Published by
Saidu Medical College

OPEN ACCESS

ISSN (P): 1819-4583
ISSN (E): 3007-9470

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Citation:
Mumtaz M, Khan M, Naila, Bibi M, Ali S, Zeb M, et al. Frequency of Pre-Prosthetic Procedures Involving Abutments of Partial Edentulous Patients Undergoing Rehabilitation with Fixed Dental Prosthesis Reporting to Department of Prosthodontics Bacha Khan College of Dentistry. *J Saidu Med Coll.* 2026;16(1):135–141.

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Funding:
The authors received no external funding for this study.

Conflicts of Interests:
The authors have declared that no competing interests exist.

Data Sharing Statement:
The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

Received: May 07, 2025
1st Revision: July 09, 2025
2nd Revision: September 03, 2025
3rd Revision: October 28, 2025
Accepted: November 02, 2025

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Original Article

Frequency of Pre-Prosthetic Procedures Involving Abutments of Partial Edentulous Patients Undergoing Rehabilitation with Fixed Dental Prosthesis Reporting to Department of Prosthodontics Bacha Khan College of Dentistry

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https://doi.org/10.52206/jsmc.2026.16.1.1316

Abstract

Background: Pre-prosthetic treatment plays a crucial role in preparing abutment teeth for fixed dental prostheses (FDPs) and is fundamental to achieving long-term functional and biological success. These procedures range from simple restorative and periodontal interventions to complex endodontic and surgical procedures, depending on the condition of the abutment teeth.

Objective: The objective of this study was to evaluate the types, frequency, and complexity of pre-prosthetic procedures required for abutment teeth in partially edentulous patients undergoing rehabilitation with fixed dental prostheses at Bacha Khan Dental Hospital.

Methodology: A cross-sectional analytical study was conducted in the Department of Prosthodontics, Bacha Khan College of Dentistry, Mardan. A total of 148 partially edentulous patients aged 18–40 years, requiring fixed dental prostheses, were enrolled through non-probability consecutive sampling. Clinical intraoral examination was performed to assess abutment teeth for caries, periodontal status, restorability, and need for pre-prosthetic intervention. Required procedures were documented and abutments were categorized according to treatment complexity.

Results: Among the 312 abutment teeth evaluated, 201 (64.4%) required one or more pre-prosthetic procedures. At the patient level, 133 patients (89.9%) required pre-prosthetic intervention. The most frequently required procedures were direct composite restorations (30.8%) and supra-gingival scaling (26.9%). More than half of the abutments (53.5%) required complex procedures such as endodontic therapy or crown lengthening, while 10.9% were deemed non-restorable and extracted. A significantly higher need for pre-prosthetic procedures was observed in patients aged 31–40 years compared to those aged 18–30 years ($p = 0.048$), while no significant gender-based association was identified.

Conclusion: A high proportion of partially edentulous patients require pre-prosthetic treatment prior to FDP placement, with a substantial number of abutments needing complex interventions.

Keywords: Abutment Teeth, Fixed Dental Prosthesis, Pre-Prosthetic Procedures, Partial Edentulism, Prosthodontic Rehabilitation, Treatment Planning.

Introduction

Fixed dental prostheses (FDPs), commonly referred to as fixed partial dentures or bridges, are widely used to restore function, aesthetics, and occlusal stability in partially edentulous patients. These restorations rely heavily on adjacent natural teeth, known as abutment teeth, for support and retention, making the biological and structural integrity of these teeth critical to the success of treatment [1,2]. Inadequate assessment or preparation of abutment teeth can compromise prosthesis longevity and lead to mechanical failure or biological complications.

Pre-prosthetic procedures constitute an essential preparatory phase prior to FDP placement and aim to optimize the condition of abutment teeth and surrounding oral structures [3–5]. These procedures encompass a broad spectrum of interventions, ranging from minor restorative treatments for carious lesions to advanced periodontal therapy, endodontic treatment, surgical crown lengthening, and other surgical procedures required to establish favorable biomechanics and periodontal health [6]. Proper execution of these interventions enhances load distribution, improves marginal adaptation, and reduces the risk of prosthetic failure.

