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Orginal Article

PREVALENCE OF FIXED PARTIAL DENTURE COMPLICATIONS: A CROSS SECTIONAL STUDY

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ABSTRACT

Objectives: *To assess the prevalence of issues among patients who visit Bacha Khan College of Dentistry in Mardan after receiving fixed partial dentures.*

Materials and Methods: *The study comprised 157 participants with fixed partial dentures of both sexes. After three months, all patients were evaluated, and problems such as cavities, the need for endodontic therapy, and retention loss were identified. The statistical analysis employed the Shapiro-Wilk test for normality.*

Results: *The study included participants aged 18 to 50, with an average age of 44.337±4.14 years and a procedure time of 38.484±6.88 minutes. 51.6% of the patients were women, while 48.4% were men. 44.6% of patients had cavities, 21% required endodontic treatment, and 34.4% had lost their retainer.*

Conclusion: *This study demonstrates how biological issues often occur with permanent partial dentures, particularly in abutment teeth. It highlights the significance of timely post-treatment intervention and continuous observation. The highlighted concerns can be reduced, and patient outcomes can be improved by implementing enhanced follow-up procedures and patient education on oral hygiene and fixed partial denture care.*

Key words: *Fixed partial dentures, endodontic, prevalence*

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INTRODUCTION

Fixed dental prostheses (FDPs) are among the most popular alternatives for replacing missing teeth, although there are other possibilities as well. FDPs serve as abutments for the remaining teeth, restoring form, function, and look. FDPs have significant drawbacks, despite their ability to solve both functional and aesthetic difficulties. The treatment may cause complications, and the operation is often expensive and time-consuming. Traditional full-coverage FDPs, for example, increase the risk of unfavorable effects such as pulp injury or tooth weakness since they require a significant portion of healthy tooth structure to accommodate the prosthesis[1-4]. The introduction of adhesive dentistry has had a considerable impact on restorative operations. Buonocore's use of phosphoric acid etching in 1955 revolutionized dental bonding by fortifying the binding between enamel and resin materials[5]. In 1973, Rochette expanded on this development by introducing resin-bonded FDPs (RBFDPs), which allowed metal retainers to be directly connected to enamel using adhesive technology. This technique may allow for more conservative preparation of abutment teeth while preserving more of the natural tooth structure than is possible with conventional full-coverage

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FDPs[5]. Over time, improvements in materials and procedures have made RBFDPs a more reliable alternative to traditional prosthodontic treatments, despite their initial high failure rates, particularly in posterior placements[6,7].

These advancements have not eliminated the prevalence of complications with fixed prosthodontic treatments. Although these issues do not always imply treatment failure, they can arise during or after the procedure and may suggest that adjustments or additional care are necessary. Caries, the need for endodontic therapy, and retention loss are all prevalent concerns associated with FDPs that might have an impact on the restoration's longevity and success[8-10]. As a result, clinicians must have a full grasp of potential problems because it aids in diagnosis, therapy planning, and post-treatment care[11-13].

The rates of complications with FDPs have been documented in a number of studies. For instance, Goodacre et al. discovered that loss of retention happened in 7% of instances, endodontic treatment was required in 11%, and caries occurred in 18% of cases[12]. Curtis et al., however, found that the rates of complications were higher, with retention loss occurring in 41% of instances, endodontic therapy in 27%, and cavities in 50% of cases[14]. These findings indicate the variance in complication rates among populations and studies. Even though global data provides significant insights, local data that captures our population's specific challenges and outcomes is critical because global discoveries may not be instantly applicable.

Teledentistry helps address the accessibility and awareness problems around dental care in Pakistan. A recent study found that although dental professionals are aware of and supportive of teledentistry, barriers like technological limitations still persist. These problems are especially relevant in impoverished areas like Mardan. By facilitating remote consultations, diagnoses, and follow-ups, teledentistry offers the ability to alleviate these accessibility concerns and get over financial and geographic constraints. Nevertheless, despite its potential, certain regions continue to face difficulties with infrastructure, internet connection, and technological literacy[15].

Understanding the specific issues that develop in our local community is critical, especially given the widespread use of FDPs in clinical settings. Global studies provide useful baseline information, but they may overlook the unique challenges related with our region's healthcare system, oral health practices, and demographic Clinicians' ability to foresee and manage FDP problems is limited by a lack of regional data. This study intends to fill that vacuum by giving focused, region-specific insights on the types and frequency of problems associated with FDP treatments, allowing doctors to fine-tune their treatment techniques and improve patient outcomes.

MATERIALS AND METHODS

This descriptive observational study was undertaken at the Department of Dentistry, Bacha Khan College of Dentistry in Mardan. The trial ran from February 20 to August 20, 2023.Sample Size: Using a 95% confidence range, a 4% margin of error, and a 7% expected retention loss rate, the sample size was calculated using the WHO sample size calculator. .A total of 157 participants participated in this research[12]. Participants were selected using non-probability sequential sampling in compliance with the inclusion criteria.

