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# Assessment of Communication Quality through Work Authorization between Dentists and Dental Technicians in Fixed and Removable Prosthodontics

**Hadiqa Afzal [1], Naseer Ahmed [1,2], Abhishek Lal [1], Khulud A. Al-Aali [3], Mohammed Alrabiah [4], Mai M. Alhamdan [4], Ahmed Albahaqi [5], Abdulaziz Sharaf [4], Fahim Vohra [4,*] and Tariq Abduljabbar [4]**

1 Department of Prosthodontics, Altamash Institute of Dental Medicine, Karachi 75500, Pakistan; hadiqaafzal855@gmail.com (H.A.); drnaseerahmed@altamash.pk (N.A.); abhishekdarshan@yahoo.com (A.L.)
2 Prosthodontics Unit, School of Dental Sciences, Universiti Sains Malaysia, Kubang Kerian 16150, Malaysia
3 Department of Clinical Dental Sciences, College of Dentistry, Princess Nourah Bint Abdulrahman University, Riyadh 11671, Saudi Arabia; kaalaali@ksu.edu.sa
4 Department of Prosthetic Dental Science, College of Dentistry, King Saud University, Riyadh 11545, Saudi Arabia; mohalrabiah@ksu.edu.sa (M.A.); mayalhamdan@ksu.edu.sa (M.M.A.); zalhaf222@gmail.com (A.S.); tajabbar@ksu.edu.sa (T.A.)
5 Department of Restorative Dental Science, College of Dentistry, University of Jouf, Sakaka 55476, Saudi Arabia; bahawiahmed@gmail.com
* Correspondence: fvohra@ksu.edu.sa; Tel.: +966-1434555

**Abstract:** Fabrication of a clinically successful dental prosthesis requires clear and effective communication between dentists and dental technicians. Adequate completion of work authorization by dentists provides a means for increased professional quality assurance and satisfaction in dental prosthesis. The aim of this study was to evaluate the quality of communication between dentists and dental technicians via work authorization for fixed and removable dental prosthesis in Pakistan. This cross-sectional study was conducted for a period of 6 months to assess the quality of communication between dentists and dental technicians. A well-constructed questionnaire regarding work authorization of removable and fixed prostheses was used as a tool to collect data from 453 dentists. A linear regression analysis was performed to evaluate the relationship of the independent and dependent variables. A p value of $\leq$0.05 was considered statistically significant. It was observed that 92.1% of the dentists leave removable partial denture design to the dental technicians. About 56.5% of the dentists indicated information about base retention of partial dentures in work authorization. The majority of the dentists (56.5%) mentioned the material to be used for the construction of casting partial dentures. Nearly 66% of the dentists indicated the design of margins, and 44.6% of the dentists did not select the shade for fixed prostheses. Nearly 43% of the dentists did not draw the design of restoration, 21.9% chose to draw the design on paper, and 32.2% of the dentists drew the design on the cast. Meanwhile, 76.8% of the participants chose to directly communicate with their dental technicians personally. Nearly 41% of the dentists were satisfied with the restoration design, and 13.5% of the participants were not satisfied with the designs. Poor communication between dentists and technicians was observed, as the majority of the design decisions were left to the dental technicians. Therefore, communication between dentists and dental technicians should be improved by conducting combined workshops for the successful construction of dental prostheses.

**Keywords:** communication; dentist; dental technician; removable partial denture; fixed prosthesis



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## 1. Introduction

Advancements in public awareness and improving the perception toward oral health have resulted in complex and extensive dental treatments. Contemporary dental procedures for the replacement of lost or congenitally missing oral tissues are required to fulfill the goals of oral health in today's society [1,2]. One important constituent of complex procedures is

prosthodontic treatment, including the prescription of a prosthesis design, which should be implemented with respect to the biological and mechanical factors [3]. The fabrication of a durable and successful dental prosthesis is considered a reflection of the skills of both the dental practitioner and dental technician, and effective communication through detailed work authorization is central to this process.