Several studies have highlighted the high prevalence of compromised abutment teeth requiring pre-prosthetic intervention. Harrita et al. reported that a substantial proportion of abutment teeth exhibited periodontal compromise, caries, or gingival inflammation prior to prosthetic rehabilitation [7]. Similarly, Khalil et al. documented that a large percentage of abutment teeth required complex pre-prosthetic procedures, while a subset was deemed unsuitable for prosthetic support altogether [8]. Furthermore, prospective analyses have demonstrated that insufficient pre-prosthetic evaluation can result in post-prosthetic complications, including the need for endodontic intervention following FDP placement [9].

Inadequate pre-treatment planning has also been implicated as a major contributor to prosthetic instability and failure, particularly in the mandibular arch, where biomechanical demands are high [10,11]. These findings underscore the importance of meticulous pre-prosthetic assessment and intervention as an integral component of successful prosthodontic rehabilitation.

Despite the available literature, existing studies often focus on isolated aspects of pre-prosthetic care, such as periodontal status or endodontic needs, or are derived from heterogeneous populations across diverse clinical settings [11–13]. There remains a lack of comprehensive, standardized data documenting the full range and frequency of pre-prosthetic procedures required for abutment teeth within a defined clinical population. Moreover, regional variations in oral health status, access to dental care, and socioeconomic factors further necessitate localized studies to guide clinical practice and resource allocation.

Therefore, this study was designed to comprehensively evaluate the frequency and spectrum of pre-prosthetic procedures involving abutment teeth in partially edentulous patients undergoing rehabilitation with fixed dental prostheses at Bacha Khan Dental Hospital. Understanding these patterns is essential for improving treatment planning, optimizing institutional protocols, and enhancing patient counseling, ultimately leading to more predictable and successful prosthetic outcomes.

Methodology

Study Design

A cross-sectional analytical study was conducted to assess the frequency and type of pre-prosthetic procedures required for abutment teeth in partially edentulous patients undergoing rehabilitation with fixed dental prostheses (FDPs). The cross-sectional design was selected to provide a snapshot of pre-prosthetic treatment needs within a defined clinical population over a fixed period.

Ethics

Ethical approval for the study was obtained from the Ethical Committee of Bacha Khan College of Dentistry, Mardan, after formal review and approval of the study synopsis by the College of Physicians and Surgeons Pakistan (CPSP) (Ref No: CPSP/REU/DSG-2022-028-4209). All procedures were conducted in accordance with the Declaration of Helsinki. Eligible patients were informed about the study objectives, procedures, potential risks, and benefits, and written as well as verbal informed consent was obtained prior to enrollment.

Setting

The study was carried out in the Department of Prosthodontics, Bacha Khan College of Dentistry, Mardan, Pakistan. Data collection was conducted over a six-month period, from December 24, 2024 to June 24, 2025. The department serves as a tertiary care teaching facility with a high patient turnover for fixed prosthodontic rehabilitation.

Participants

A total of 148 partially edentulous patients were enrolled using a non-probability consecutive sampling technique. Patients of both genders, aged between 18 and 40 years, presenting with tooth-bounded edentulous spaces in either the maxillary or mandibular arch and planned for fixed dental prosthesis were included. Patients were excluded if they had deciduous teeth, required more than four-unit prostheses, had advanced periodontal disease, active periapical pathology, history of chemotherapy or radiotherapy, or were planned for combined fixed and removable prostheses.

Variables

The primary outcome variable was the requirement of any pre-prosthetic procedure on abutment teeth prior to FDP placement. Secondary variables included the type of pre-prosthetic procedure (restorative, periodontal, endodontic, surgical), abutment tooth status, and categorization of abutments based on treatment complexity. Demographic variables such as age and gender, and clinical variables including arch involved and number of abutment teeth, were also recorded.

