

## **Evaluation Of Patterns of Restorative Approaches Post-Endodontic Treatment: A nationwide survey of Dental Practitioners in Pakistan**

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### **Abstract:**

Long term effects of root canal therapy (RCT) have remained the subject of numerous clinical researches. The final coronal restoration, patient selection, operator abilities, patient age, specialty, affiliations of dental practitioners, and various clinical procedures, all have a significant impact on the outcome of root canal treated tooth. The purpose of this investigation was to determine dental practitioner's opinions, techniques, and materials used for the restoration of endodontically treated teeth (ETT) in Pakistan. A comprehensive nationwide survey regarding treatment strategies of ETT, on the post types and material used for core foundations were distributed either by email or by hard copies to the dentists in different parts of Pakistan (Urban and Rural). Descriptive statistics were used to analyze the responses to the questions. A total of 2000 participants were included in the survey, the response rate was 84.45%, 69.6% of them were male, and 30.4% were female. A response rate of 1:1 was achieved in both urban (50%) and rural (50%) areas. Out of the surveyed dentists, seventy-five percent of dental practitioners considered post placement for almost every post-endodontic restoration of ETT, whereas 70%

preferred prefabricated fiber posts exclusively. Composite resin (65%) was preferred for the core foundation, followed by glass ionomer cements (GICs) (30%). The desired material for post cementation was primarily dual polymerized adhesive resin cement cure resin composite (50%), followed by GIC (35%). Within the limitations of this survey-based investigation among dental practitioners in Pakistan, it was concluded that the treatment strategies of ETT are in accordance with the current state of evidence-based knowledge amongst dental practitioners in urban as well as rural areas and that the rural areas had limited access to the materials that reinforces the ETT.

**Keywords: Endodontically-treated teeth (ETT); Post and Core; Dental Practitioners; Restoration strategies**

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## 1. Introduction:

Various clinical researches documenting the long-term results of endodontic teeth have been reported and the results of those studies have revealed that the root canal treatment carried out by undergraduate and graduate students is of acceptable quality. Nevertheless, the root canal treatment outcome varies based on clinical procedures, patient selection, final coronal restoration, and techniques employed. Coronal as well as root fractures have been identified as the most common reasons for tooth repair and extraction following RCT, and post-endodontic restorations play a significant influence in the survival of endodontically treated teeth (ETT) (1). The treatment outcome may be influenced by root canal filling characteristics for instance insufficient condensation, inadequate filling of root canal, and extrusion of material into Periapical tissues. Various studies have shown that the incidence of apical periodontitis is frequently found in root canal treated teeth (2) (3).

Further research has found that a fine quality coronal restoration serves to reduce root canal re-infection, and crown cuspal covering enhance longevity of teeth following endodontic treatment. Coronal restoration greatly influences the outcomes of root canal treatment which has been warily observed in several clinical studies. Several researchers have yet questioned its significance, despite the fact that the results of many studies are suggestive about the significance of coronal restoration for the longevity of endodontic treatment. One source claims that the success of ETT is most significantly influenced by the quality of the obturation. Additionally, there is ongoing disagreement among dentists on the final restoration technique following RCT (4, 5) (6). Coronal restorations may be crucial for the outcome of endodontic therapy, based to the result of these searches, but some investigators have questioned this notion. According to one of the authors, the success of ETT depends largely on the quality of the obturation; also, dental professionals continue to disagree on the best type of final restoration to use. In multiple studies investigating how coronal restorations affect ETT survival, it has been found that indirect restorations hold a substantially higher survival rate as compared to direct restorations. According to several researches if final coronal restoration is not placed immediately or prolonged, leaves a poor impact on the long term prognosis of endodontic treatment (7). To the best of author's information, no comprehensive research on survival of

endodontically treated teeth or relevant study with a sizable sample size in the south Asian population have been conducted among Pakistan's urban and rural dental practitioners.

## **2. Methodology**

### ***2.1 Involvement of participants***

Out of a total of 2000 participants, 1689 dental practitioners returned the completed questionnaire, resulting in a response rate of 84.45%.

The questionnaire used in this current study was modified from a similar study performed in Turkey in 2020 (8). The questionnaire survey was mailed (soft copy through a link) and distributed via hand (hard copy) to 2000 dental practitioners all over Pakistan, encompassing both urban and rural locations. Those dentists who had received hard copies were visited within a month, from February 2023 to February 2024, and corresponding author had described the survey objectives to them. The survey was accessible online from 25 December 2023 to 25 January 2024.

This questionnaire's rationality was tested out using face validity by professionals holding experience and having understanding about the topic. It was thoroughly assessed by them whether the questions properly apprehended the topic of investigation. Secondly, a statistician had reviewed the questionnaire to set sights on frequent mistakes including double-barreled, unclear, and misleading questions. All dental professionals included in the database of the Pakistan Medical and Dental Council were the potential survey respondents. A letter of explanation was included, including the study's objectives, the authors' names, and the instructions. The questionnaire was generated online using Redcap software.

### ***2.2 Study design, setting and duration:***

The study design was a descriptive research study, the study encompassed the dental practitioners, covering the urban and rural dentists of Pakistan. The study duration was one month.

### ***2.3 Population and sampling:***

2000 dental practitioners were included in this study, this survey was anonymous so that who did not respond to the survey could not be identified and only data received from respondents was counted in the study. Following an explanation of the study objectives, selected patients were invited to participate willingly. Participants provided informed written consent before being a part of this research, the responses obtained were kept confidential.

Sample size was calculated by using OpenEpi online software, proportion of preferred composite resin for post-endodontic restorations was 52% (8), a sample size of 684 achieves, margin of error 5%, having significance level of 0.05. After counting 20% non-response rate, 982 participants were recruited for the study. To increase the validity of study, the number of

participants were increased by 50% and final number of participants recruited in the study was 2000.

#### **2.4 Statistical Analysis:**

Statistical package for Social Sciences (SPSS) Version 26 was used to compile and analyze data.

Categorical variables were summarized as frequency (percentage) and were compared by a chi-square test. Demographics such as clinical experience, affiliation, specialty, and geographic region were selected as variables for the frequency of using posts for the restoration of ETT.