The work authorization forms the basis for the successful completion of any laboratory job requested by the dental operator. Therefore, a detailed relevant design and the material information must effectively and clearly be transmitted from the dental office to the dental laboratory. A carefully completed prescription enables the dental team to improve the quality of the final prosthesis, avoid delays, improve treatment efficiency, and most importantly enhance the treatment prognosis [4]. By contrast, inadequate communication of procedures, design, and material results in a prosthesis fabricated with little reference to critical clinical or biological information. In addition, the potential for a poorly designed prosthesis to cause tissue damage and treatment failure is high [5]. One ethical obligation on the part of the dentist is to effectively communicate the design and material instructions to the dental laboratory technicians, and work authorization is central to this process [6]. On the other hand, it is the responsibility of the dental technician to follow the instructions provided by the dentist for timely and accurate prosthesis fabrication [7].

Prosthodontic educators are concerned with the lack of interaction between dentists and the dental laboratory, and studies have demonstrated concerns about the quality of dentist–technician communication [8,9]. The findings of previous studies globally indicate shortcomings in the design and fabrication procedures of different types of prostheses in the dental practice [9,10]. Some countries have stipulated ethical and legal guidelines that require the clinician to adequately design prostheses and communicate these design features to the technician [11]. It was hoped that these ethical and legal guidelines would improve dentist–technician communication. However, studies carried out in the UK and Ireland indicate that the problem still persists [12,13].

A survey of fixed prosthodontic laboratories revealed that technicians were often dissatisfied with the information provided in work authorizations by the dentists [14]. In addition, a survey by Afsharzand et al. [15] suggested that there is a lack of communication regarding the choice of the metal alloy, type of porcelain, choice of margin, and pontic design for the prosthesis. Dental schools are preparing new graduates to effectively communicate with dental laboratories [16]. Recently, the American College of Prosthodontists [16] issued updated guidelines to improve the relationship between the dentist and laboratory technician. These guidelines not only advance the communication between the technicians and dentists but also the efficiency and the quality of care for the patient.

It is clear that communication between the dentist and dental technicians through work authorizations is critical to a properly fabricated and executed prosthesis. Through work authorization forms, dental laboratories are able to observe whether the communication is effective in allowing them to proceed with prosthesis fabrication [17]. As in Pakistan, there is no clear stipulation that outlines the dentist's responsibility in authorizing the fabrication of any dental prostheses. A study evaluating the quality of communication between dentists and dental laboratory technicians will provide valuable data, indicating the need for improvements in dentist–technician communication. Therefore, the purpose of this study was to assess the communication between dentists and dental technicians through work authorizations for the fabrication of fixed and removable prostheses.

## 2. Materials and Methods

This cross-sectional study was conducted for a period of 6 months from 1 November 2020 until 30 April 2021. The study was approved by the ethical and review committee of the Altamash Institute of Dental Medicine in Pakistan. Data were collected through a structured questionnaire administered through emails and also in paper form (Figure 1). A pilot study was conducted to assess the content and face validity of the questionnaire.

The reliability or internal consistency of the questionnaire items was tested with intra-class correlation, and a strong relation of $\alpha = 0.72$ (Cronbach's alpha) was obtained.

**QUESTIONNAIRE**

**TOPIC: "TO ASSESS THE QUALITY OF COMMUNICATION BETWEEN DENTISTS AND TECHNICIANS"**

**SECTION 1: CONSENT STATEMENT:**

I would be grateful if you could complete this form regarding the detailed written directions for framework design and laboratory procedures for fabrication of cast dental restorations by laboratory technicians. If you are willing to participate in this study kindly fill in the following information.This form will hardly take 3 minutes.

**SECTION 2 : DEMOGRAPHICS**

**Gender** ☐ M ☐ F **Age** _____

**Speciality** _____ **Years of experience** ___

**Academic designation:**

i. Lecturer.
ii. Assistant professor.
iii. Associate professor.
iv. Professor.
v. None.

**Professional designation:**

i. General dentist.
ii. Specialist.
iii. Consultant.

