




## Use of Sealants in Permanent Molars by Brazilian Dentist: A Comparative Study of Public *versus* Private

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### ABSTRACT

**Objective:** To compare the use of sealants in permanent molars between public and private dentists in Brazil. **Material and Methods:** This was a cross-sectional and analytical web survey study. The convenience sample consisted of dentists in Brazil who answered a pre-tested online form released via social media between July and October 2021. Descriptive analysis was performed using absolute and relative frequencies (%) and associations using the Chi-square test ( $p < 0.05$ ). **Results:** Brazilian professionals participated in the study ( $n = 2,244$ ). Comparing the professionals from the public service with those from the private service, the former had a higher positive perception of the use of sealants as a preventive (92.4% *vs.* 81.1%,  $p < 0.001$ ) and therapeutic procedure (90.7% *vs.* 82.4%,  $p = 0.001$ ), higher percentage of non-invasive (91.7% *vs.* 83.8%,  $p < 0.001$ ) and invasive (22.8% *vs.* 12.0%,  $p < 0.001$ ) techniques. Professionals from the private service reported more frequently that they did not use sealants than those from the public service (14.0% *vs.* 4.8%,  $p < 0.001$ ). Resin sealant (97.7% *vs.* 94.9%,  $p = 0.015$ ) and Flow resin (62.0% *vs.* 54.3%,  $p = 0.013$ ) were the most used by professionals in the private service. The use of glass ionomer cement was not associated with the type of service (75.1% *vs.* 77.2%,  $p = 0.172$ ), nor was the use of adhesives (0.6% *vs.* 1.4%,  $p = 0.195$ ) or resin with Giomer technology (1.9% *vs.* 2.2%,  $p = 0.856$ ) ( $p > 0.05$ ). **Conclusion:** The percentage of use of sealants among dentists in Brazil is high, especially among professionals in the public service, and the most used materials were resinous sealants and glass ionomer cement.

**Keywords:** Dentistry; Pit and Fissure Sealants; Molar; Public Health; Private Practice.

## Introduction

A higher prevalence of carious lesions on the occlusal surfaces of posterior teeth compared to smooth surfaces demonstrates the need for special care, especially on the first and second permanent molars, which are considered more susceptible to developing dental caries [1-3]. These teeth sometimes present deep, irregular pits and difficult to clean fissures, allowing biofilm accumulation. As for the first permanent molars, it is worth highlighting their eruption around six years of age, a critical period [3] when the child has not acquired sufficient skills to remove the biofilm effectively and depends on their parents or guardians to carry out and supervise brushing, and some parents are unaware that the permanent tooth is already present, not giving real importance to the kid's dental hygiene. Therefore, the occlusal surface requires additional preventive, non-operative/non-invasive, micro, or minimally invasive interventions according to the patient's caries risk [4]. Sealants can contribute to keeping permanent molars healthy throughout the patient's life. When applied in the first years, right after the eruption, they contribute to the prevention of carious lesions in more than 90% of the cases [5].

The role of fluorides in preventing dental caries is undeniable. However, the use of a physical barrier represented by the sealant to isolate the biofilm from the dental surface and consequently inhibit mineral loss and the development of carious lesions [6-8] represents additional protection. Children and adolescents with sealed teeth presented a 29% caries incidence, while in those without sealed clefts, the incidence of caries was 74% after seven years of follow-up [9].

Sealants are considered an effective secondary preventive approach when placed in non-cavitated early carious lesions, inhibiting caries progression. They can be applied effectively to any primary or permanent posterior tooth without adverse effects [10].

The total failure rate of fissure sealants after one year was 27.7%. The most frequent reason for the failure of fissure sealants was marginal discoloration [11]. The efficiency of fissure sealing in preventing caries is related to the quality of the sealed fissure, as incompletely sealed fissures were more susceptible to caries development than completely sealed fissures [12].