Inclusion Criteria include patients between the ages of 18 and 50, patients of both genders, and individuals getting FPDs. Exclusion Criteria include patients with fixed and removable dentures, those with evident cavities around loose retainers, and those with insufficient periodontal support during physical examination.

The CPSP and the institutional ethics committee approved the data gathering as ethical. 157 patients who met the inclusion criteria were recruited from the Department of Dentistry. Patient details were gathered, including age, gender, and type of FPD attachment (wire loop or hook). Each participant gave informed consent, stating that they were completely aware of the study's objectives, potential risks, and the confidentiality of their information.

Under the direction of a dental professional with more than three years of experience, all patients received FPD therapy in compliance with departmental protocol. Each procedure's duration was also noted. Any problems, including cavities, the requirement for endodontic therapy, and loss of retention, were recorded using predetermined criteria when patients were followed up with at 1, 2, and 3 months after treatment. The collected information was painstak-

ingly recorded on a specifically made proforma.

Once the retainer was secured with assistance, hooks or loop attachments were utilized to remove loose retainers. Opposing teeth were covered with gauze to lessen the chance of accidental damage, and the force was applied along the long axis of the cemented retainer.

Data analysis was done using IBM SPSS version 25. Depending on the distribution of the data, quantitative characteristics such as procedure length and age were summarized as means and standard deviations or as medians with interquartile ranges. The data's normality was assessed using the Shapiro-Wilk test.Using a chi-square test and a p-value ≤ 0.05, the study examined the frequencies of complications in endodontic treatments by age, gender, procedure time, and attachment type.

RESULT

A total of 157 participants (48.4% male, 51.6% female) were included in the study, with a mean age of 44.34 ± 4.14 years. The average duration of the fixed partial denture procedure was 38.48 ± 6.88 minutes. Among the participants, 56.7% received hook attachments, while 43.3% were fitted with wire attachments (Table I). There was no significant difference in attachment type distribution between genders (Table I). Caries were observed in 44.6% of patients, with a slightly higher prevalence in those with hook attachments (48.3%) compared to those with wire attachments (39.7%) (Table 2). Stratified analysis revealed no significant differences in caries occurrence based on age (p = 0.298) or gender (p = 0.776) (Table II). Caries occurrence also showed no significant correlation with the duration of the procedure (p = 0.228) (Table 2). A total of 21% of patients required endodontic treatment. Males showed a slightly higher rate of endodontic treatment need (26.3%) compared to females (16%) (Table 3). However, no significant difference was found between age groups (p = 0.806) or attachment types (p = 0.090) in the need for endodontic treatment (Table 3). The duration of the procedure also had no significant impact on the need for endodontic treatment (p = 0.287) (Table 3). Loss of retention occurred in 34.4% of cases, with a significantly higher incidence in those with wire attachments (45.6%) compared to hook attachments (25.8%) (Table 4). This difference was statistically significant (p = 0.010), suggesting that the type of attachment may affect retention outcomes. Neither age (p = 0.380) nor gender (p = 0.291) had a significant impact on retention loss (Table IV). Additionally, the duration of the procedure did not significantly influence retention loss (p = 0.728) (Table 4).The Shapiro-Wilk test was used to assess the normality of data for continuous variables. The findings revealed that the data for age, procedure length, and other continuous variables were normally distributed (all p-values > 0.05). Statistical analyses were performed using suitable methods, with p-values < 0.05 indicating statistical significance.

Table 1: Procedural and Demographic Information (n=157)

Demographics	Mean ±SD	n	%age
Age of patients in years	44.337 ±4.14		
Duration of procedure in minutes	38.484±6.88		
Gender		Male (76)	(48.4 %)
		Female (81)	(51.6 %)
Attachment type		Hook (89)	(56.7 %)
		Wire (68)	(43.3 %)
Caries (Yes)		Yes (70)	(44.6 %)
		No (87)	(55.4 %)
Endodontic treatment need (Yes)		Yes (124)	(79 %)
		No (33)	(21 %)
Retention loss (Yes)		Yes (54)	(34.4 %)
		No (103)	(65.6 %)

Table 2: Stratification of Caries and Other Variables (n=157)

Variables	Caries (Yes)	Caries (No)	p-value
Age			
18-30	14 (53.8 %)	12 (46.2 %)	0.298
31-50	56 (42.7%)	75 (57.3 %)	
Gender			
Male	33 (43.4%)	43 (36.6 %)	0.776
Female	37 (45.7%)	44 (54.3 %)	
Treatment duration (minutes)			
1-30	8 (33.3 %)	16 (66.7 %)	0.228
Greater than 30	62 (46.6 %)	71 (53.4 %)	
Attachment type			
Hook	43 (48.3%)	46 (51.7 %)	0.282
Wire	27 (39.7 %)	41 (60.3 %)	