**Place of practice:**
i. Hospital.
ii. Institute.
iii.Clinic

- Do you design the prosthesis for patients yourself or leave it to the technicians.

☐ Yes I do. ☐ No I, rely on technicians.

**If yes, kindly move to following questions regarding the design of cast removable partial denture.**

**SECTION II:CAST REMOVABLE PARTIAL DENTURE.**

- Does the lab card on case submission to the dental laboratory contain the information about the following design specifications:

| | | | |
|---|---|---|---|
| i. Rests | ☐ Yes | ☐ No | ☐ Sometimes |
| ii. Retention | ☐ Yes | ☐ No | ☐ Sometimes |
| iii. Reciprocation | ☐ Yes | ☐ No | ☐ Sometimes |
| iv. Major connectors | ☐ Yes | ☐ No | ☐ Sometimes |
| v. Indirect retention | ☐ Yes | ☐ No | ☐ Sometimes |
| vi. Guide planes | ☐ Yes | ☐ No | ☐ Sometimes |
| vii. Base retention | ☐ Yes | ☐ No | ☐ Sometimes |
| viii.Areas to be contoured | ☐ Yes | ☐ No | ☐ Sometimes |
| ix. Arch classification | ☐ Yes | ☐ No | ☐ Sometimes |

- Do you indicate the material to be used for denture base or metal for metal framework?

☐ Yes ☐ No ☐ Sometimes

- Do you indicate teeth number?

☐ Yes ☐ No ☐ Sometimes

**SECTION III: FIXED PROSTHESIS ( CROWNS AND BRIDGES )**

Thanks for your response regarding this, now please fill in the form regarding design specification instructions for fixed restorations.On lab card do you indicate,

| | | | |
|---|---|---|---|
| i. Margin design | ☐ Yes | ☐ No | ☐ Sometimes |
| ii. Number and design of pontics | ☐ Yes | ☐ No | ☐ Sometimes |
| iii. Surfaces to be covered with metal only | ☐ Yes | ☐ No | ☐ Sometimes |
| iv. Occlusal scheme | ☐ Yes | ☐ No | ☐ Sometimes |
| v. Shade | ☐ Yes | ☐ No | ☐ Sometimes |
| vi. Bisque trial | ☐ Yes | ☐ No | ☐ Sometimes |
| vii. Type of porcelain glaze | ☐ Yes | ☐ No | ☐ Sometimes |
| viii. Ceramo-metal coping design | ☐ Yes | ☐ No | ☐ Sometimes |
| ix. Type of metal alloy | ☐ Yes | ☐ No | ☐ Sometimes |

- For effective communication,do you draw restoration's design on
  ☐ Paper ☐ Cast ☐ I do not draw
- Do you ask for metal trial?
  ☐ Yes ☐ No ☐ Sometimes
- Do you communicate with the technician directly?
  ☐ Yes ☐ No ☐ Sometimes
  If yes,through which means
  ☐ Call ☐ Mail ☐ Meet in person
- Do you get satisfied with the restoration design you receive?
  ☐ Yes ☐ No ☐ Sometimes
- Do you change your dental laboratory frequently
  ☐ Yes ☐ No ☐ Sometimes
  If yes,how frequently?
  ☐ 6 months ☐ 1 year ☐ 2 years ☐ specify_____

**Thanks for your precious time.Your sincere response will definitely play an important part in this study.**

**Figure 1.** The study's questionnaire.

The objective of the study and a consent statement for voluntary participation were included in the questionnaire for all participants to understand before agreeing to the study. The questionnaire relating to the specific areas of work authorization was divided into

three sections. The first section consisted of demographics, which included gender, age, dental specialty, years of experience, academic designation, professional designation, and place of practice. The second section included 11 questions regarding the design of cast removable partial dentures, including the aspects of rest, reciprocation, retention, major connectors, and indirect retention. The third section consisted of 14 questions regarding fixed prosthesis (crowns and bridges) regarding margin designs, the number of pontics, surfaces to be covered with metal only, occlusal scheme, and shade.