#### **2.5 Questionnaire**

- 1. How long have you been practicing dentistry?** -5 years, 6-10 years, 11-20 years, >20 years.
- 2. Field of practice?** General dental practitioner, Operative Dentistry & Endodontics, Prosthodontics, Pediatric dentistry, Oral and maxillofacial surgery, Prosthodontics, Radiology, Periodontology.
- 3. What kind of institution do you practice in?** Private Practice, Private clinic, University hospital, Oral and dental health center, Other.
- 4. What kind of area do you practice in?** Urban. Rural.
- 5. Do you use posts in the treatment of endodontically treated tooth (ETT)?** Yes, No.
- 6. Do you believe that every endodontically treated tooth (ETT) must receive a post?** Yes, no, I don't know.
- 7. Frequency of using post?** Always, occasionally, rarely.
- 8. Do you believe that a post reinforces an ETT and reduces the fracture probability?** Yes, no, I don't know.
- 9. Type of the post you prefer the most?** Prefabricated metal post, cast post, Fiber post, I do not use posts in the treatment of my patients.
- 10. Choosing a particular post option depends on?** Economic factors, Esthetic purposes, Function, Ease of application, Ferrule effect, Width of the canal. Ease of removal, Other.
- 11. Choosing a restoration strategy?** Economic factor, Esthetic factor, Periodontal conditions of the tooth, The remaining tooth structure, Tooth location, Habits and speculations of patient, Other.
- 12. Type of coronal restoration you prefer the most:** Amalgam, Composite resin, Glass Ionomer, Inlays/ Onlays / Overlays.
- 13. Types of extra-coronal restoration you prefer the most with post and core?** Endo-crowns, Metal ceramic crowns, Porcelain crowns, Porcelain fused to metal crown, Zirconia crowns, Other.

14. **Types of extra-coronal restoration you prefer the most in absence of post?** Endo-crowns, Metal ceramic crowns, Ceramic composite resin veneer, Combined restorations, Other.
15. **Do you believe that creating a ferrule below the core foundation following post cementation increases fracture resistance?** Yes, no, I don't know.
16. **In your opinion, what is the main criterion in choosing between prefabricated posts and custom-made posts?** The remaining tooth structure, Ease of use, A reduced number of visits, Ease of removal when a problem has occurred, Cost, Aesthetic purposes, Tooth location (anterior or posterior), Canal width, Other.
17. **What type of cement do you use for post cementation?** Dual polymerized adhesive resin cement, chemically polymerized adhesive resin cement, Self-adhesive resin cement, Glass ionomer, Resin-modified glass ionomer cement, Zinc phosphate cement, Polycarboxylate cement, Other.
18. **What type of core build-up material do you mostly prefer to use with prefabricated posts?** Resin composite, Glass ionomer build-up material, Amalgam, Other.
19. **When do you usually insert the posts into the canal after obturation?**  **Directly 24 h after obturation?** One week post obturation, Two weeks post obturation, Three-week post obturation, Four weeks post obturation, Other.
20. **Should the tooth (with post and core) be crowned?** Yes, no, I don't know.
21. **Do you have availability of the materials mentioned in previous questions to restore ETT?** Yes, no, I don't know.
22. **Problems encountered on the restoration of EET?** Adhesive problems, Coronal fractures, Vertical fractures, Aesthetic problems.

### 3. Results:

The questionnaire was sent electronically and by hand to 20,000 dental practitioners enrolled in the Pakistan Medical & Dental Council. 1689 surveys were received, for a response rate of 84.45%.

#### 3.1 Demographic Data (Figure 1 – Figure 5):

The greatest number of participants (40%) had a bachelor's degree (BDS), followed by specialists (FCPS 25% and MDS 22%). The majority of clinical practitioners had worked in university hospitals for more than five years, with the longest tenures being six to ten years (35%), eleven to twenty years (20%), and more than twenty years (15%). Oral and dental health facilities followed with a 40 percent share. General dentistry accounted for 55% of the practice, with restorative and endodontist dentistry comprising about 15% and other specialties following. A response rate of 1:1 was achieved in both urban (50%) and rural (50%) areas.

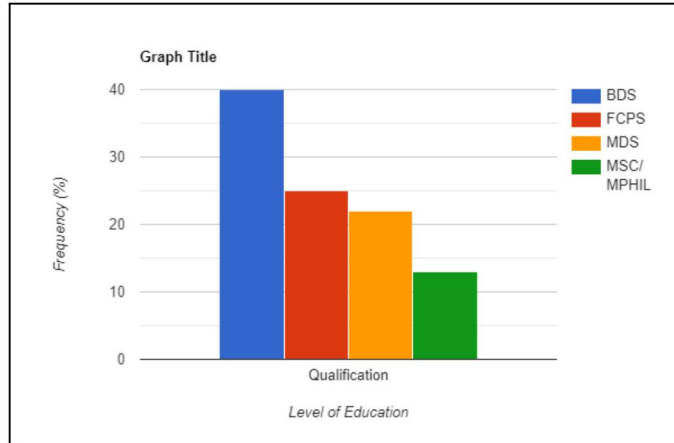


Figure: 1

Figure: 2- How long have you been practicing dentistry?

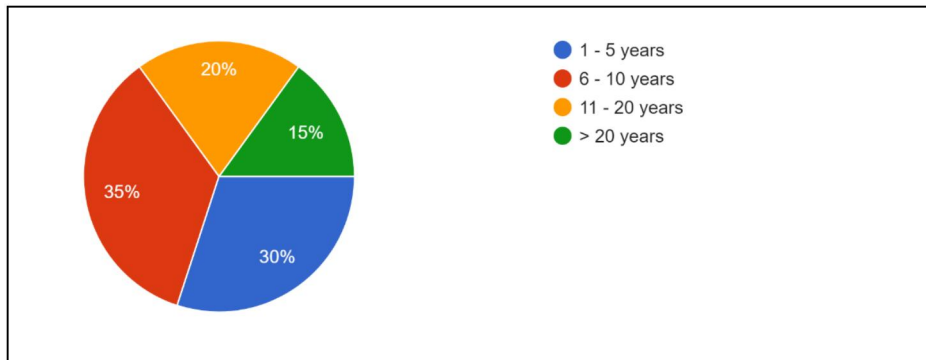


Figure: 3- What is your field of practice?