DISCUSSION

Crown and bridge placement in dental clinics significantly impacts longevity and complication rate of fixed dental prostheses (FDPs), with proper construction improving appearance and functionality[4]. This study highlights three key findings about fixed partial dentures (FPD). First, 41% of respondents stated that many patients did not know they had a loose FPD retainer until they were informed by a dentist. This conclusion is supported by Karlsson's study, which found that 12.6% of FPDs in people with active recall were loose after 10 years[16]. The study found that 82% of patients with loose retainers reported no discomfort, suggesting treatment may delay. Despite minor challenges, some patients experienced porcelain chipping, dental structural fractures, core fractures, and gingival-level abutment tooth fractures, particularly in cases with long, parallel abutment preparations[17]. However, although they have been seen in some studies, root fractures remain a rare result of FPD removal[18].

Table 3: Stratification of Need for Endodontic Treatment (n=157)

Variables	Endodontic treatment need yes	Endodontic treatment need no	p- value
Age			
18-30	5 (19.2 %)	21 (80.8 %)	0.806
31-50	28 21.6 %)	103 (78.6 %)	
Gender			
Male	20 (26.3 %)	56 (73.7 %)	0.0115
Female	13 (16 %)	68 (84 %)	
Procedure time in minutes			
1-30	7 (29.2 %)	17 (70.8 %)	0.287
Greater than 30	26 (19.5 %)	107 (80.5 %)	
Attachment type			
Hook	23 (25. 8 %)	66 (74.2 %)	0.090
Wire	10 (14.7 %)	58 (85.3 %)	

Table 4: Stratification of retention loss (n=157)

Variables	Retention loss (Yes)	Retention loss (No)	p-value
Age			
18-30	7 (26.9%)	19 (73.1 %)	0.380
31-50	47(35.9%)	84 (64.1 %)	
Gender			
Male	23 (30.3 %)	53 (69.7 %)	0.291
Female	31 (38.3 %)	50(61.7 %)	
Procedure time in minutes			
1-30	9 (37.5 %)	15 (62.5 %)	0.728
Greater than 30	45(33.8 %)	88 (66.2 %)	
Attachment type			
Hook	23(25. 8 %)	66(74.2 %)	0.010
Wire	31 (45.6 %)	37 (54.4 %)	

According to the study's findings, 75% of problems with fixed dental prosthesis (FDPs) manifested within 5 years of the FDP being fitted, with the bulk of complications occurring within that time frame. Caries (20.5%), peri-apical issues (18.1%), and de-cementation (24.8%) were the most frequent consequences. The largest percentage of complications (60%) were related to hospital-fitted FDPs, followed by private-practice (30%) and quack-fitted prosthesis (10%). It is noteworthy that the problems were spread across several levels, with level-1 and level-2 complications accounting for 43% and 44% of cases, respectively, being the most common[19]. Karthikeyan's study shows positive outcomes for FPDs with high survival rates and low complication rates. Wire attachments experienced higher retention loss than hook attachments, but no differences in endodontic treatment or caries need. Both studies highlight the value of FPDs, with one focusing on attachment style[20]. Finally, whereas 64% of the FPDs could be recemented, severe cavities in the abutment tooth under the loose retainer was the primary impediment to recementation. When the retainer was removed, degradation was frequently more severe than expected, emphasizing the significance of a comprehensive examination before trying FPD removal. Clinicians must carefully analyze the condition of abutment teeth in order to avoid difficulties during retainer removal and ensure proper recementation. These findings match prior research where the condition of the abutment tooth was a critical determinant in FPD recementation outcomes.

CONCLUSION

The results of our investigation indicate that abutment teeth exhibit high prevalences of biological problems, including caries and the requirement for root canal therapy. Additionally frequent are technical issues such as the restoration's debonding. Significant biological and technical issues frequently

result in the repair needing to be replaced. Adverse occurrences can be decreased by using appropriate tooth preparation, impression technique, laboratory work, cementation, and treatment planning. Patients should be advised, meanwhile, that problems with fixed partial dentures are frequent and that they are likely to occur during the first five to fifteen years of use. Timely upkeep and careful monitoring are essential to these repairs' lifespan.

LIMITATIONS

The study's limitations include non-random patient selection, which may have introduced bias, as patients with clinical difficulties are more likely to seek treatment at specialist institutes such as dental schools. Variability in operator approaches, as well as uncontrollable factors such as cement type or abutment tooth mobility, may have influenced the results. Future research should look into these aspects further, notably how occlusion and unequal abutment mobility effect the loosening of FPD retainers.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	MK, TH
Acquisition, Analysis or Interpretation of Data:	TH, MK, KZ
Manuscript Writing & Approval:	MK, KZ, PU

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.