Five hundred fifty dentists working in different well-recognized hospitals and universities of Pakistan were approached to obtain their consent if they were interested in participating in the study. Some were approached through different social media groups (WhatsApp, Facebook, and Twitter) and some by visiting hospitals and universities or meeting dentists personally. Out of those, 480 dentists agreed to participate, and questionnaires were sent to them. The responses were collected online via Google forms through social media (WhatsApp, Facebook, and Twitter) and via email, as well as manually by giving the questionnaires to doctors personally and then collecting them. In the case of data collection through Google forms, duplicate entries were removed by using the 'Remove Duplicates' tool.

Among the 480 questionnaires received, 27 responses were discarded which included any inappropriately filled out questionnaires, those having double responses, or those with missing information. Four hundred fifty-three completed questionnaires were included. No undergraduate dental students participated in this study.

The data obtained were tabulated in the Statistical Program for Social Sciences (SPSS version 22, IBM, Armonk, NY, USA) and subjected to statistical analysis. Descriptive statistics including the frequency and percentages were calculated for the demographics, experience, academic designation, professional designation, and place of practice. Linear regression analysis was carried out to analyze the relationship between the independent and dependent variables. The level of significance was set up at $p \leq 0.05$.

## 3. Results

In this cross-sectional study, a total of 453 completed questionnaires were received from the participants. Out of 453 responses, there were 173 (38.2%) males and 280 (61.8%) females, with an average age of 26.24 $\pm$ 3.76. Regarding the specialties of the participants, nearly 97% (437) of the participants belonged to the field of dentistry. Regarding the work experience of the participants, the average experience was 2.53 $\pm$ 2.25 years. Most of the participants (311 (68.7%)) in the study were non-teaching staff (clinical dentist), followed by lecturers (63 (13.9%)) and assistant professors (58 (12.8%)). Concerning professional designation, 91.4% (414) of the participants were general dentists, with a few specialists (5.1%) and consultants (3.5%). Regarding the place of practice, about 247 (54.5%) of the participants practiced at a teaching institute, and 198 (43.7%) practiced at hospitals, as presented in Table 1.

**Table 1.** Demographic characteristics of participating dentists (N = 453).

| Demographics | | *n*% |
|---|---|---|
| Gender | Male | 173 (38.2%) |
| | Female | 280 (61.8%) |
| Specialty | Dentistry | 437 (96.5%) |
| | Others | 16 (3.5%) |
| Academic Designation | Lecturer | 63 (13.9%) |
| | Assistant Professor | 58 (12.8%) |
| | Associate Professor | 12 (2.6%) |
| | Professor | 9 (2.0%) |
| | Non-teaching dentist | 311 (68.7%) |

**Table 1.** *Cont.*

| Demographics | | *n*% |
|---|---|---|
| Professional Designation | General Dentist | 414 (91.4%) |
| | Specialist | 23 (5.1%) |
| | Consultant | 16 (3.5%) |
| Place of Practice | Hospital | 198 (43.7%) |
| | Institute | 247 (54.5%) |
| | Clinic | 8 (1.8%) |

With regard to the design of the dental prosthesis, most of the dentists (417 (92.1%)) left this to the dental technicians, with a few dentists (36 (7.7%)) designing the prostheses themselves. Regarding the information available on laboratory work authorization requests for the dentists designing cast partial dentures themselves, about 310 (68.4%) of the dentists agreed that information about rests was present on the laboratory card. Moreover, 306 (66.4%) dentists mentioned information about retention on work authorization, just over half of the participants (50.1%) explained reciprocation, and 242 (59.4%) dentists detailed major connector information. Furthermore, 53.4% and 50.3% of the dentists added indirect retention and guide plane information, respectively. In addition, base retention on the cast partial denture and areas to be contoured on the cast were explained by 56.5% and 50.3% of the dentists, respectively. The classification of the patient's arch was added by 270 (59.6%) dentists. Since there are different materials used in fabrication of cast removable partial dentures (RPDs), the majority of the participants (71.3%) recognized a list of different materials to select from on the work authorization, and nearly 84% of the participants mentioned the number of teeth to be replaced, as presented in Table 2.