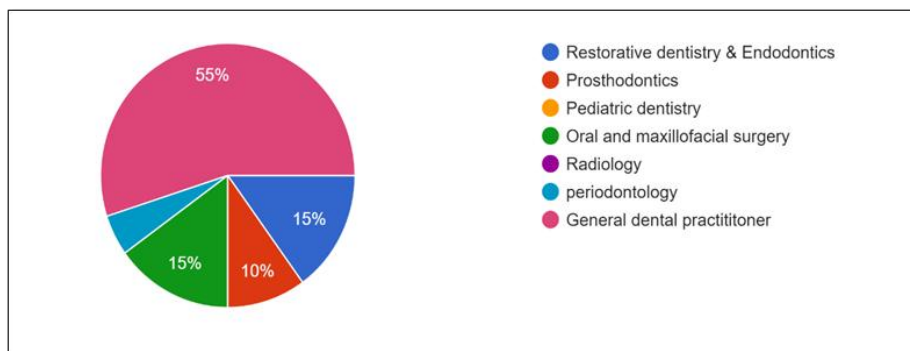




Figure: 4- What kind of institution do you practice in?

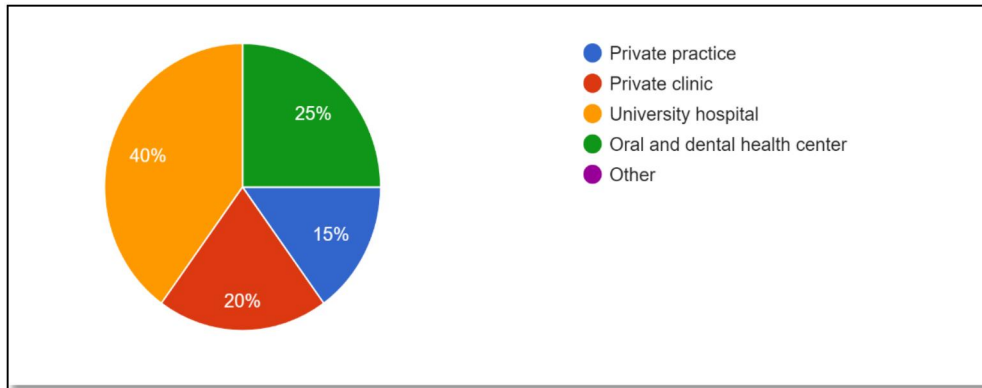
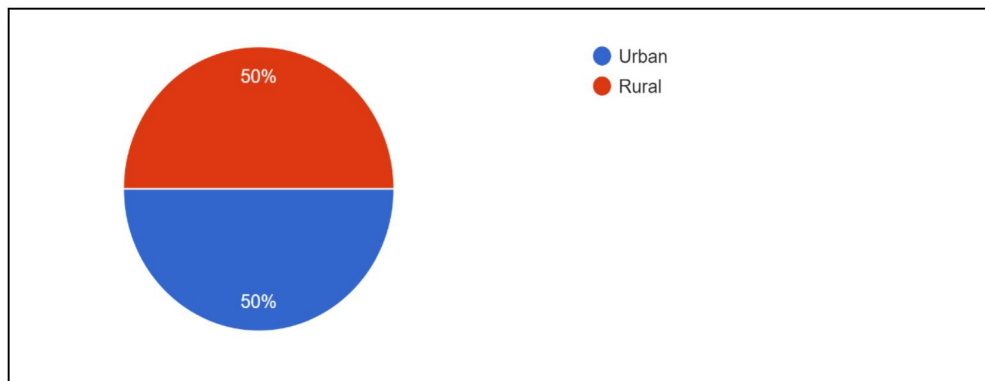


Figure: 5- What kind of area do you practice in?



### 3.2 (Figure 6 – Figure 24): Patterns in Post-Endodontic Restorations & The results associated with using posts.

Figure 6-7 depicts the outcomes of post application analyses. Seventy-five percent of dentist employed posts for post-endodontic treated teeth and Ninety percent believed that every endodontic treated tooth must receive post whilst ten percent with denial for this were the restorative dentist and endodontist. The frequency of post used by all the participants was either occasionally (55%) or rarely (45%).

Respondents reported that economic factors (30%), function (25%) and ease of application (25%) were the most important elements in selecting a post. Majority of participants (70%) used fiber posts. Fiber posts were more common among participants with more than 5 years and more than 20 years of clinical experience. Fiber posts were preferred in private clinics and university hospitals, although prefabricated metal posts were more commonly utilized in oral and dental health centers and choosing this restoration strategy was based majorly on the remaining tooth structure (88.2%)

Based on the findings, composite resins were primarily selected by great part of participants (65%) and all specialties except prosthodontists for post-endodontic restorations. When compared to composite resins, prosthodontists were substantially more inclined to use metal-ceramic crowns as extra-coronal restoration without post and core and the majority of extra-coronal restorations preferred. Furthermore, in university hospital settings, composite resins were more frequently employed than metal-ceramic crowns. Moreover, composite resin was the material of choice across all the dentists of urban and rural areas.

Vertical fracture was the most prevalent problem (47.1%) with post-endodontic restorations, followed by coronal (29.4%), adhesive (11.8%) and aesthetic concerns (11.8%). All the respondents agreed to the fact that all teeth with post and core should be crowned. Sixty percent of dentist had availability of the materials mentioned in questionnaire and 40% of the dentist who did not have access to these materials belonged to rural areas.

Figure: 6- Do you use post in the treatment of endodontically treated tooth (ETT)?

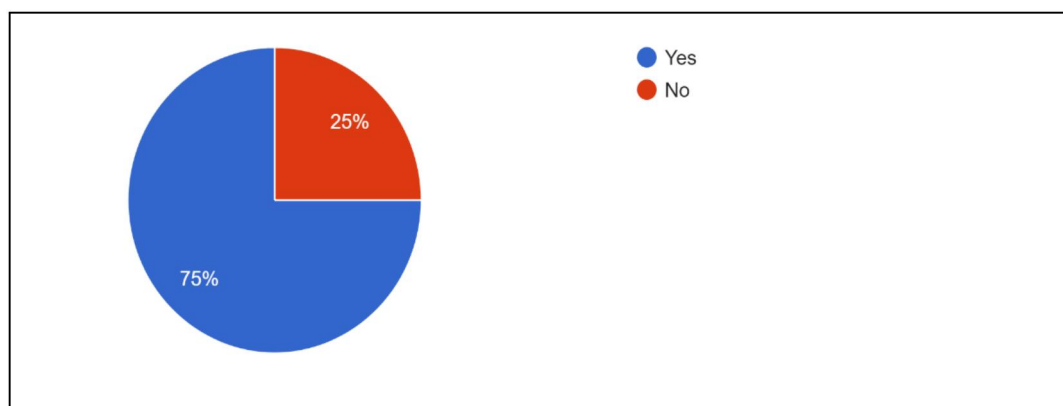


Figure: 7- Do you believe that every endodontically treated tooth (ETT) must receive post?