Data Sources/Measurement

Data were collected through clinical intraoral examination performed with the patient in a supine position using standard dental diagnostic instruments including a mouth mirror, dental probe, tweezers, and dental unit light. A self-structured, pre-validated proforma was used to record demographic information, indication for FDP, number and condition of abutment teeth, and details of all required pre-prosthetic procedures.

Abutment teeth were evaluated for caries, periodontal status, structural integrity, and restorability. Based on coronal condition and treatment complexity, abutments were categorized into three groups: those requiring no or simple corrective procedures, those requiring complex procedures, and those deemed non-restorable.

Bias

To minimize selection bias, strict inclusion and exclusion criteria were applied. All clinical examinations were performed by a single trained examiner to reduce inter-examiner variability. Standardized diagnostic criteria and instruments were used throughout the study. Potential confounding factors were addressed through stratification during statistical analysis.

Study Size

The sample size of 148 patients was calculated using the WHO sample size calculator, assuming a prevalence of 56.4% for pre-prosthetic treatment needs, based on previous literature. A confidence level of 95% and a margin of error of 8% were applied to ensure adequate statistical precision.

Quantitative Variables

Quantitative variables included patient age and the number of abutment teeth requiring pre-prosthetic procedures. These variables were summarized using means and standard deviations. Qualitative variables, such as gender, arch involved, type of pre-prosthetic procedure, and abutment categorization, were summarized using frequencies and percentages.

Statistical Methods

Data were entered into Microsoft Excel 365 for initial coding and cleaning and subsequently analyzed using the Statistical Package for Social Sciences (SPSS) version 27.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Chi-square tests were applied to assess associations between demographic variables (age group and gender) and the need for pre-prosthetic procedures. A p-value of ≤0.05 was considered statistically significant.

Results

Participants

A total of 148 partially edentulous patients who fulfilled the inclusion criteria were enrolled in this study. The study population included 78 males (52.7%) and 70 females (47.3%), showing a nearly equal gender distribution (Table 01). The mean age of the participants was 32.4 ± 6.1 years, with the majority of patients (54.1%) falling in the 31–40 years age group, while 45.9% were between 18 and 30 years of age. Fixed dental prosthesis rehabilitation was planned more frequently in the maxillary arch (57.4%) compared to the mandibular arch (42.6%). Across all enrolled patients, a total of 312 abutment teeth were clinically examined and evaluated for pre-prosthetic treatment needs.

Descriptive Data

Out of the 312 abutment teeth assessed, 201 teeth (64.4%) required one or more pre-prosthetic procedures prior to fixed dental prosthesis placement. At the patient level, 133 out of 148 patients (89.9%) required at least one pre-prosthetic intervention, highlighting the widespread need for preliminary treatment in this population. Restorative and periodontal procedures constituted the majority of pre-

prosthetic interventions. Direct composite restorations were the most frequently performed procedure (30.8%), followed by supra-gingival scaling (26.9%). More complex procedures such as endodontic therapy (15.4%) and surgical crown lengthening (6.0%) were also commonly required, indicating compromised abutment conditions in a substantial proportion of cases (Figure 01).

Outcome Data

Based on coronal condition and complexity of intervention required, abutment teeth were categorized into three predefined groups. Of the total 312 abutments, 111 teeth (35.6%) were classified as Category 1, indicating that they were either sound or required only simple corrective procedures before FDP placement. A majority of abutments, 167 teeth (53.5%), fell into Category 2, requiring complex pre-prosthetic procedures such as endodontic treatment or crown lengthening to become suitable for prosthetic support. Notably, 34 abutment teeth (10.9%) were categorized as Category 3 and deemed non-restorable, necessitating extraction and modification of the original prosthetic treatment plan.

