



# Indirect Restorative Materials and Techniques Selection and Used by General Dentists in Riyadh, Kingdom of Saudi Arabia

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## Abstract

**Introduction:** Dentistry is a highly commercialized profession, constantly changing with many new technologies, techniques, and dental materials. Patients suffering from dental decay and missing teeth would like to have their teeth replaced with the most aesthetically appealing and long-lasting material and technique possible and general dental practitioners provide a significant number of indirect restorations and fixed prostheses and the following are the most commonly used categories of indirect restorations in dental practice Inlays, Onlays, Veneers and Single crowns. **Objectives:** The purpose of this study is to investigate the use and selection of dental material used in indirect restorations by general dental practitioners in Riyadh, Kingdom of Saudi Arabia. **Methods:** This is an observational cross-sectional study based on a survey, validated questionnaires by Brunton Paul in the United Kingdom. The sample size was estimated using the Qualtrics calculator with a confidence level of 95% and a margin of error of 5%; a sample size of 226 collected from March 2020 to May. Data was entered on the computer using the "Microsoft Office Excel Software" program (2016) for Mac. Data was transferred to the Statistical Package of Statistical Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) Pearson Chi-Square and Fisher's Exact test we used to statistically analyzed. **Results:** A total of 226 participants, over half the participants, were females (53.3%). The majority were Saudi nationals (91.2%) and had 1-10 years of practice since graduation (62.2%, n=140). Just under half work in private sector (47.6%) and most of the participants reported material of choice for tooth-colored Inlays and Onlays and a case with anterior veneers is laboratory fabricated porcelain (56.2%) and (45.6%) respectively. The material of choice for core build-ups in vital teeth is a light-cured composite resin in 77.4% of cases and impression materials used are addition-cured silicones in 61.9% of cases. **Conclusion:** Our community needs more education about oral health and indications of esthetic dental treatments and their side effects. Also, we need to increase patients' awareness of the importance of proper treatment planning and more conservative treatment options.

**Keywords:** *Onlays, Inlays, Amalgam, Composite.*

## Introduction

Oral health is essential for our overall quality of life. Poor oral hygiene has a major negative impact on patients physically and psychologically [1]. Dental caries is a significant public health issue for all ages and sex as a result of various causes, including cariogenic ingestion of foods, insufficient fluoride intake, socioeconomic status, race, health, age, access to oral health, and other lifestyle services [2].

Nowadays with these factors in mind, dentistry is a highly commercialized profession, constantly changing with many new technologies, techniques, and dental materials. Patients suffering from dental decay and missing teeth would like to have their teeth replaced with the most aesthetically appealing and long-lasting

material and technique possible [3]. General dental practitioners provide a significant number of indirect restorations and fixed prostheses [4] and the following are the most commonly used categories of indirect restorations in dental practice Inlays, Onlays, Veneers, and Single crowns.

Indirect restoration (Inlays, Onlays) is used when a molar or premolar is too damaged to support a basic filling, but not so severely that it needs a crown [5]. The dentist's choice and recommendation to the patient can depend on various patient and tooth factors, such as tooth location, esthetics, patient desires, masticatory factors, and patient finances [6-8].

Based on their strength, durability, biocompatibility, conservative nature, since their introduction in 1983, veneers have been considered one of the most viable treatment modalities for

esthetics [9]. However, porcelain-fused-to-metal (PFM) has been used for many years and studied extensively. Studies have demonstrated a 94% success rate over 10 years [10].

Zirconia layered with a translucent ceramic, such as porcelain, is considered a more esthetic crown option, but the relatively low coefficient of thermal expansion and thermal diffusivity of zirconia compared to traditional metal coping materials led to laboratory complications. These manifested as veneer chipping and delamination [11,12].

The clinical success that the technique has found can be attributed to great attention to detail in a set of procedures, including planning the case, with the correct indication; conservative preparation of the teeth; proper selection of ceramics to use; proper selection of the materials and methods of cementation; and proper planning for the ongoing maintenance of these restorations [13]. With the significantly increased rate of change in contemporary clinical dentistry, it is important to explore the treatment options and choice of materials by general dentists so the aim of our research is: to investigate the use and selection of material used in indirect restorations by general dental practitioners in Riyadh, Kingdom of Saudi Arabia.