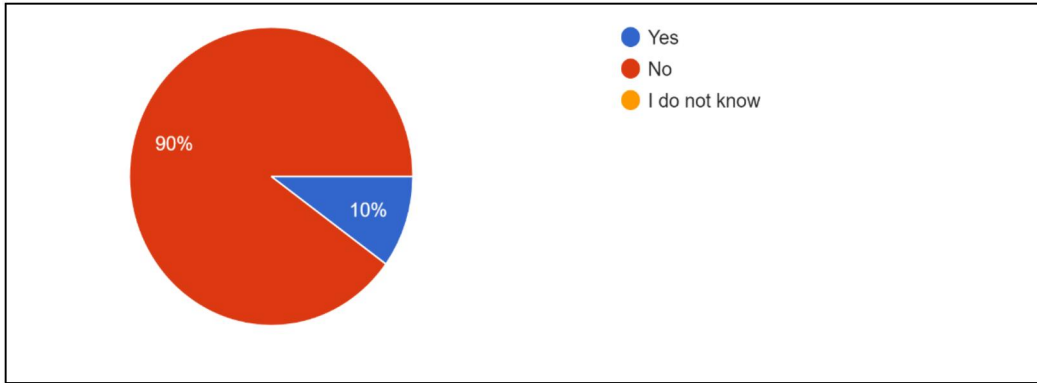


Figure: 8- Frequency of using post?

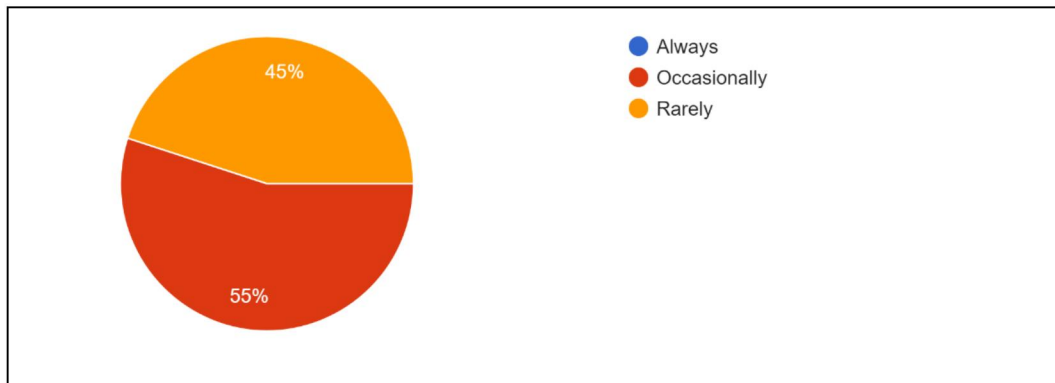


Figure: 9- Do you believe that a post reinforces an ETT and reduces the fracture possibility?

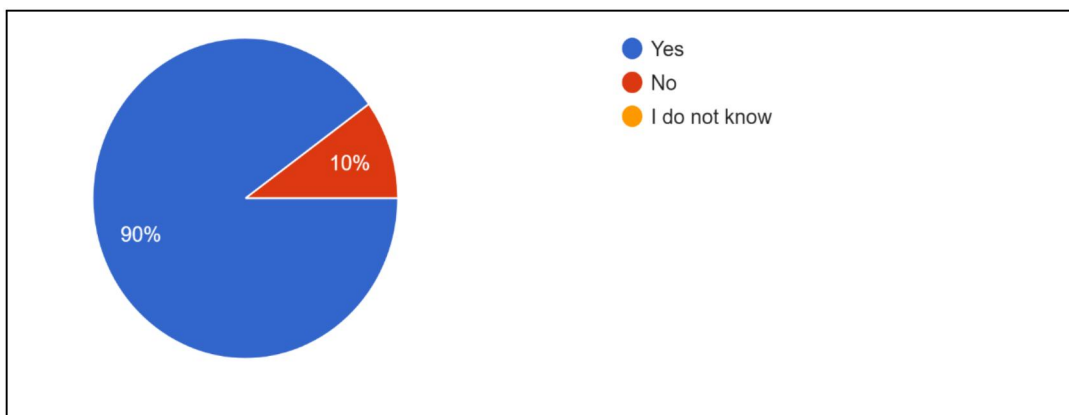


Figure: 10- Type pf the post you prefer the most?

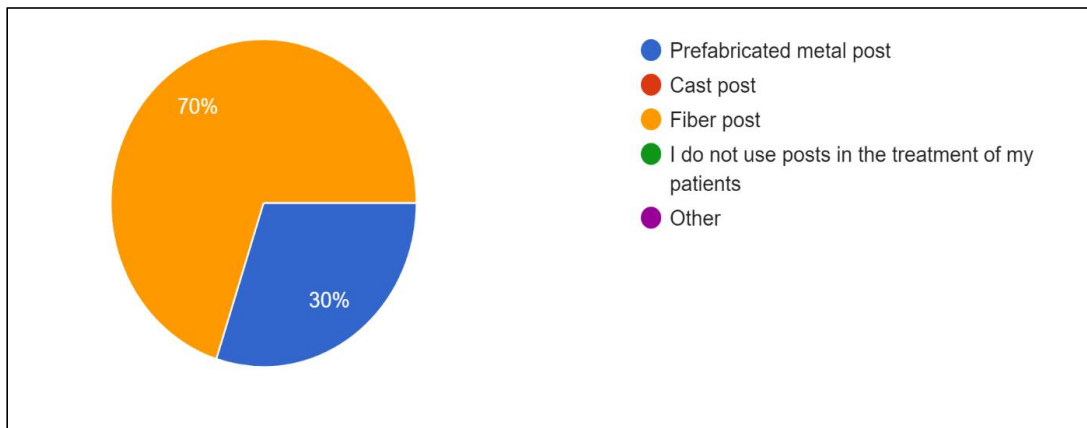


Figure: 11- Choosing a particular post option depends on?