Main Results

Statistical analysis demonstrated a significant association between patient age and the need for pre-prosthetic procedures. Patients aged 31–40 years showed a significantly higher requirement for pre-prosthetic intervention compared to those aged 18–30 years ($p = 0.048$). In contrast, no statistically significant association was observed between gender and the need for pre-prosthetic procedures ($p = 0.621$) (Table 02). The findings collectively indicate that pre-prosthetic treatment is required in the vast majority of partially edentulous patients undergoing fixed dental prosthesis rehabilitation, with increasing age emerging as an important contributing factor. The predominance of complex abutment conditions underscores the critical role of comprehensive pre-prosthetic evaluation in achieving predictable and successful prosthodontic outcomes.

Table 1: Demographic and Clinical Characteristics of the Study Participants (N=148).

Variables		Frequency	Percentage
Gender	Male	78	52.7
	Female	70	47.3
Age Group (Years)	18-30	68	45.9
	31-40	80	54.1
Age (years); Mean ± SD		32.4 ± 6.1	
Arch Involved	Maxillary	85	57.4
	Mandibular	63	42.6
Total Abutments Examined		312	--

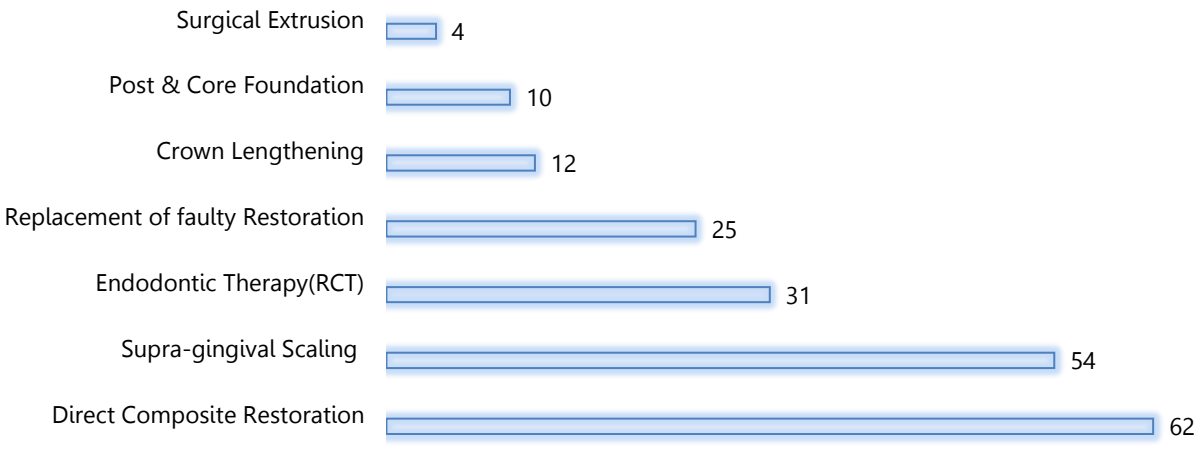


Figure 1: Distribution of Pre-Prosthetic Procedures Performed on Abutment Teeth.

Table 2: Association between patient demographics and need for pre-prosthetic procedures (N=148).

Variable	Category	Required Procedure (n=133)	No Procedure Needed (n=15)	p-value
Gender	Male	71 (91.0%)	7 (9.0%)	0.621
	Female	62 (88.6%)	8 (11.4%)	
Age Group	18-30 years	58 (85.3%)	10 (14.7%)	0.048*
	31-40 years	75 (93.8%)	5 (6.2%)	

Discussion

The present study evaluated the frequency and spectrum of pre-prosthetic procedures required for abutment teeth in partially edentulous patients undergoing rehabilitation with fixed dental prostheses (FDPs). The findings demonstrate a high overall requirement for pre-prosthetic intervention, with 89.9% of patients and 64.4% of abutment teeth requiring at least one preparatory procedure prior to FDP placement. This highlights the clinical reality that abutment teeth are rarely ideal at presentation and often require comprehensive management to ensure predictable prosthetic outcomes.

