

Assessment of Fixed Dental Prosthesis Failure In Patients Reporting to a Tertiary Care Hospital: A Cross-Sectional Survey

Qamar Ishfaq, Kiran Javed, Azmina Salman, M Omer Awan, Qayyum Akhtar, Muhammad Sajjad

Department of Prosthodontics, Armed Forces Institute of Dentistry/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To evaluate the causes of failure of fixed dental prostheses (FDPs) in patients reporting to the Prosthodontic outpatient department.

Study Design: Cross-sectional study

Place and Duration of Study: Department of Prosthodontics, Armed Forces Institute of Dentistry (AFID), Rawalpindi, Pakistan, from Jan to Jun 2021.

Methodology: Fifty-four patients aged 21–65 years presenting with failed fixed dental prostheses were included. Participants' age, gender, prosthesis-related factors, reasons for failure, opposing dentition, and patient-related factors were recorded.

Results: The total sample size was 54. The mean age was 47.67 ± 9.898 years. The males were 31(57.4%) and females were 23(42.6%). The most common reasons for failure were periodontal issues 14(25.93%) followed by endodontic 10(18.52%), fracture of abutments 9(16.67%), restorative issue 6(11.11%), dislodgment of crown 6(11.11%), incorrect margin 3(5.56%), and esthetic problems 3(5.56%). There was a statistically significant association between gender and reasons for failure of fixed partial denture (p -value=0.04).

Conclusion: Periodontal and endodontic problems were the most common causes of fixed dental prosthesis failure. Careful assessment of abutment teeth, periodontal and endodontic status, prosthesis-related factors, and oral hygiene is important during treatment planning.

Keywords: Crowns; Dental prosthesis failure; Fixed dental prosthesis

How to Cite This Article: Ishfaq Q, Javed K, Salman A, Awan MO, Akhtar Q, Sajjad M. Assessment of Fixed Dental Prosthesis Failure in Patients Reporting to a Tertiary Care Hospital: A Cross-Sectional Survey. *Pak Armed Forces Med J* 2026; 76(Suppl-9): S1521-S1525. DOI: <https://doi.org/10.51253/pafmj.v76i Suppl-9.8580>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Tooth loss is a very common and increasing occurrence worldwide.¹ Consequently, patients suffer from loss of multiple functions like mastication, speech, and esthetics.² Loss of dentition also affects the quality of life of the patient.³ A myriad of treatment options are available for restoring missing teeth, like provision of removable partial dentures, fixed dental prosthesis, and dental implant prosthesis.⁴ Fixed dental prosthesis (FDP) was defined as a dental prosthesis luted or mechanically attached to natural teeth that provides primary support to restore a partially edentulous space and cannot be removed by the patient. Fixed prosthesis is the most commonly chosen treatment option to rehabilitate patients with missing teeth. Patients usually have a better satisfaction level with these prostheses.⁵

Proper case selection, diagnosis, and treatment planning are very important for the provision of a fixed partial denture. In cases in which proper

treatment planning is not done, premature failure of fixed dental prosthesis (FDP) can occur. Studies have been conducted on long term success and failures of FDP.⁶ Among the common reasons for failure of FDP are fracture of porcelain, separation of soldered joint, fracture of abutment teeth, and fracture of retainers or pontics. Recurrent caries in abutment teeth or total loss of abutments can occur due to these failures in FDPs.⁷ The clinician should know these complications, their associated factors, and should take proper measures while planning FDP for patients.⁸

Three main types of complications associated with FDPs are biological, mechanical, and esthetic failures.⁹ Biological complications are failures due to non-vitality of pulp or periodontal issues. Fracture of porcelain, separation of soldered joint, and fracture of retainer or pontic are mechanical complications. Unsatisfactory esthetics of the prosthesis and patients' dissatisfaction with esthetics are esthetic failures.¹⁰

The rationale of this study is to better understand and assess causes of failure of fixed dental prosthesis, so that the dental practitioner can form a multidisciplinary approach to make an appropriate

Correspondence: Dr Qamar Ishfaq, Department of Prosthodontics, Armed Forces Institute of Dentistry Rawalpindi Pakistan

Received: 18 Apr 2022; revision received: 22 Jan 2025; accepted: 13 Feb 2025

treatment plan for improved level of patient care. The objective of this study was to evaluate the causes for failure of fixed dental prosthesis in patients reporting to the Prosthodontics Department, AFID.

METHODOLOGY

This cross-sectional study was conducted at the Department of Prosthodontics, AFID, Rawalpindi, Pakistan, from Jan to Jun 2021. Based on a previously published study by Riaz et al., an anticipated population proportion of 0.69, a level of significance of 5%, a confidence level of 95%, and a margin of error of 12.5% were used for sample size calculation.¹¹ The calculated sample size was 54. Therefore, 54 patients with failed fixed dental prostheses were included using non-probability consecutive sampling.

Inclusion Criteria: Patients aged 21–65 years reporting with failed FDPs due to endodontic, restorative, periodontal, mechanical, or esthetic causes were included.

Exclusion Criteria: Immunocompromised patients, pregnant females, teeth with vertical root fractures or iatrogenic root perforations, and FDPs cemented less than one month before evaluation.