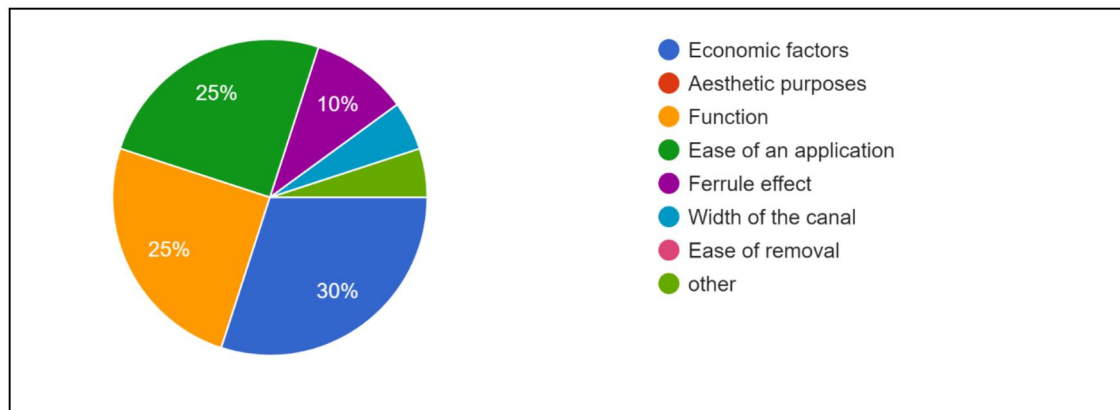


Figure: 12- Choosing a restoration strategy?

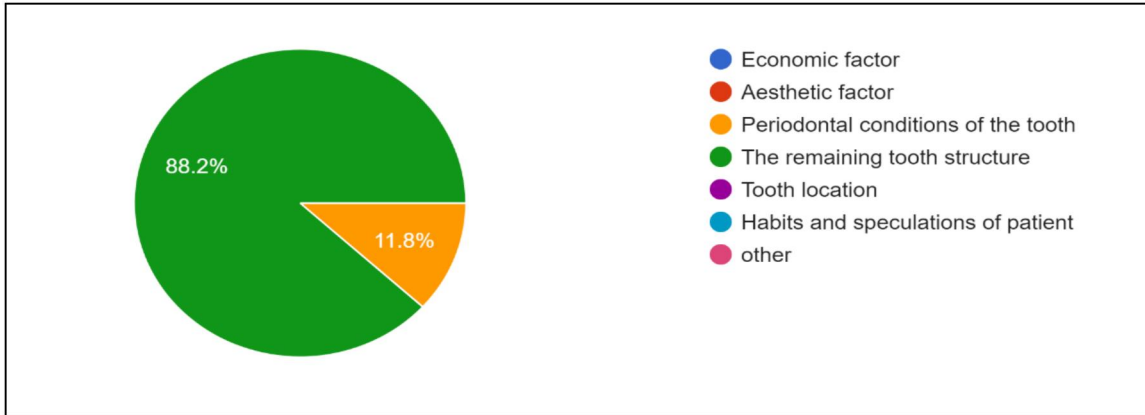


Figure: 13- Type of coronal restoration you prefer the most?

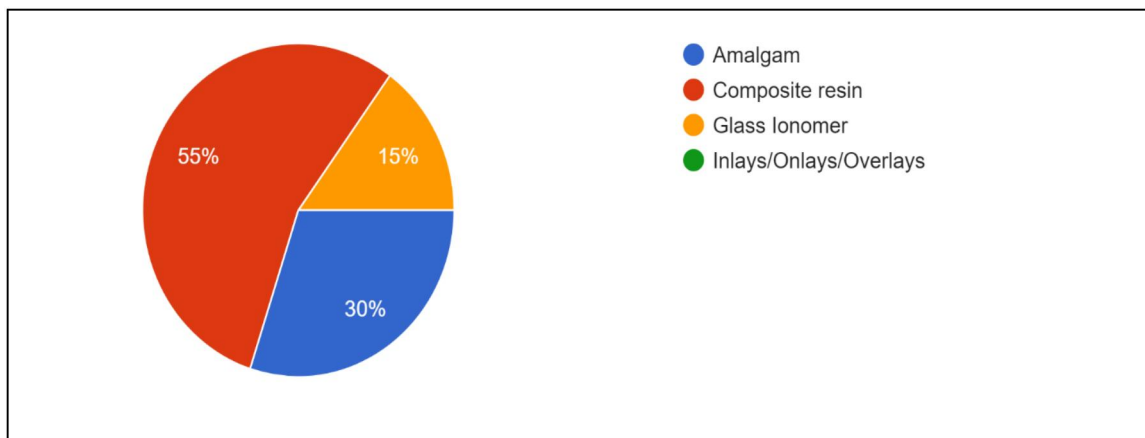


Figure: 14- Type of extra-coronal restoration you prefer the most with post and core?

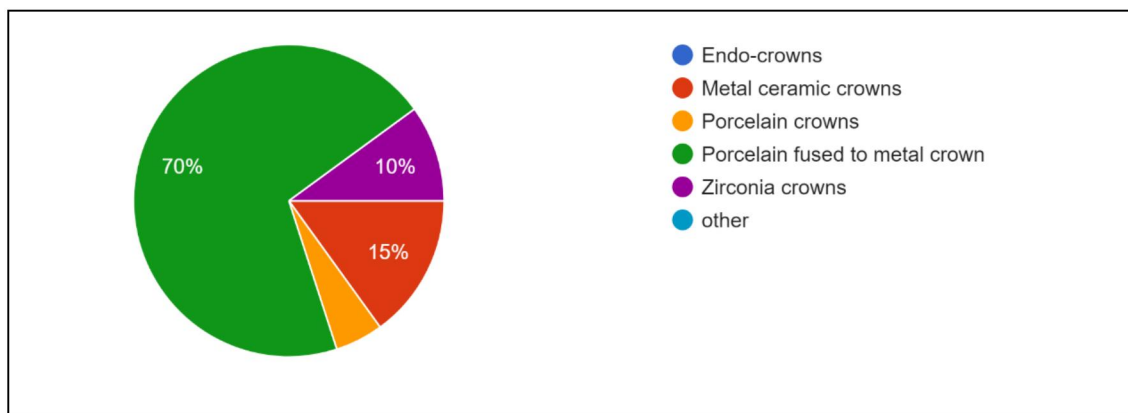


Figure: 15- Types of extra-coronal restoration you prefer the most in absence of post?