**Table 2.** Responses of the participants for cast removable partial dentures (N = 453).

| Variables | Yes | No | Sometimes |
|---|---|---|---|
| Rests | 310 (68.4%) | 98 (21.9%) | 39 (8.7%) |
| Retention | 301 (67.3%) | 111 (24.8%) | 35 (7.8%) |
| Reciprocation | 227 (52.4%) | 152 (35.1%) | 54 (12.5%) |
| Major connectors | 269 (60.2%) | 128 (28.6%) | 50 (11.2%) |
| Indirect retention | 242 (55.0%) | 144 (31.8%) | 54 (12.3%) |
| Guide planes | 228 (51.8%) | 144 (32.7%) | 68 (15.5%) |
| Base retention | 256 (58.2%) | 140 (31.8%) | 44 (10.0%) |
| Areas to be contoured | 228 (51.8%) | 111 (25.2%) | 101 (23.0%) |
| Arch classification | 270 (61.4%) | 88 (20.0%) | 82 (18.6%) |
| Material to be used for denture base or metal for metal framework? | 323 (72.3%) | 48 (10.7%) | 76 (17.0%) |
| Indicate teeth number? | 379 (83.7%) | 32 (7.2%) | 31 (7.0%) |

Concerning the design specifications for fixed partial dentures (FPDs) by the participants, the majority of the (65.3%) dentists indicated the design of the margins. In addition, 71.7% of the participants mentioned the number of pontics included in the FPD. Sixty-two percent of the dentists failed to mention the number of surfaces covered with metal for the FPD, but only 16.3% provided this information. The majority of the dentists (60.5%) chose the occlusal scheme for FPDs; however, 17.2% did not specify the occlusal scheme. Surprisingly, only 32.2% (146) of the participants selected the shade of the teeth for the FPDs, while 44.6% did not select the tooth shade. The ceramo-metal coping design was

specified by 41.5% of the participants, and 40.4% failed to mention it. Only 37.7% of the dentists mentioned the type of metal alloy for FPD fabrication, as presented in Table 3.

**Table 3.** Participant response for fixed partial dentures (N = 453).

| Variables | Yes (*n*%) | No (*n*%) | Sometimes (*n*%) |
|---|---|---|---|
| Margin design | 296 (67.7%) | 75 (17.2%) | 66 (15.1%) |
| Number and design of pontics | 325 (73.5%) | 73 (16.5%) | 44 (10.0%) |
| Surfaces to be covered with metal only | 281 (64.9%) | 74 (17.1%) | 78 (18.0%) |
| Occlusal scheme | 274 (62.0%) | 78 (17.2%) | 90 (20.4%) |
| Shade | 365 (82.6%) | 35 (7.9%) | 42 (9.5%) |
| Bisque trial | 202 (46.2%) | 146 (33.4%) | 89 (20.4%) |
| Type of porcelain glaze | 184 (41.6%) | 185 (41.9%) | 73 (16.5%) |
| Ceramo-metal coping design | 188 (42.5%) | 183 (41.4%) | 71 (16.1%) |
| Type of metal alloy | 171 (39.1%) | 204 (46.7%) | 62 (14.2%) |
| Do you ask for a metal trial? | 302 (69.1%) | 49 (11.2%) | 86 (19.7%) |
| Do you communicate with the technician directly? | 348 (79.6%) | 31 (7.1%) | 58 (13.3%) |
| Are you satisfied with the restoration design you receive? | 182 (42.3%) | 61 (14.2%) | 187 (43.5%) |
| Do you change your dental laboratory frequently? | 67 (15.6%) | 290 (67.4%) | 73 (17.0%) |

