good knowledge, and good practices regarding dental sealants. Dental hygienists working in public clinics have better opinions about dental sealants, probably due to the national oral health program's support in terms of costs. There is a positive correlation between knowledge and practice, meaning that when one is enhanced, the other will also improve, and this can be used to further increase the use of dental sealants in Portugal.

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## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that they have followed their work center protocols on access to patient data and for its publication.

**Right to privacy and informed consent.** The authors declare that no patient data appear in this article.

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## Conflict of interest

The authors have no conflicts of interest to declare.



## REFERENCES

1. Mathur V, Dhillon J. *Dental Caries: A Disease Which Needs Attention*. Indian J Pediatr. 2017;85:202-6.
2. San Martin L, Huertos-Marchante A, Galvan-Martos J, Rodriguez-Lozano F. *Dental sealant knowledge, opinion, values and practice of Spanish dental hygienists*. Int J Dent Hyg. 2015;15:46-52.
3. Ahovuo-Saloranta A, Forss H, Walsh T, Hiiri A, Nordblad A, Mäkelä M, et al. *Sealants for preventing dental decay in the permanent teeth*. Cochrane Database Syst Rev. 2013;28:CD001830.
4. San-Martin L, Ogunbodede E, Kalenderian E. *A 50-year audit of published peer-reviewed literature on pit and fissure sealants, 1962–2011*. Acta Odontol Scand. 2013;71:1356-61.
5. Griffin S, Oong E, Kohn W, Vidakovic B, Gooch BF, Bader J, et al. *The Effectiveness of Sealants in Managing Caries Lesions*. J Dent Res. 2008;87:169-74.
6. San Martin L, Castaño A, Bravo M, Tavares M, Niederman R, Ogunbodede E. *Dental sealant knowledge, opinion, values and practice of Spanish dentists*. BMC Oral Health. 2013;13:12.
7. Michalaki M, Sifakaki M, Oulis C, Lygidakis N. *Attitudes, knowledge and utilization of fissure sealants among Greek Dentists: a national survey*. Eur Arch Paediatr Dent. 2010;11:287-93.
8. Oulis C, Berdouses E, Mamai-Homata E, Polychronopoulou A. *Prevalence of sealants in relation to dental caries on the permanent molars of 12 and 15-year-old Greek adolescents. A national pathfinder survey*. BMC Public Health. 2011;11:100.
9. Sarmadi R, Gahnberg L, Gabre P. *Clinicians' preventive strategies for children and adolescents identified as at high risk of developing caries*. Int J Paediatr Dent. 2010;21:167-74.
10. Clarkson JE, Turner S, Grimshaw JM, Ramsay CR, Johnston M, Scott A, et al. *Changing Clinicians' Behavior: a Randomized Controlled Trial of Fees and Education*. J Dent Res. 2008;87:640-4.
11. Tellez M, Gray SL, Lim S, Ismail AI. *Sealants and dental caries: dentists' perspectives on evidence-based recommendations*. J Am Dent Assoc. 2011;142:1033-40.
12. Direção Geral de Saúde. *Circular Normativa 13/DSE 12/11/1999*. <https://www.dgs.pt/directrizes-da-dgs/normas-e-circulares-normativas/circular-normativa-n-13dse-de-12111999-pdf.aspx>. Accessed November 12, 2018.
13. Programa Nacional de Promoção de Saúde Oral. <https://www.dgs.pt/paginas-de-sistema/saude-de-a-a-z/programa-nacional-de-promocao-de-saude-oral.aspx> Accessed November 12, 2018.
14. Saúde escolar – Áreas de intervenção – Saúde oral. <https://www.dgs.pt/promocao-da-saude/saude-escolar/areas-de-intervencao/saude-oral.aspx> Accessed November 12, 2018.
15. Von Amann GP. *Programa nacional de saúde oral*. Ministério da Saúde de Portugal. Direção Geral da Saúde. Lisboa. 2005.
16. Calado R, Ferreira CS, Nogueira P, Melo P. *Caries prevalence and treatment needs in young people in Portugal: the third national study*. Community Dent Health. 2017;34:107-11.
17. História da Profissão. <https://www.apfo.pt/node/53> Accessed November 12, 2018.
18. Ealla K, Kumar A, Turagam N, Sooraparaju S, Yerrapothu R, Bhaskaran M. *Knowledge analysis of pit and fissure sealants among the dental students of South India*. J Int Soc Prev Community Dent. 2018;8:508-12.
19. Bonetti D, Johnston M, Clarkson J, Turner S. *Applying multiple models to predict clinicians' behavioural intention and objective behaviour when managing children's teeth*. Psychol Health. 2009;24:843-60.