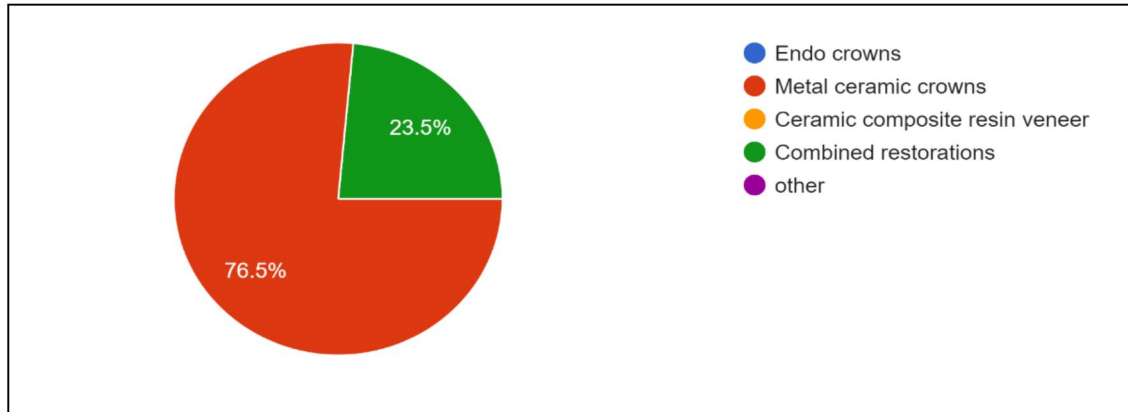


Figure: 16- Do you believe that creating a ferrule below the core foundation following post cementation increases fracture resistance?

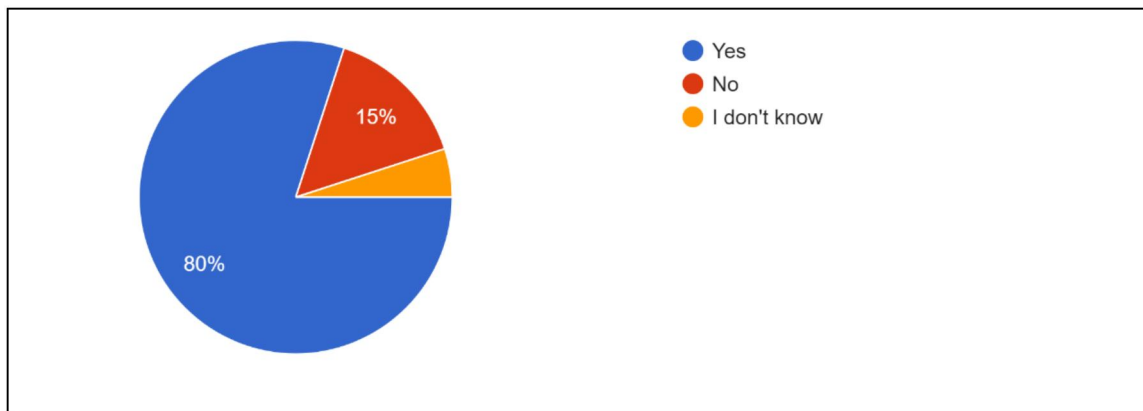


Figure: 17- In your opinion, what is the main criterion in choosing between prefabricated posts and custom-made posts?

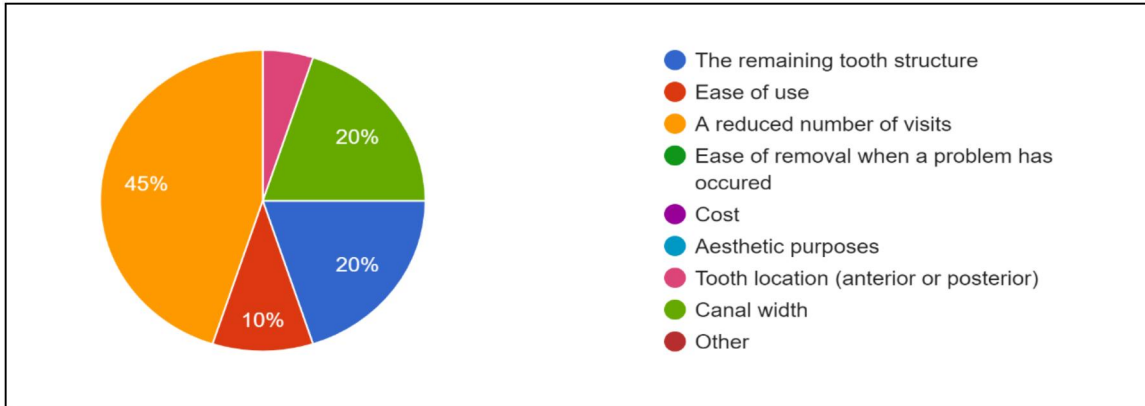


Figure: 18- What type of cement do you use for post cementation?

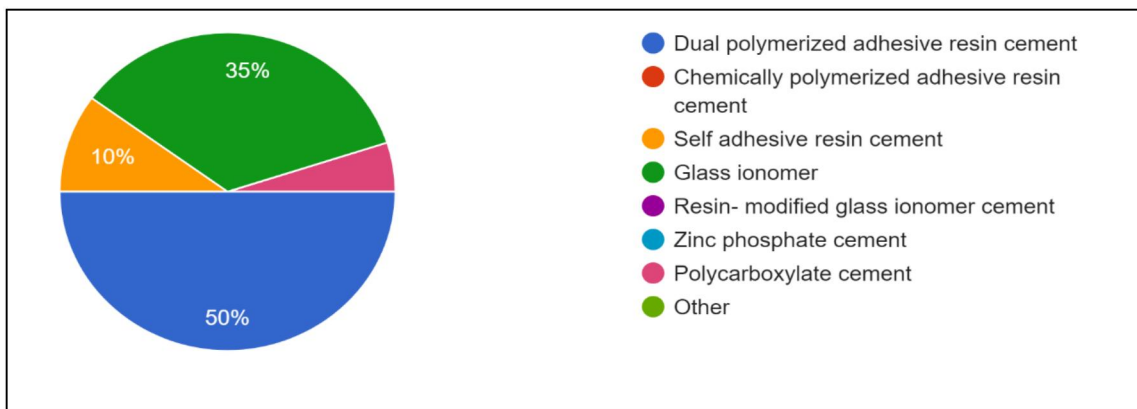


Fig: 19-What type of core build-up material do you mostly prefer to use with prefabricated post?