The predominance of direct composite restorations (30.8%) and supra-gingival scaling (26.9%) observed in this study underscores the importance of addressing both restorative and periodontal health before prosthetic rehabilitation. These findings are consistent with previous studies that emphasize the need for controlling caries and periodontal inflammation as foundational steps in prosthodontic treatment planning [14–16]. Failure to address these issues can compromise marginal integrity, retention, and long-term survival of FDPs.

A notable finding of this study was that more than half of the abutment teeth (53.5%) required complex pre-prosthetic procedures such as endodontic therapy or crown lengthening. This aligns closely with the observations of Khalil et al., who reported that 45.4% of abutments required advanced interventions prior to FDP fabrication [8]. Such complexity reflects delayed patient presentation, cumulative oral disease burden, and limited access to preventive dental care, particularly in developing regions. These findings further reinforce the need for meticulous pre-prosthetic evaluation to avoid future complications.

Additionally, 10.9% of abutment teeth were deemed non-restorable and required extraction, necessitating modification of the original prosthetic treatment plan. This finding is in agreement with earlier reports by Ettinger et al., who documented abutment loss during prosthetic planning in a significant proportion of patients [17]. This emphasizes that pre-prosthetic assessment not only prepares teeth for FDP placement but can fundamentally alter treatment decisions and prosthetic design.

The analysis also revealed a statistically significant association between increasing age and the need for pre-prosthetic procedures, with patients aged 31–40 years demonstrating a higher requirement compared to younger individuals ($p = 0.048$). This trend is supported by existing literature showing progressive deterioration of dental and periodontal structures with age, even within relatively young adult populations [18]. In contrast, no significant association was found between gender and pre-prosthetic treatment needs, consistent with previous studies indicating that oral disease burden is more strongly influenced by age and oral hygiene practices than by gender alone.

Furthermore, a greater proportion of FDP planning and pre-prosthetic interventions were observed in the maxillary arch compared to the mandibular arch. This finding corresponds with earlier reports highlighting increased vulnerability of maxillary teeth to caries and structural compromise due to anatomical and biomechanical factors [19]. Such observations reinforce the importance of arch-specific considerations during prosthodontic planning.

Collectively, these findings highlight the essential role of comprehensive pre-prosthetic evaluation and intervention in achieving successful fixed prosthodontic rehabilitation. Early identification and management of abutment deficiencies can significantly improve prosthesis longevity, functional performance, and patient satisfaction.

Limitations

Despite its strengths, this study has certain limitations. The cross-sectional design limits the ability to establish causal relationships or assess long-term prosthetic outcomes following pre-prosthetic interventions. Additionally, the study was conducted at a single institution, which may limit the generalizability of the findings to other clinical settings or populations with differing oral health profiles. The relatively narrow age range (18–40 years) may also underestimate the burden of pre-prosthetic needs in older populations, where tooth loss and structural compromise

are more prevalent. Future multicenter, longitudinal studies incorporating broader age groups are recommended to validate and expand upon these findings.

Conclusion

The majority of partially edentulous patients require pre-prosthetic treatment prior to fixed dental prosthesis placement. Most abutment teeth necessitated restorative and periodontal interventions, while a substantial proportion required complex procedures such as endodontic therapy or crown lengthening. Pre-prosthetic treatment needs were significantly higher in older patients and were more frequently associated with the maxillary arch. These findings emphasize the importance of thorough pre-prosthetic assessment and individualized treatment planning to optimize prosthetic success and long-term clinical outcomes.

Authors' Contributions:

All authors meet the ICMJE criteria for authorship.

Author 1: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 2: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 3: Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 4: Analysis and interpretation of data, critical revision, final approval, agreed to be accountable for all the work.
Author 5&6: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 7&8: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.

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