For effective communication with dental technicians, nearly 43% (192) of the dentists did not draw the restoration design on the work authorization. However, only 21.9% (99) drew it on paper, and 32.2% (146) drew it on the cast. The majority (66.7%) requested a metal trial from the dental technicians, with 10.8% (49) failing to mention this, and 348 (76.8%) dentists preferred direct communication with the technician. In addition, nearly 44% (196) of the dentists chose to discuss the case in person with the technician, 38.6% (175) preferred to communicate through a telephone call, and 8.8% (40) opted for email contact. Upon receiving the restoration from the dental technician, about 182 (40.2%) dentists were satisfied with the design, 187 (41.3%) required alterations in the restorative design, and 61 (13.5%) participants were not satisfied with the design (Figure 2). Concerning changing the dental laboratory, the majority of the dentist (64.0% (290)) did not want to change, and 14.8% (67) wanted to work with a new laboratory. Those dentists who did change their labs chose 6 months (13.2%), 1 year (10.4), and 2 years (4.2%) as the average duration before a change.

The regression analysis for this study showed a constant R-squared ($R^2$) value of 0.046 and adjusted R-squared ($AR^2$) value of 0.031. Regarding the comparison of the demographic characteristics with the responses of the participants, a significant relation was noted for academic designation ($p = 0.006$). This finding was supported by a small t-value, indicating that the difference between the mean values was small, as presented in Table 4. Furthermore, the B value of academic designation to the responses (B = 0.027) was significant.

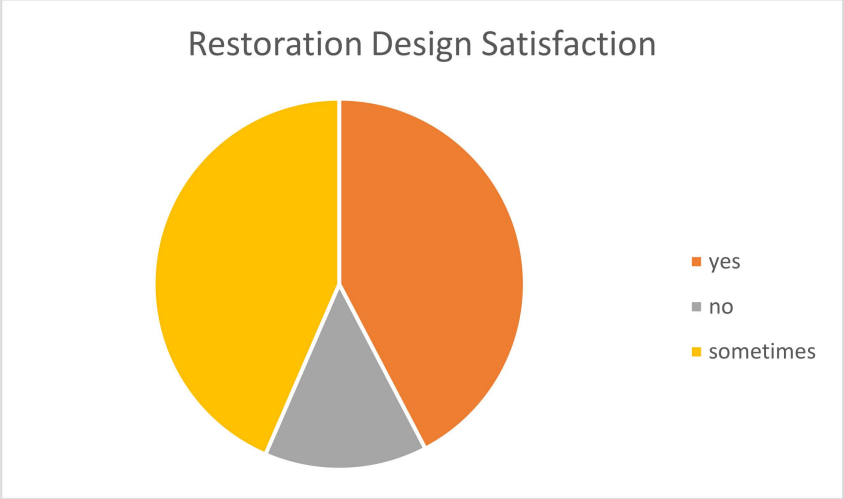


**Figure 2.** Satisfaction with the restoration design by the dentists ($n$ = 453).

**Table 4.** Statistical comparison of demographic characteristics with responses of the participants ($n$ = 453).

| Variables | Unstandardized Coefficients | | Standardized Coefficients | t | *p*-Value |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| **Gender** | −0.056 | 0.030 | −0.086 | −1.831 | 0.068 |
| **Age** | −0.007 | 0.005 | −0.083 | −1.430 | 0.153 |
| **Specialty** | 0.129 | 0.080 | 0.075 | 1.610 | 0.108 |
| **Experience** | 0.004 | 0.007 | 0.033 | 0.576 | 0.565 |
| **Academic designation** | 0.027 | 0.010 | 0.136 | 2.764 | 0.006 |
| **Professional designation** | −0.030 | 0.038 | −0.040 | −0.784 | 0.434 |
| **Place of practice** | −0.028 | 0.029 | −0.046 | −0.954 | 0.340 |

## 4. Discussion

The present study aimed to evaluate the quality of communication between dentists and dental technicians via work authorization for fixed and removable dental prostheses in Pakistan. The questionnaires used in the study were designed using binary scales rather than traditionally used ordinal multi-category answer formats (such as the Likert scale). This was performed to reduce respondent fatigue and increase the response rate and data quality by making the questionnaires short, precise, and reader-friendly [18]. Communication between dentists and dental technicians is of paramount importance, as the success of a dental restorative treatment depends on it. Dentists are equipped with the knowledge and skills to guide dental technicians regarding the patient's functional habits and aesthetics to achieve an optimal restoration for the patient. The design of an RPD also has an important role in the health of the dental and periodontal tissues and the stability of the denture [19,20]. Hence, it is the responsibility of the dentists to guide the dental technician in the design and construction of a dental prosthesis without delegating their responsibilities to the technicians.