Resin-based sealants reduced the percentage of dental caries compared to unsealed teeth, reassessed after 24 months [13]. However, a study that addressed the use of pit and fissure sealants versus fluoride varnishes in the prevention of dental caries in the permanent dentition of children and adolescents showed very low-quality evidence that the application of a resin-based sealant works better than the isolated application of fluoride varnish [14].

Effective moisture isolation is a crucial factor in the success of sealants, so the American Dental Association (ADA) recommends absolute insulation for sealant placement. However, it was shown that the type of insulation (absolute, relative, and Isolite system) had no impact on the pit and fissure sealant retention rate [15]. This data is attractive, especially for the public sector, as isolation with cotton rolls makes the procedure more feasible.

Over time, various protection modalities have been proposed to prevent the development of carious lesions in pits and fissures; however, the first idealized attempts to protect fissures involved the wear of tooth enamel. Due to the substantial scientific and technological development experienced in recent decades and with the advent of Minimal Intervention Dentistry [6], invasive procedures have become completely undesirable and have been replaced by non-invasive or micro-invasive protocols, depending on the type of procedure and material used to seal pits and fissures [6,7].

The most frequently used sealing materials are resin sealants and ionomeric sealants. Sealants based on glass ionomer cement are used with non-invasive protocols, while resin sealants require etching with phosphoric

acid for their retention. Therefore, the protocol used is considered micro-invasive. In addition to these materials, others have been proposed more recently, such as Flow resins and sealants with Giomer technology [16-18]. The indication of different materials depends on the patient's conditions, such as the risk of caries, tooth eruption stage, patient collaboration, and the characteristics of each material [16].

Therefore, a range of factors related to the option to seal a permanent tooth or not is observed. Guidelines on the use of sealants were developed by entities such as the American Association of People with Disabilities (AAPD) and the Brazilian Association of Pediatric Dentistry (ABOPED), aiming to provide professionals with updated information on the correct indication and clinical application. Even so, there are reports in the literature about the possible underutilization or inappropriate use of sealants in clinical practice by professionals working in public or private service [1,20]. The internet has been a widely used medium, but some videos contain incorrect information [20], and professionals and patients must have access to accurate and reliable information.

A fact that should be highlighted is that in recent decades, there has been a significant expansion in the number of Dentistry courses in Brazil, mainly in the private sector [21]. Thus, the country currently has professionals trained based on different philosophies [22].

The sharp increase in courses did not determine an improvement in the oral health of the Brazilian population [23], and a process of polarization of the disease is observed, with a socially unequal distribution [24]. The population's access to dental services, the National Oral Health Policy (PNSB) [25] began to emphasize primary health care through preventive and interventional procedures that promote adequacy of the oral environment [26].

If caries disease is present, there are a variety of effective interventions to treat carious lesions in a non-restorative manner, so the use of sealant in the public sector should not be underestimated since, even considering the cost, this method can benefit children in school age, both to prevent and to stop the carious process.

It is worth remembering that Brazil has the most extensive public oral health service in the world, and it is essential to consider the user's profile and their access to the public or private service, as well as to know how to prevent and treat caries in these centers. Although there are many studies to evaluate different aspects related to pit and fissure sealants, as mentioned in this introduction, the literature is scarce in studies to assess the conduct of professionals in the public and private sectors regarding the use of sealants and whether this method of prevention and treatment of dental caries is being adequately applied concerning contemporary working techniques and the use of different materials.

## Material and Methods

### Study Design

A cross-sectional web survey, with a quantitative and analytical approach involving a convenience sample of dentists working in Brazil, was used in this research.

### Ethical Aspects

This study was approved by the Research Ethics Committee of the State University of Ponta Grossa (47271321.0.0000.0105).