## Methods

This is an observational cross-sectional study based on a survey, validated questionnaires by Brunton Paul in the United Kingdom. To investigate the use and selection material of indirect restorations by general dental practitioners in Riyadh, KSA. The sample size was estimated using the Qualtrics calculator with a confidence level of 95% and a margin of error 5%; a sample size of 226 collected from March 2020 to May 2020. The inclusion criteria

conclude general dental practitioners both Male and Female, work in Private or government institutes in Riyadh, KSA, and who agree to participate in this study, while those who were students or interns were excluded. The questionnaire included some features like Gender, Nationality, Years of practice since graduation, and Workplace. The participants were asked about Material selection for core buildup on vital teeth, The types of post and core systems used, Impression materials, alloys, and luting cement used, Preference for full or partial coverage restorations, Use of metal-free restorations, cost of treatment, and the most requested dental treatment by patients. The questionnaire was adapted from a study conducted in New Zealand in 2018 by Brunton Paul A. et al., which was validated previously by the same author Brunton Paul A., but in 2008 in the United Kingdom. The collected data from google forms and prepared for analysis using the “Microsoft Office Excel Software” program (2016) for Mac. Data was transferred to the Statistical Package of Statistical Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) Pearson Chi-Square and Fisher’s Exact test we used to statistically analyzed. This study was approved by the Institutional Review Board at Riyadh Elm University, Riyadh, Kingdom of Saudi Arabia (reference: RC/IRB/2018/1603).

## Results

A total of 226 participants, over half the participants, were females (53.3%, n=120). The majority were Saudi nationals (91.2%, n=206) and had 1-10 years of practice since graduation (62.2%, n=140). Just under half work in the private sector (47.6%, n=107) (Table 1).

**Table 1: Personal characteristics**

		Frequency	Percent
Gender	Male	105	46.7
	Female	120	53.3
Nationality	Saudi	206	91.2
	Non-Saudi	20	8.8
Years of practice since graduation	1 -10 years	140	62.2
	11-20 years	29	12.9
	21-30 years	45	20.0
	31 - 40 years	5	2.2
	41+ years	6	2.7
Workplace	Private sector	107	47.6
	Government sector	81	36.0
	Both	37	16.4

Most of the participants reported they do not use dentine pins for retention of indirect restorations (78.2%, n=176) and do not use an impression mixing machine (65.6%, n=147). The majority reported they prefer metal-free full coverage restorations (65.3%, n=147), have done single zirconia crowns (70.7%, n=159), and believe that treatment cost affects patient choices (92.4%, n=206) (Table 2).

**Table 2: The response of the participants on the materials used for indirect restorations**

Questions	Answer	Frequency	Percent
Do you use dentine pins for retention of indirect restorations?	Yes	49	21.8
	No	176	78.2
Do you use an impression mixing machine?	Yes	77	34.4
	No	147	65.6
Do you prefer metal free full coverage restorations?	Yes	147	65.3
	No	78	34.7
Have you done single zirconia crowns?	Yes	159	70.7
	No	66	29.3
Do you believe that treatment cost affects patient choices?	Yes	206	92.4
	No	17	7.6

Most of the participants reported material of choice for tooth-colored Inlays and Onlays and for a case with anterior veneers is laboratory fabricated porcelain 56.2% (n=127) and 45.6% (n=103) respectively (Figures 1 and 2).