In the present study, the majority of the dentists (92.1%) left the designing of the dental prosthesis to the technician. However, it is the dentist who has knowledge of the biological factors, pathological processes, and possible influence of mechanical factors on the masticatory system. In addition, the dentist has the ability to modify the oral environment to increase the effectiveness of an RPD treatment (e.g., by tooth preparation or periodontal or orthodontic therapy). The findings of this study suggest either a lack of knowledge and ability from the dentist in designing partial dentures or their dependency

on the technicians. It has been suggested in previous studies that interns and dentists are not able to adequately design removable partial dentures [21]. The primary reason behind the lack of ability to design a denture lies in the poor knowledge, experience, and attitudes toward it [22]. However, a study by Haj-Ali et al. disagreed with the present study, where it was found that most of the dental technicians believe that the responsibility of designing the dental prosthesis is the dentist's [10]. Moreover, a lack of emphasis on laboratory work during the undergraduate study period can also be a contributing factor to the lack of knowledge on designing a dental prosthesis.

As stated by Lynch, the design of any prosthesis is based on mechanical and biological principles [11]. Inadequate communication of the design information results in a prosthesis that has been fabricated with little reference to important clinical or biological information [3]. Hence, communication between the dentist and dental technician or having complete information provided with the impression is a very important step. Providing dental laboratories impressions with adequate design information is critical, as the technician does not have access to crucial information relating to the nature and health (biology) of the periodontal and oral tissues. This will reflect negatively on the prosthesis fabrication accuracy and may result in damage and injuries to dental and periodontal tissues.

In this present survey, about 7.7% of the dentists did select the components that were needed for cast removable partial dentures in their work authorizations, but some did not. Those who did not complete the design left it for the dental technician to decide by himself or herself. Since rests, clasps, and connectors are essential components in cast removable partial dentures in order to achieve retention, resistance, and support, their proper selection plays a vital role in the design process for every individual patient. A lack of proper connector designing can lead to impingement of the gingival margins and failure to provide relief at the gingival margins [23]. Moreover, an unfitting design of the clasps can lead to fracturing of the clasps and a lack of retention [22]. Furthermore, incorrect designing of the rests can result in undue stress on the RPD [23]. It is clear, however, that the dentists should select and decide upon the components of the RPD, such as guide planes, and communicate this to the dental technicians [24]. Since it is the dentist who has studied the anatomy of the teeth and occlusion of patients, including the physiological and pathological processes in the oral cavity, selecting the right components of the RPD for the patient is the responsibility of the dentist.

Furthermore, the choice of denture material, including metal alloy, which is used for a removable partial denture, has its effect on the patient, dentist, and technician with respect to allergic reactions, cost, corrosion resistance, castability, and personal choice. The American Dental Association indicates that the type of metal alloy that is used has its ethical and legal implications on the dentist [25]. In our study, about 72.3% of the dentists did choose a specific material for the construction of RPDs, but 10.7% of the dentists did not. One study in the literature emphasized the choice of material for RPDs such as cobalt chromium, but aesthetics was a major concern [26].

The number and design of the pontics for fixed partial dentures is critical for the gingival health and ability to be cleaned by the patients. In the present study, most of the dentists selected the number and design of the pontics for the FPDs. However, previous reports from dental laboratories have suggested that some dentists fail to include the information about the number and design of the pontics for fixed partial dentures [27].

In this study, we found that about 67.7% of the dentists did select the type of margins for a fixed partial denture, but 17.2% of the dentists did not. The importance of the margin design has been emphasized in order to maintain oral hygiene and the periodontal health of the patient. Improper margin design of an FPD might lead to the creation of a favorable environment for the deposition of plaque, development of caries, and periodontal diseases [28].