### Population and Sample

A convenience sample of dentists (CDs) working in Brazil was used; even so, a minimum number of professionals who should participate in the study was stipulated through sample calculation. The population of CDs in Brazil in May 2021, according to the Federal Council of Dentistry (CFO), comprised 336,249 professionals. For the sample calculation, the following aspects were considered: 50% population distribution, 95% confidence level, and 2% margin of error. The minimum number expected was 2,384 professionals.

### Eligibility Criteria

For data collection, Brazilian CDs working in Brazil with a single employment relationship (which could be in the public or private network) and double employment relationship (public, private, and teaching network) were included, and those who accepted the Free and Informed Consent Term. Participants who had already participated in the pilot study, those who submitted duplicate answers, or those who solely held teaching employment were excluded.

### Research Instrument

A questionnaire designed for this research was applied. The questionnaire contained closed and open questions divided into eight blocks: (1) Professional profile. (2) Use of sealants routinely. (3 to 7) Materials – resin sealant, glass ionomer cement, Flow resin, adhesive, resin with Giomer technology. (8) Perception of the sealant's effectiveness as a preventive and therapeutic method.

Before collecting the data to qualify the instrument, a pilot study was carried out between May and June 2021, with 17 dentists (10 Master's students from the Postgraduate Program in Dentistry and seven professors from the field of Pediatric Dentistry and Public Health at the State University of Ponta Grossa (UEPG)), using an online form (Google Forms®), which provided space for comments so that respondents could include their questions and suggestions. The suggestions or doubts presented were analyzed and added to the questionnaire by the team of researchers according to the research objectives. Three rounds were carried out until the final version was obtained.

### Data Collection

The questionnaire was made available from July to October 2021 as an online form (Google Forms®) and posted on the social networks (Instagram, Facebook, and WhatsApp) of the researchers involved.

At all times, responses to the form were monitored by a researcher, and new dissemination strategies were implemented considering the proportion of the sample by the CD's sex, age group, and region of the country.

This research was based on the study by Rizzo [27], analyzing sociodemographic data (distribution of professionals by gender, age group, and training time), data on training (public or private institution), and place of work (by Brazilian geographic states, macro-regions, and expertise).

### Variables

The variables of interest were the type of service to which the professional was linked, categorized into public service, private service, or public and private service. The independent variables were divided into 1) Sociodemographic characteristics: gender (female and male). 2) Training characteristics: type of undergraduate institution (public or private), training time, degree level, and work specialty. 3) Professional characteristics: Brazilian geographic region of operation, type of municipality in which professionals operated, and size of the

municipality where they worked. 4) Perception of technique: use of sealants for preventive purposes (totally disagree, partially disagree, neither agree nor disagree, partially agree, and totally agree) and therapeutically (totally disagree, partially disagree, neither agree nor disagree, partially agree, and totally agree). 5) Clinical use: frequency of pit and fissure sealants, type of sealant used (invasive or non-invasive), and materials used (resin sealant, glass ionomer cement, Flow resin, adhesive, and resin with Giomer technology).

### Data Analysis

Quantitative data were tabulated in an Excel® spreadsheet version 16.59 (Microsoft Office) and analyzed using the Statistical Package for the Social Science (SPSS) for Windows (version 16.0) program. Descriptive data were analyzed by absolute (n) and relative (%) frequency, and the comparison between types of service was carried out using the chi-square test ( $p < 0.05$ ).

### Results

A total of 2,405 responses were obtained. After removing nine duplicates and two refusals to participate, 2,394 valid responses were included. Next, 161 dentists who worked only in the teaching field were excluded, leaving 2,244 responses in the study.

There was greater participation of females (65.2%), coming from public undergraduate institutions (60.5%), graduated between 6 and 15 years (38.5%), and with a *Lato Sensu* postgraduate degree (66.8%). 61.9% did not have a specialty or worked in other specialties (different from Pediatric Dentistry or Public Health). They worked in cities in the interior of the country (42.2%) or with more than 500 thousand inhabitants (39.7%) in the Southeast region (36.9%) (Table 1).