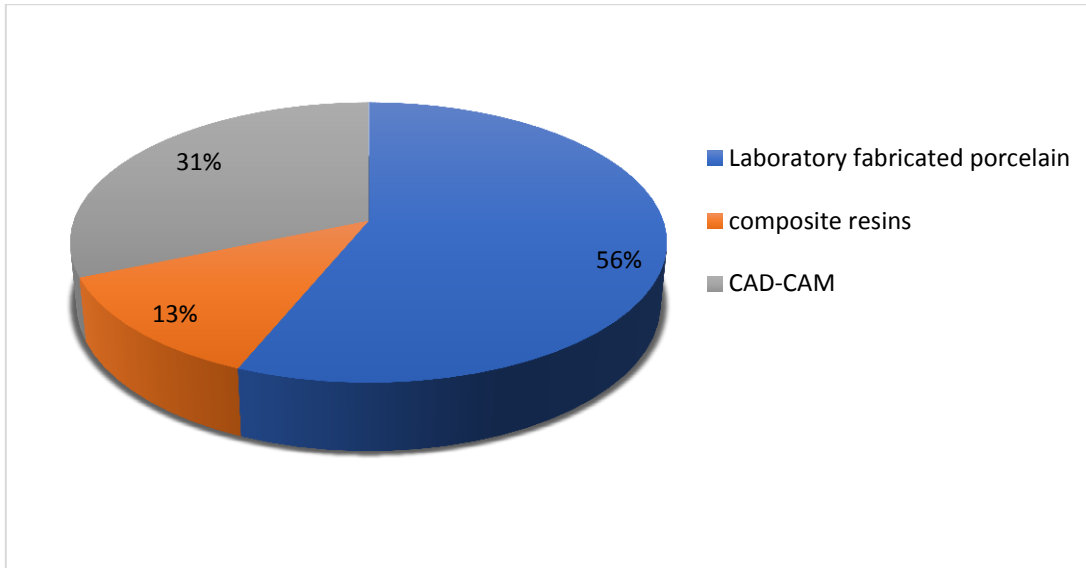


Figure 1: The material of choice for tooth-colored Inlays and Onlays

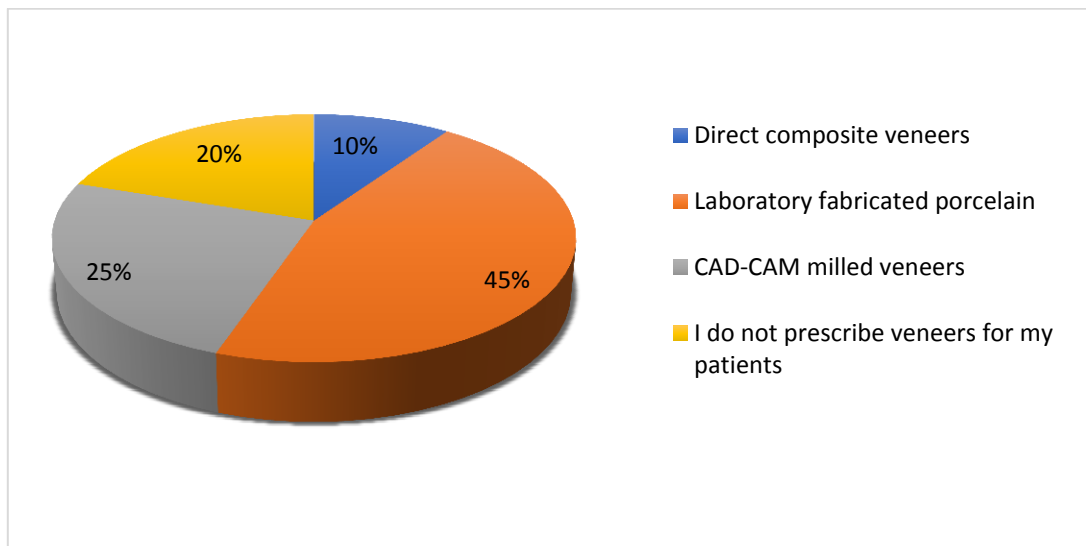


Figure 2: Material of choice for a case with anterior veneers

The majority reported a fiber post (73.3%, n=165) as the post system of choice (Figure 3). Distribution of preferred metal alloy for porcelain fused to metal (PFM) fixed prosthesis, choice of luting cement for cementation of single zirconia crown, and the most patient requested dental treatment in practice is shown in (Figures 3,5).