In the present study, 64.9% of the dentists instructed the dental technicians about the surface of the FPDs to be covered with metal, but 17.1% of the dentists did not. Metal alloys are known to be vital for the construction of FPDs, as the presence of metal increases the

fracture resistance, leading to an increase in the life of the prosthesis [29]. Furthermore, the presence of metal alloys provides FPDs the strength to resist occlusal forces and durable occlusal contact [29]. In addition, the type of metal alloy selection in the construction of FPDs plays a vital role, as precious metals provide a much better fit at the margins and adaptation compared with base metals, along with the variable costs of the metals. In our study, 46.7% of the dentists did not select the type of metal alloy for their FPDs, but 39.1% of the dentists agreed to select the metal alloy. Different studies in the literature state that cobalt chromium is the most commonly used metal alloy in FPDs, primarily due to its strength, cost-effectiveness, and light weight compared with noble metals [30]. Moreover, the shade of teeth being incorporated into FPD design plays a crucial role for the patient in terms of aesthetics. In this study, it was found that 82.6% of the dentists selected the shade for FPDs, but a few (7.9%) neglected this. Since many patients are concerned with the proper shade of their teeth, a mismatch in the color of the FPD teeth leads to greater dissatisfaction among the patients, which may even lead to complete rejection of treatment by the patient [31].

It is pertinent to mention that dental technicians are an important and fundamental part of the construction of dental prosthesis, but they are not trained to manage and diagnose a patient, and therefore they must be provided all the relevant information for fixed prosthesis design [2]. Ceramics, as part of metal-ceramic FPDs, coat the outermost layer of an FPD that imparts the aesthetic requirements of the patient. In our study, about 42.5% of the dentists instructed the dental technician for the ceramo-metal coping design. On the other hand, 41.4% did not. Ceramics, although aesthetically pleasing, can fracture during the use of the patient mostly due to poor metal framework design [32]. Therefore, if designing is left to the technician, this might lead to fractures and ceramic debonding. In addition, detailed written and verbal instructions to the dental technicians regarding the case design can prove to be an effective means of communication. In the present study, some dentists chose to draw the design of the prosthesis for the dental technicians to have a better understanding and guidance for the construction of the dental prosthesis. A design illustration accompanied by written and verbal instruction emphasizes the need for accurate communication, and such information, when provided to the dental technicians, can act as a legal document [33].

In the present study, the dentists preferred to communicate through phone calls and in-person meetings. Such findings have also been reached in a study by Gordon et al., where communication methods such as phone calls were recognized as effective modes of communication [34]. Moreover, 40.2% of the dentists were satisfied with the prostheses, but 13.5% were dissatisfied in the present study. Therefore, for optimal construction and treatment of the patient, effective communication between the dentists and dental technicians is of absolute importance. Despite the strengths of this study, such as the sample size and detailed questionnaire, there were some limitations. The opinions of the dentists presented in this study were based on experiences with different dental laboratories, and the accuracy of construction of dental prostheses varied among different laboratories as the availability of equipment varied. In addition, there might be a lack of objectivity while answering the questionnaire, as this depends on the subjective perspective of the dentists. Moreover, the outcomes of the study were based on a Pakistani dental cohort, and therefore caution should be exercised in generalizing the inference of the study's conclusions. Based on the study findings, proper training of work authorization form completion should be given to dental students throughout their preclinical and clinical training years. In addition, training workshops for dental interns and graduates must be organized to emphasize the role and responsibility of dentists in prosthesis designing and its communication to technicians, along with their legal and ethical obligations as dentists.

## 5. Conclusions

The findings of the present study suggest that, within a Pakistani dental cohort, the design of fixed and removable dental prostheses was mostly left to the dental technicians.

The dentists failed to provide information about all the components needed for the successful construction of dental prostheses on work authorization forms. As a consequence, there was a lack of satisfaction among dentists regarding the accuracy of the prostheses received from dental laboratories. This study's findings highlight the need for effective and direct communication between dentists and dental technicians for the accurate construction of dental prostheses.

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