Most participants were women with more training time, a postgraduate degree of the *Stricto Sensu* type, with a specialty in Pediatric Dentistry or Collective Health, who worked in a city in the interior, with less than 100 thousand inhabitants and in the South region, were linked to the public service or both (public and private) ( $p < 0.05$ ) (Table 1).

**Table 1. Sociodemographic, training, and professional characteristics of the Brazilian dentists participating in the study, distribution of agreement on the purpose of using sealants, type of sealants, and materials used in permanent molars according to the place of practice of Brazilian dentists.**

Variables	Total N (%)	Public N (%)	Private N (%)	Public and Private N (%)	p-value
Gender§					
Female	1464 (65.2)	204 (70.3) <sup>a</sup>	1076 (63.7) <sup>b</sup>	184 (69.4) <sup>a</sup>	0.028
Male	780 (34.8)	86 (29.7) <sup>a</sup>	613 (36.3) <sup>b</sup>	81 (30.6) <sup>a</sup>	
Type of graduation institution§					
Public	1358 (60.5)	184 (63.4) <sup>a</sup>	1013 (60.0) <sup>a</sup>	161 (60.8) <sup>a</sup>	0.534
Private	886 (39.5)	106 (36.6) <sup>a</sup>	676 (40.0) <sup>a</sup>	104 (39.2) <sup>a</sup>	
Training time (in years)§					
0 to 5 years	562 (25.0)	43 (14.8) <sup>a</sup>	487 (28.8) <sup>b</sup>	32 (12.1) <sup>a</sup>	<0.001
6 to 15 years	863 (38.5)	90 (31.0) <sup>a</sup>	680 (40.3) <sup>b</sup>	93 (35.1) <sup>ab</sup>	
16 to 25 years	569 (25.4)	90 (31.0) <sup>a</sup>	392 (23.2) <sup>b</sup>	87 (32.8) <sup>a</sup>	
26 or more	250 (11.1)	67 (23.1) <sup>a</sup>	130 (7.7) <sup>b</sup>	53 (20.0) <sup>a</sup>	
Higher degree level§					
Without specialization	377 (16.8)	37 (12.8) <sup>a</sup>	322 (19.1) <sup>b</sup>	18 (6.8) <sup>a</sup>	<0.001
Postgraduate <i>Lato Sensu</i>	1500 (66.8)	153 (52.8) <sup>a</sup>	1166 (69.0) <sup>b</sup>	181 (68.3) <sup>b</sup>	
Postgraduate <i>Stricto Sensu</i>	367 (16.4)	100 (34.5) <sup>a</sup>	201 (11.9) <sup>b</sup>	66 (24.9) <sup>c</sup>	
Specialist work area§					
Pediatric Dentistry/Public Health	856 (38.1)	179 (61.7) <sup>a</sup>	529 (31.3) <sup>b</sup>	148 (55.8) <sup>a</sup>	<0.001