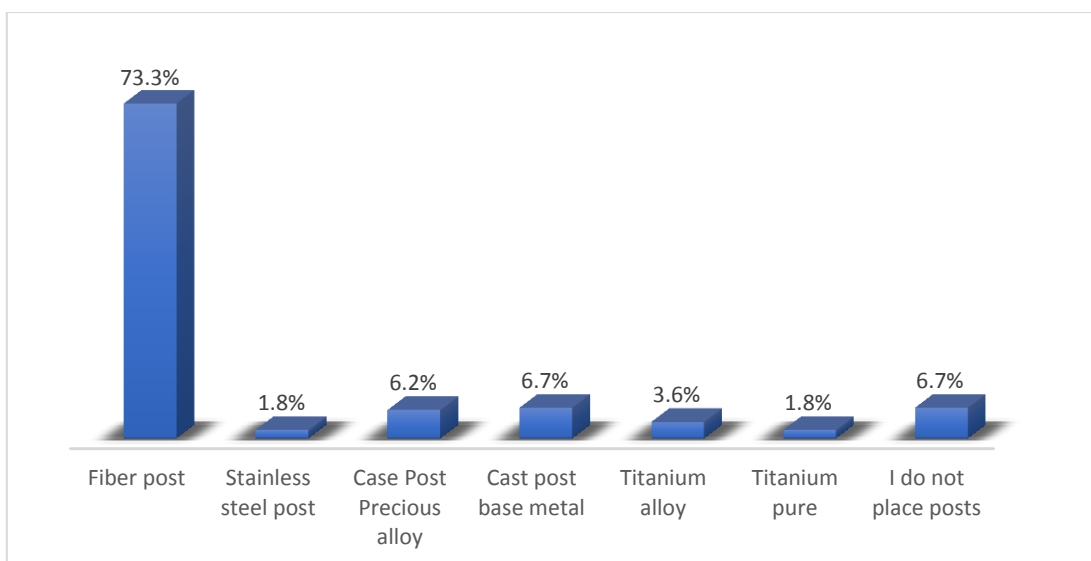


Figure 3: Post system of choice

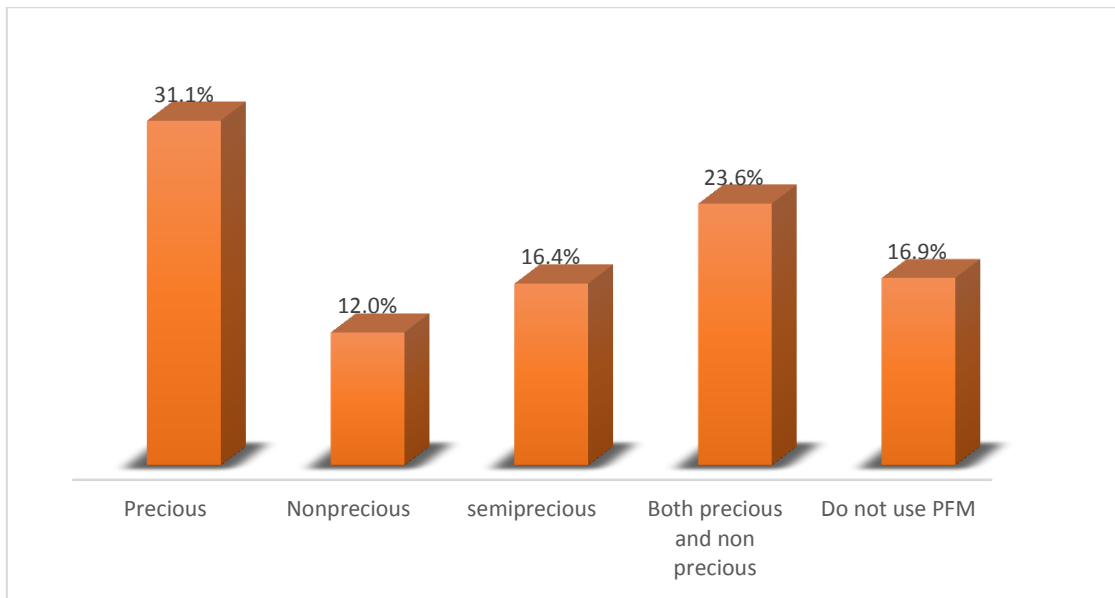


Figure 4: Preferred metal alloy for porcelain fused to metal (PFM) fixed prosthesis