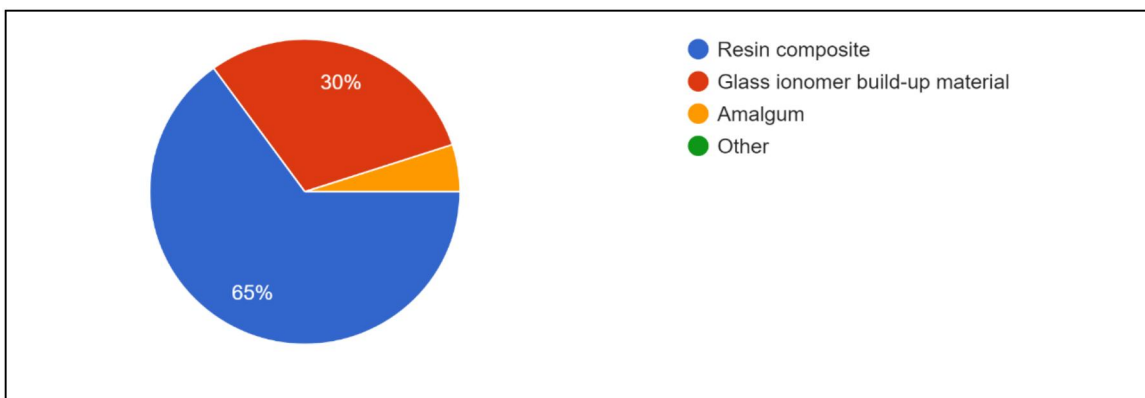


Figure: 20- When do you usually insert the posts into the canal after obturation?

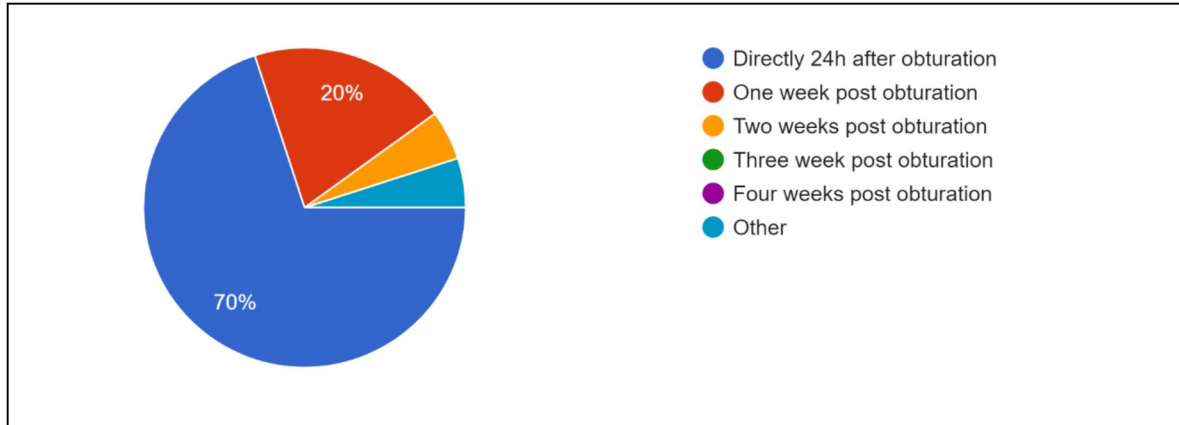


Figure: 21- Problems encountered on the restoration of EET?

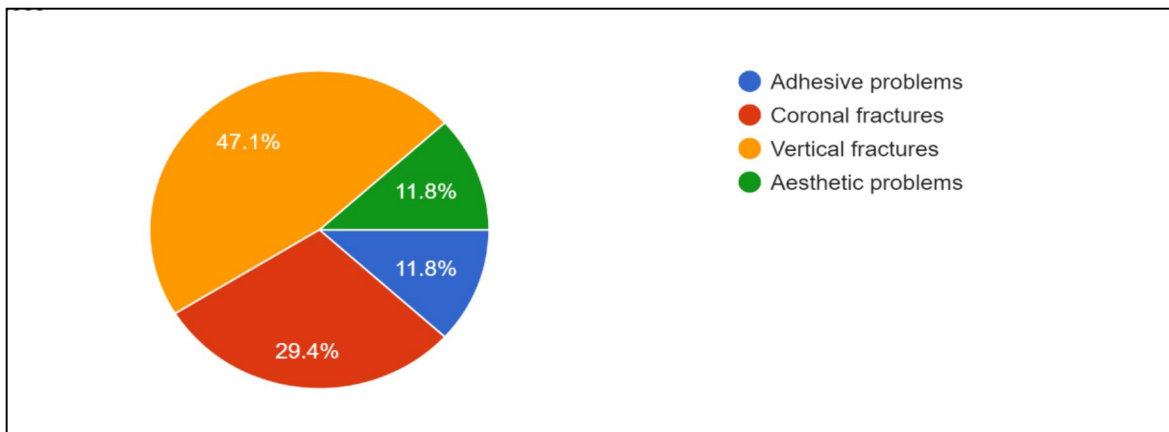


Figure: 22- Should the tooth (with post and core) be crowned?

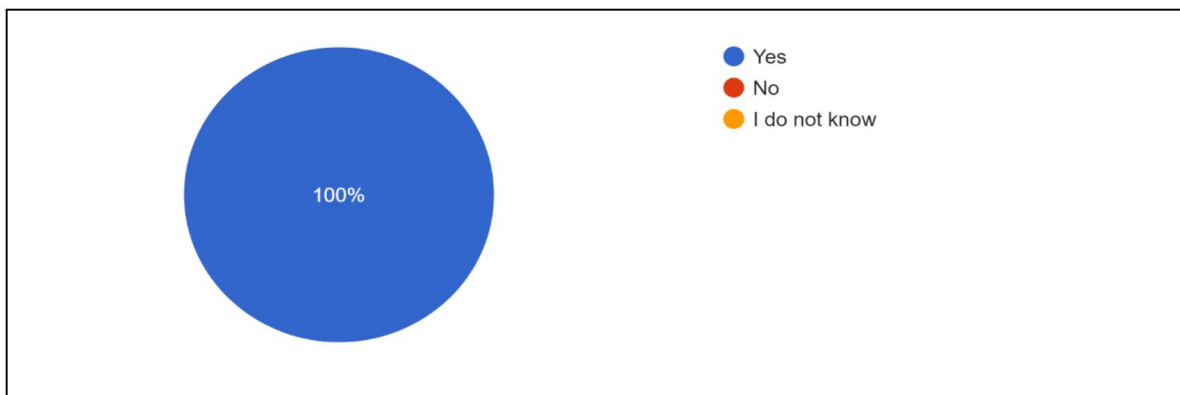


Figure:23- Do you have availability of the materials mentioned in previous questions to restore ETT?