Without specialization or others	1388 (61.9)	111 (38.3) <sup>a</sup>	1160 (68.7) <sup>b</sup>	117 (44.2) <sup>a</sup>	
Type of municipality of work <sup>§</sup>					
Capital	708 (31.6)	77 (26.6) <sup>a</sup>	579 (34.3) <sup>b</sup>	52 (19.6) <sup>a</sup>	<0.001
Metropolitan region	588 (26.2)	57 (19.7) <sup>a</sup>	470 (27.8) <sup>b</sup>	61 (23.0) <sup>a,b</sup>	
Interior	948 (42.2)	156 (53.8) <sup>a</sup>	640 (37.9) <sup>b</sup>	152 (57.4) <sup>a</sup>	
Size of the municipality <sup>§</sup>					
Over 500 thousand inhabitants	891 (39.7)	88 (30.3) <sup>a</sup>	734 (43.5) <sup>b</sup>	69(26.0) <sup>a</sup>	<0.001
Between 100 and 500 thousand inhabitants	701 (31.2)	77 (26.6) <sup>a</sup>	536 (31.7) <sup>a</sup>	88 (33.2) <sup>a</sup>	
Less than 100 thousand inhabitants	652 (29.1)	125 (43.1) <sup>a</sup>	419 (34.8) <sup>b</sup>	108 (40.8) <sup>a</sup>	
Brazilian geographic region <sup>§</sup>					
North	129 (5.7)	16 (5.5) <sup>a</sup>	103 (6.1) <sup>a</sup>	10 (3.8) <sup>a</sup>	0.001
North East	610 (27.2)	75 (25.9) <sup>a</sup>	462 (27.4) <sup>a</sup>	73 (27.5) <sup>a</sup>	
Midwest	265 (11.8)	32 (11.0) <sup>a</sup>	210 (12.4) <sup>a</sup>	23 (8.7) <sup>a</sup>	
Southeast	827 (36.9)	89 (30.7) <sup>a</sup>	637 (37.7) <sup>a</sup>	101 (38.1) <sup>a</sup>	
South	413 (18.4)	78 (26.9) <sup>a</sup>	277 (16.4) <sup>b</sup>	58 (21.9) <sup>a,b</sup>	
Effectiveness of sealants as a preventive measure <sup>§</sup>					
Disagree fully/partially	118 (5.3)	8 (2.8) <sup>a</sup>	99 (5.9) <sup>a</sup>	11 (4.2) <sup>a</sup>	<0.001
Not agree nor disagree	254 (11.3)	14 (4.8) <sup>a</sup>	221 (13.1) <sup>b</sup>	19 (7.2) <sup>a</sup>	
Agree fully/partially	1872 (83.4)	268 (92.4) <sup>a</sup>	1369 (81.1) <sup>b</sup>	235 (88.7) <sup>a</sup>	
Effectiveness of sealants as a therapeutic form <sup>§</sup>					
Disagree fully/partially	159 (7.1)	13 (4.5) <sup>a</sup>	129 (7.6) <sup>a</sup>	17 (6.4) <sup>a</sup>	0.001
Not agree nor disagree	197 (8.8)	14 (4.8) <sup>a</sup>	169 (10.0) <sup>b</sup>	14 (5.3) <sup>a</sup>	
Agree fully/partially	1888 (84.1)	263 (90.7) <sup>a</sup>	1391 (82.4) <sup>b</sup>	234 (88.3) <sup>a</sup>	
Sealant type: invasive <sup>§</sup>					
Yes	317 (14.1)	66 (22.8) <sup>a</sup>	202 (12.0) <sup>b</sup>	49 (18.5) <sup>a</sup>	<0.001
No	1927 (85.9)	224 (77.2) <sup>a</sup>	1487 (88.0) <sup>b</sup>	216 (81.5) <sup>a</sup>	
Sealant type: non-invasive <sup>§</sup>					
Yes	1921 (85.6)	266 (91.7) <sup>a</sup>	1416 (83.8) <sup>b</sup>	239 (90.2) <sup>a</sup>	<0.001
No	323 (14.4)	24 (8.3) <sup>a</sup>	273 (16.2) <sup>b</sup>	26 (9.8) <sup>a</sup>	
I do not perform sealing <sup>§</sup>					
Yes	272 (12.1)	14 (4.8) <sup>a</sup>	237 (14.0) <sup>b</sup>	21 (7.9) <sup>a</sup>	<0.001
No	1972 (87.9)	276 (95.2) <sup>a</sup>	1452 (86.0) <sup>b</sup>	244 (92.1) <sup>a</sup>	
Do you use resinous sealant as sealing material? <sup>§</sup>					
Yes	1915 (97.0)	262 (94.9) <sup>a</sup>	1418 (97.7) <sup>b</sup>	235 (95.5) <sup>a,b</sup>	0.015
No	59 (3.0)	14 (5.1) <sup>a</sup>	34 (2.3) <sup>b</sup>	11 (4.5) <sup>a,b</sup>	
Do you use GIC as a sealing material? <sup>§</sup>					
Yes	1502 (76.1)	213 (77.2) <sup>a</sup>	1091 (75.1) <sup>a</sup>	198 (80.5) <sup>a</sup>	0.172
No	472 (23.9)	63 (22.8) <sup>a</sup>	361(24.9) <sup>a</sup>	48 (19.5) <sup>a</sup>	
Do you use Flow resin as a sealing material? <sup>§</sup>					
Yes	1185 (60.0)	150 (54.3) <sup>a</sup>	900 (62.0) <sup>b</sup>	135 (54.9) <sup>a</sup>	0.013
No	789 (40.0)	126 (45.7) <sup>a</sup>	552 (38.0) <sup>b</sup>	111 (45.1) <sup>a</sup>	
Do you use adhesive (alone) as a sealing material? <sup>§</sup>					
Yes	15 (0.8)	4 (1.4) <sup>a</sup>	8 (0.6) <sup>a</sup>	3 (1.2) <sup>a</sup>	0.195
No	1959 (99.2)	272 (98.6) <sup>a</sup>	1444 (99.4) <sup>a</sup>	243 (98.8) <sup>a</sup>	
Do you use resin with Giomer technology as a sealing material? <sup>§</sup>					
Yes	40 (2.0)	6 (2.2) <sup>a</sup>	28 (1.9) <sup>a</sup>	6 (2.4) <sup>a</sup>	0.856
No	1934 (98.0)	270 (97.8) <sup>a</sup>	1424 (98.1) <sup>a</sup>	240 (97.6) <sup>a</sup>	