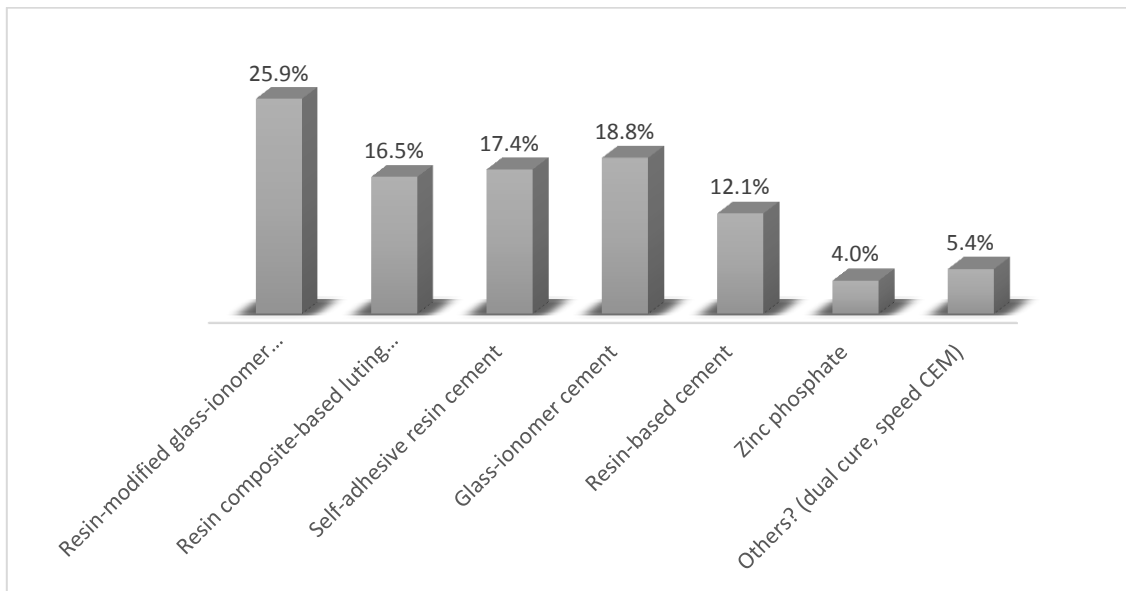


Figure 5: Choice of luting cement for cementation of single zirconia crown

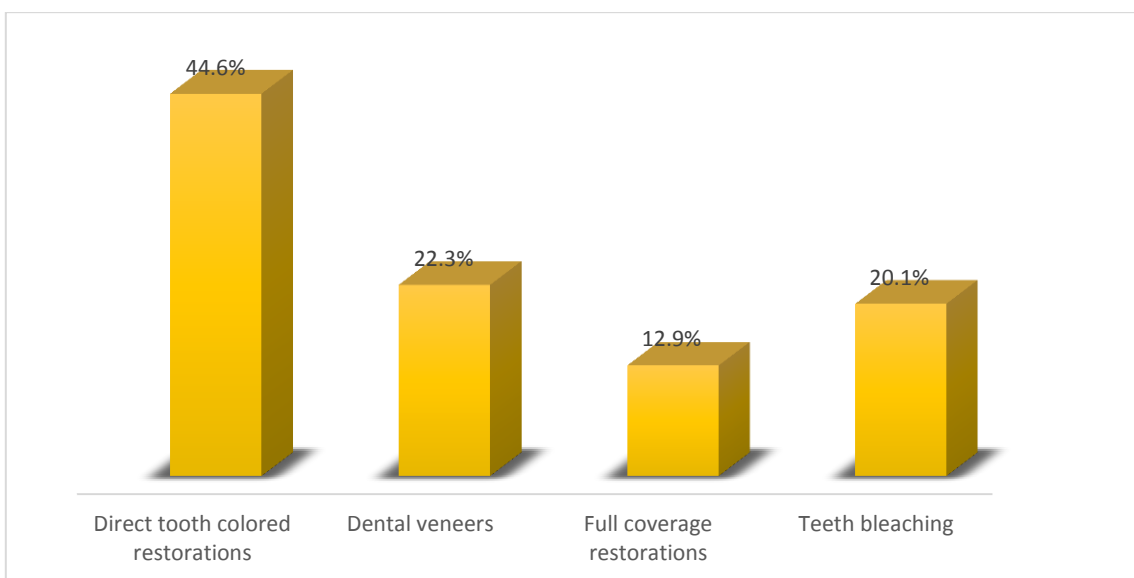


Figure 6: Most patient requested dental treatment in practice

The material of choice for core build-ups in vital teeth is light-cured composite resin in 77.4% (n=175) of cases and impression materials used are addition-cured silicones in 61.9% (n=140) of cases (Tables 3-4).

**Table 3: The material of choice for core build-ups in vital teeth (Multiple responses)**

Material of choice		Responses		Percent of Cases
		N	Percent	
	Amalgam	35	11.1%	15.5%
	Light cured composite resin	175	55.4%	77.4%
	Dual cured resin composite	69	21.8%	30.5%
	Glass ionomer	37	11.7%	16.4%
Total		316	100.0%	139.8%

**Table 4: Impression materials used (Multiple responses)**

Material of choice		Responses		Percent of Cases
		N	Percent	
	Addition cured silicones	140	37.8%	61.9%
	Polyether	54	14.6%	23.9%
	Condensation cured silicones	71	19.2%	31.4%
	Alginate	105	28.4%	46.5%
Total		370	100.0%	163.7%

Table 5 shows the association between personal characteristics and all the variables. Pearson Chi-Square and Fisher’s Exact test showed a statistically significant association between gender and ‘For a case with anterior veneers, what is your material of choice?’, ‘For cementation of single zirconia crown what is your luting cement of choice?’, and ‘What is the most patient requested dental treatment in your practice?’ (p<0.05). Two-way cross-tabulation showed males are more likely to use laboratory fabricated porcelain, females are more likely to use resin-modified glass ionomer cement as luting cement for cementation of single zirconia crown, and males are more likely to have patients requesting direct tooth-colored restorations in their practice.