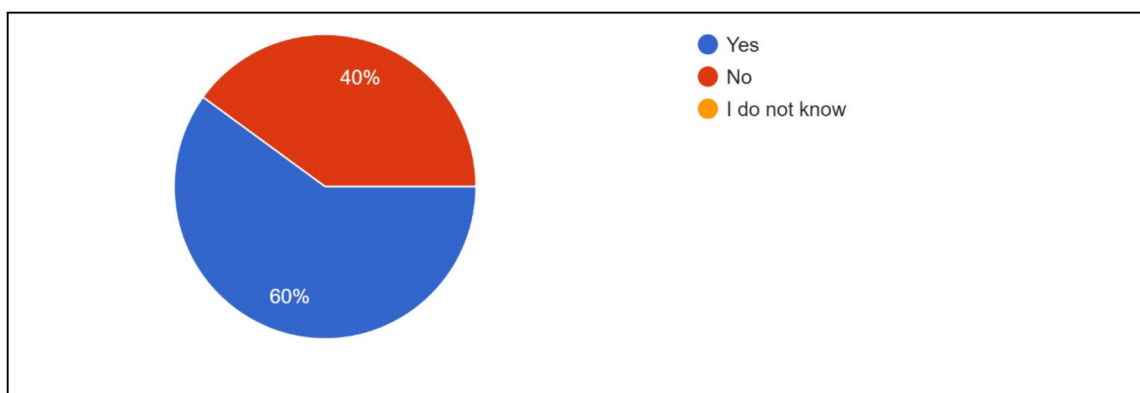
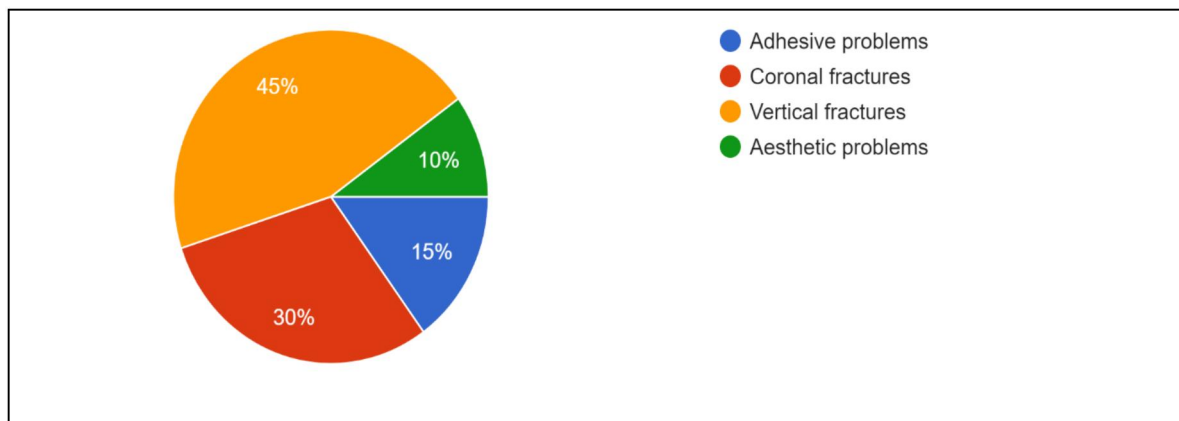


Figure: 24- Problems encountered on the restoration of EET?





## DISCUSSION:

Endodontically treated teeth typically suffer significant structural loss, necessitating multiple techniques of reinforcement for their reconstruction (9) (10). Further researches have demonstrated that if quality of coronal restoration is good, it can inhibit re-entry of bacteria and full cuspal coverages such as crowns can increase longevity of endodontic treated teeth (11). (12) (13), the present study also investigated that all the participants (100%) believed that ETT should receive crown. Moreover, a study carried out by Ng et al. studied that in ETT that had crowns, the likelihood of needing extraction was 2.05 times higher than in those that had composite buildup (14).

Additionally, ETT undergo significant tooth structure loss, they could need post in order to hold core restoration in place. Prefabricated posts are among the most popular options because of how simple and inexpensive they are to handle (15) (16), this research supports the results of current study where a larger number of participants (70%) preferred fiber post over metal and cast post and core. The present study showed that key complications associated with post & core were vertical fractures (47.1%), these results are supported by the findings of Pereira et al. which depicted that the forces from post placed on dentin could result in vertical root fracture, which would need tooth extraction (17). One of the study showed the success ratio of 98.5% and 90.6% for endo treated teeth that received cast posts and cores and full-coverage crowns, respectively (18). Creugers et al. used meta-analysis to analyze durability of post-and core repairs. Only three of the sixteen studies had record, at six years, the survival estimates varied between 81% for buildups consisting of resin composites and 91% for screw-type posts to cast posts and cores (19, 20) (21). RCT treated posterior teeth, a study favored the utilization of intricate cusp-covering with amalgam restorations as an substitute to crowns, but there was no evidence to back up the suggestions extracted from results of various studies for complicated silver amalgam restorations that can function on their own (22) (23). In the present study, great number of participants (70%)

chose that they prefer to place the post with in twenty four hours after the obturation, these findings are line with the findings of a meta-analysis conducted by Zhou and Wang et al., it was discovered that the existence of a post and time of post placement had an impact on the survival of ETT (24).

Very few studies have evaluated and compared these parameters between rural and urban dental practitioners. Majority of the rural practitioners had no availability of material such as posts and build-up materials, Due to the multiple additional variables such as operator skills and preferences, survival of endodontically treated teeth, availability of material, the suitable restoration post endodontic treatment is still under question (14) (25).

### **Conclusion:**

Within the bounds of the current survey, it was demonstrated that Pakistani dentists employ the most recent techniques and alternatives for post-endodontic restorations, contingent upon a number of clinician-related criteria, including years of clinical experience, specialization, workplace location, and work environment. Compared to other specialists and general dentists, endodontists used posts more frequently. The most popular choices for post-endodontic restorations were fiber posts and composite resins. It is challenging to come up with a restoration idea that is clear, organized, and generalizable because the results do not reflect all the Pakistani dentists.

### **Institutional Review Board Statement:**

Ethical approval was issued by Institutional Review Board (IRB-DUHS) Ref: IRB-3251/DUHS/Approval/2023/484.

### **Data Availability**

The corresponding author can provide the data used to support the study's findings upon request.

### **Conflicts of Interest**

The authors declare no conflict of interest.

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