<sup>§</sup>N=2244; <sup>§</sup>N=1976; <sup>#</sup>N=1974.

Professionals stated that they fully or partially agreed with the use of sealants on permanent molars for both prevention (83.4%) and treatment (84.1%) of caries. Most professionals reported performing a non-invasive sealant technique (85.6%). Dental surgeons in the public or public/private service showed a higher prevalence of positive perception of sealants as a preventive or therapeutic method, with more excellent performance of invasive and non-invasive techniques ( $p < 0.05$ ). Dental surgeons in the private service responded more frequently that they did not use sealants ( $p < 0.05$ ) (Table 1).



According to the answers, resin sealant (97.0%) and glass ionomer cement (76.1%) were the most used materials for sealing pits and fissures. The adhesive (alone) was the least used (0.8%). Private service professionals made greater use of resin sealant and Flow resin ( $p < 0.05$ ), without differing between glass ionomer cement, adhesive, and resin with Giomer technology ( $p > 0.05$ ) (Table 1).

## Discussion

This study revealed that most dentists working in Brazil usually apply pit and fissure sealants to permanent molars. According to the literature, the existence of a proportion of professionals who do not perform this procedure can derive from several factors, such as a lack of knowledge of the technique for having concluded their undergraduate course long ago and have not updated their knowledge on the subject, the professional works in another specialty different from pediatric dentistry or public health (specialties familiar with this procedure), and also for lacking material and adequate resources in their workplace [21,28-30].

To expand the use of sealants, updated guidelines and protocols on the sealing technique are needed, which should be more disseminated in dental colleges also through continuing education courses, incorporating the latest recommendations from the American Dental Association (ADA) so that all professionals, regardless of the place or specialty of action could learn how to indicate and perform sealants in their clinical practice adequately and effectively. Current knowledge about the diagnosis of carious lesions, risk, and caries activity is essential data for the individual assessment of patients and their need to receive or not this intervention that must be carried out promptly, avoiding overtreatment [21].