There was a statistically significant association between workplace and ‘For porcelain fused to metal (PFM) fixed prosthesis which metal alloy do you prefer?’ and ‘What is the most patient requested dental treatment in your practice?’ (p<0.05). Participants in the Government sector are more likely to prefer precious metal alloy for porcelain fused to metal (PFM) fixed prosthesis and those in the private sector are more likely to prefer non-precious metal. Government sector participants are more likely to have patients requesting direct tooth-colored restorations in their practice and private sector participants are more likely to have patients requesting dental veneers in their practice.

**Table 5: Association between personal characteristics and all the variables**

Questions	p value			
	Gender	Nationality	Years of practice since graduation	Workplace
What is your material of choice for core build ups in vital teeth?	0.236	na	na	0.179
For tooth colored Inlays and onlays, what is your material of choice?	0.354	0.835	na	0.472
For a case with anterior veneers, what is your material of choice?	0.010*	na	na	0.226
Do you use dentine pins for retention of indirect restorations?	1.000	0.572	na	0.320
What is your post system of choice?	na	na	na	na
What impression material do you use?	0.315	0.256	na	0.990
Do you use an impression mixing machine?	0.481	0.328	na	0.280
For porcelain fused to metal (PFM) fixed prosthesis which metal alloy do you prefer?	0.445	na	na	0.021*
Do you prefer metal free full coverage restoration?	0.329	0.145	na	0.794
Have you done single zirconia crowns?	0.187	0.444	na	0.285
For cementation of single zirconia crown what is your luting cement of choice?	0.014*	na	na	na
What is the most patient requested dental treatment in your practice?	0.020*	na	na	0.005*
Do you believe that treatment cost affects patient choices?	0.205	0.165	na	0.986

na-not applicable (Condition for Chi-Square test was not met)

\* indicates statistical significance

## Discussion

In this study around 62.2 % are less than 10 years’ experience which reflects on the result which in using dentine pin for retention around 78% said that they are not using it , for core build-up we noticed a significant increase for using light-cured composite was 55.4 % compared to 11.2% use amalgam reflecting adequate awareness of general practitioners about the mercury poisoning and

also shows the direction towards chemo-mechanical bonding with tooth structure enhancing strength and retention of the restoration. On the other hand, GIC was slightly preferable to amalgam (11.7 %). Significant increase in using prefabricated fiber post 73% to other techniques such as stainless metal post 1.8 % for cast precious metal 6.8% which also reflects an awareness of the GP dentists in Riyadh of many studies conducted on prefabricated fiber post that support their use as they are durable and more

conservative in comparison to cast post. Our findings were in line with [14,15], they have reported an increasing trend to use fiber posts, especially in anterior teeth and among dentists with < 5 years of experience. This trend could be due to the favorable clinical and laboratory reports on fibre posts, the straightforward nature of the procedure, and the increased use of composite as a core material [3]. Regarding patients' choice of direct restorations 44% as their most requested treatment followed by veneers by 22% and for bleaching 15%, which may be due to the effect of social media and advertising.

## Conclusion

New materials and new techniques are embraced by the new generation of dentists in Riyadh. Prefabricated fiber post is dominating the dental field; however, alginate is still highly popular to this day. Significantly high awareness of amalgam contraindications and side effects is clearly displayed through our results, and there is more confidence in using composite resin restorations as they have proved to be durable and more esthetically pleasing materials. However, our community needs more education about oral health and indications of esthetic dental treatments and their side effects. Also, we need to increase patients' awareness of the importance of proper treatment planning and more conservative treatment options.

## Limitation

We faced some issues due to uncooperative attitude of some dentists who refused to take the survey, also online distribution doesn't guarantee a good response rate. Hopefully, we will continue this study in our internship and aim for a higher response rate.

## Conflicts of interest

The authors have no conflicts of interest to declare.

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This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Ethical approval

This study was approved by the Institutional Review Board at Riyadh Elm University, Riyadh, Kingdom of Saudi Arabia (reference: RC/IRB/2018/1603).

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