This research demonstrated a difference in the demographic and professional profile according to the type of service. Women with more training time, postgraduate degrees of the *Stricto Sensu* type, and a specialty in pediatric dentistry or public health were associated with the public service or both (public and private). Women have predominated in health professions since the 2000s, with the feminization process including in Dentistry [25], and their greater insertion in the public service may derive from the search for greater financial stability and guarantee of labor rights [31].

The more extended period of training and the highest level of training among public service workers can be explained by the main form of recruitment via public tests, which in most cases includes a phase in which time of experience and qualifications or degree obtained are part of the professional's career plan [26]. The Collective Health/Public Health and Pediatric Dentistry specialties can be associated with training in a more general perspective since both focus on the integral care of the population, favoring prevention and health promotion to minimize the damage of major oral diseases. Also, in the public service, professionals are incentivized to have or seek training in Collective Health, including continuing education courses for workers in the public network [24].

The results showed that many dentists positively perceived using sealants, which is consistent with the current literature. Reviews show that sealants can prevent and stop the carious process by forming a microlayer that protects the dental surface, acting as a physical barrier between the occlusal surface and the oral environment. Such a barrier prevents the diffusion of bacterial acids from the biofilm to the tooth surface and, consequently, inhibits mineral loss and the development of carious lesions [32].

Dental surgeons working in the public and public/private networks had more positive perceptions of the use of sealants as a preventive and therapeutic method, consistent with the proposal of the National Oral Health Policy (PNSB). This policy seeks to reorient and structure the oral health care network, initiating new perspectives and strategies for the organization of dental work, focusing on the patient care model [33].

including a National Program of Permanent Education in Health, whose objective is to provide the practice permanent and continuing education of workers in the public network, since many were trained in another work logic [24]. On the other hand, professionals in the private sector may have a work profile that is still focused on specialties. They also have differentiated patients who do not need sealants, and the sealant might also be considered a devalued procedure.

In addition to having a better perception, public service professionals also showed greater adherence to using sealants in permanent molars. It is even noteworthy that professionals who had a double employment contract, that is, in the public and private sector, presented data closer to professionals who worked only in the public service. In this aspect, the prevention practices expected by the Unified Health System, especially in primary care, can be the determining factor for these professionals to perform this technique more often to prevent and stop carious lesions, a disease that affects the Brazilian population, mainly because it is a procedure of easy and fast execution, with low cost and proven effectiveness [34].

However, professionals should be aware that sealants should not be used indiscriminately or even become an overtreatment. According to the Joint Delphi Expert Consensus Statement of the European Organization for Caries Research (ORCA) and the European Federation of Conservative Dentistry (EFCO) [35], pit and fissure sealants should be used as a preventive and therapeutic method. For prevention, it should be used for patients without carious lesions (ICDAS 0) but with a high risk of developing carious lesions, mainly during the eruption of the permanent molars. When choosing the material, the probability of its retention must be considered. Suppose the patient has favorable conditions (possibility of effectively isolating the operative field, patient committed to improving dietary and hygiene habits). In that case, resin-based sealants should be the materials of choice. Otherwise, consideration should be given to glass ionomer cement as a sealing material [35,36]. For treatment, should be used for active incipient or microcavitated (ICDAS 1, 2, and 3) carious lesions in enamel and for active carious lesions in the outer third of dentin (up to 3 mm) that are microcavitated (ICDAS 4). In teeth in the process of eruption, one should choose to use the ionomeric sealant, as this material is less sensitive to humidity when compared to the resin sealant. The Brazilian Association of Pediatric Dentistry (ABOPED) follows the same guidelines [36]. Due to the complexity of caries disease, it is essential to always associate using sealants with dietary guidance and oral hygiene using fluoride toothpaste.

Although public service dentists performed more sealants using non-invasive techniques, they also performed the invasive sealant technique. This data is alarming since almost a quarter of professionals still perform invasive sealants, demonstrating the need for professional updating. Initially, the pit and fissure sealant was used for prevention purposes only, being placed only on sound surfaces, as there was fear of the occurrence of lesion progression. For a long time, this belief led professionals to remove all carious/demineralized tissue to eliminate the possibility of lesion progression and promote sealant retention [8]. However, it is now known that the presence of a properly sealed active carious lesion does not progress to more advanced stages, and the sealant is also used for therapeutic purposes [17,18].

Dentists use resin sealants, ionomeric sealants, and Flow resins, which stand out and confirm the data obtained in other studies [37,38]. According to the Ministry of Health [39], it is recommended to carry out prophylaxis of the tooth surface and isolation, in addition to acid etching of the enamel when using resin-based materials. For the indication of sealants, the system is based on the decision taken by the Faculty of Public Health of the University of São Paulo (FSP-USP), containing the following items: presence of the tooth in the oral cavity for less than two years, presence of carious lesion or signs of disease in the homologous tooth, and presence of biofilm on the dental surface. Private service professionals made greater use of resin sealant and Flow resin. This



may be due to the preference of these professionals for materials that present a fast execution technique due to the intense Flow of patients. In addition, the method depends on more excellent technology and the use of equipment with a higher cost, which may make their use in some public services unfeasible [40].

According to the findings of this study, although most Brazilian dentists perform pit and fissure sealants, it is imperative that more professionals, regardless of location or area of expertise, perform the procedure, given its effectiveness in preventing and paralyzing carious lesions. In addition, disseminating updated techniques and protocols based on Minimally Invasive Dentistry is necessary to avoid unnecessary wear of tooth structure. Although professionals in the public sector mostly perform the procedure, professionals working in the private network must follow the same ideology to prevent the appearance and progression of carious lesions, avoid more invasive and expensive treatments, and improve oral health and patient's quality of life. Another critical factor is encouraging professionals to update themselves frequently, whether by taking continuing education courses or participating in congresses and scientific fairs, where you can access the most recent evidence and new dental materials.






Despite working with calculated sample size and with the minimum number of participants that was reached, which might be a limitation of this study, it is worth mentioning that it was a web survey with data collection via social networks. Therefore, it became a convenience sample. Thus, the results may not accurately reflect the knowledge about sealants of all dentists in the country. As the study participants selected themselves to respond to the survey, selection bias may have occurred.

In addition, the questionnaire developed by the researchers was not intended to achieve reproducibility as a research instrument; therefore, it only went through some of the validation steps. However, the expert committee and pilot stages were carried out to improve the quality of the items to be researched. After compiling the data, the researchers identified that it would be essential to identify the barriers that prevent professionals from using sealants, an aspect that should be considered in future studies.

## Conclusion

The use of sealants in permanent molars was highly prevalent among dentists in Brazil. Greater positive perceptions of the use of sealants with preventive and therapeutic purposes and invasive and non-invasive sealants among professionals working in the public service or both (public and private) were observed when compared to professionals who worked only in the private service. The most used materials for pit and fissure sealants were resin sealant, ionomeric sealant, and Flow resin. However, the use of resin sealant was more common in the private service.

## Authors' Contributions

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LMW	 <a href="https://orcid.org/0000-0002-9696-0406">https://orcid.org/0000-0002-9696-0406</a>	Conceptualization, Methodology, and Validation.
ACRC	 <a href="https://orcid.org/0000-0001-7072-9444">https://orcid.org/0000-0001-7072-9444</a>	Methodology and Validation.
MFSJ	 <a href="https://orcid.org/0000-0001-8837-5912">https://orcid.org/0000-0001-8837-5912</a>	Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Data Curation, Writing - Original Draft and Writing - Review and Editing.
DSW	 <a href="https://orcid.org/0000-0002-1827-5040">https://orcid.org/0000-0002-1827-5040</a>	Conceptualization, Validation, Investigation, Data Curation, Writing - Original Draft, Writing - Review and Editing and Supervision.

All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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## Conflict of Interest

The authors declare no conflicts of interest.

## Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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