Prosthodontic diagnosis was made after history taking and thorough clinical examination. Participants' age, gender, age of prosthesis, arch, prosthetic materials, number of units, reasons for failure, opposing dentition, abutment status, patient-related factors such as parafunctional habits or occlusal interferences, and local factors such as oral hygiene were recorded. Abutment evaluation was performed clinically and radiographically for resistance and retention form. Parafunctional habits were assessed through history. Occlusal interference was assessed clinically by asking participants to move the jaw into a protrusive position and to open and close the mouth. Oral hygiene was assessed by visual inspection for plaque, calculus, and carious lesions.

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 23. Categorical variables were presented as frequencies and percentages, while mean and standard deviation were calculated for age. Reasons for failure were stratified by age group and gender to assess effect modification using Fisher's exact test. A p -value ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of the participants was 47.67 ± 9.91 years (range: 21–65 years). There were 31 (57.4%)

males and 23 (42.6%) females. The most common age of the failed prosthesis was 11–15 years ($n=17$, 31.5%), followed by 7–10 years 14(25.9%). Most failures occurred in the mandible ($n=32$, 59.3%). Porcelain-fused-to-metal (PFM) was the most common material used in failed FDPs ($n=44$, 77.8%), followed by all-metal and all-ceramic prostheses ($n=6$, 11.1% each). Most FDPs comprised 3–5 units ($n=28$, 51.9%). (Table-I)

Table-I: Frequency of Gender, Age, Arch, Materials of Prosthesis, and Number of Units (n=54)

Variables	n(%)
Gender	
Male	31(57.4%)
Female	23(42.6%)
Age of Prosthesis (years)	
1-3	2(3.7%)
4-6	10(18.5%)
7-10	14(25.9%)
11-15	17(31.5%)
>15	11(20.4%)
Arch	
Maxilla	22(40.7%)
Mandible	32(59.3%)
Materials of prosthesis	
PFM*	44(77.8%)
All metal	6(11.1%)
All ceramic	6(11.1%)
Number of units	
1-2	5(9.3%)
3-5	28(51.9%)
4-8	16(29.6%)
>8	5(9.3%)

*PFM - porcelain-fused-to-metal

The most common status of opposing dentition was natural dentition ($n=35$, 64.8%), followed by FDPs ($n=12$, 22.2%) and removable dentures ($n=7$, 13.0%). Abutments were non-vital in 25 (46.3%) cases. Parafunction was present in 7 (13.0%) participants, systemic conditions in 4 (7.4%), and inadequate oral hygiene in 20 (37.0%) cases. (Table-II)

The most common reason for fixed dental prosthesis failure was periodontal problems ($n=14$, 25.93%), followed by endodontic problems ($n=10$, 18.52%) and abutment fracture ($n=9$, 16.67%). Other reasons were restorative problems ($n=6$, 11.11%), crown dislodgement ($n=6$, 11.11%), incorrect margins ($n=3$, 5.56%), and esthetic problems ($n=3$, 5.56%). (Figure)

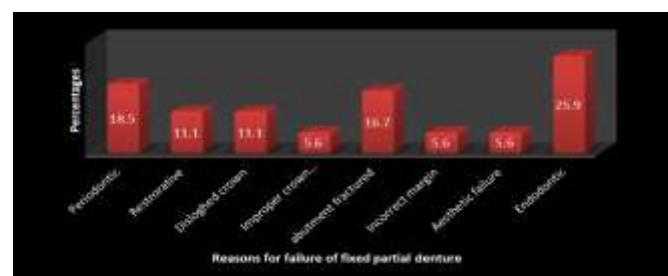


Figure: Reasons for Failure of Fixed Partial Dentures (n=54)

There was a statistically significant association between gender and reasons for failure of fixed partial dentures ($p=0.04$). Among males, restorative problems (83.3%), crown dislodgement (83.3%), and endodontic problems (64.3%) were more frequent than among females. (Table-III)

Table-II: Frequency of Opposing Dentition Status, Abutment Condition, Patient Factors, and Local Factors (n=54)

Variables		n(%)
Status of opposing dentition	Natural	35(64.8%)
	Fixed partial denture	12(22.2%)
	Removable	7(13%)
Abutment condition	Vital	29(53.7%)
	Non-vital	25(46.3%)
Patient factors	Normal	43(79.6%)
	Parafunction	7(13%)
	Systemic conditions	4(7.4%)
Local factors	Inadequate oral hygiene	20(37.0%)
	Regular brushing	34(63.0%)

The association between age group and reasons for failure of fixed partial dentures was not statistically significant ($p=0.458$). In the 21-30-year age group, restorative problems were the most common reason for failure ($n=2$, 22.2%). Among participants aged 51 years and above, endodontic problems were the most common reason ($n=7$, 50.0%). (Table-IV)

Table-III: Reasons For Failure Of Fixed Partial Dentures Stratified By Gender (n=54)

Variable	Gender		p-value*
	Male	Female	
	n(%)	n(%)	
Periodontal	5(50%)	5(50%)	0.04
Restorative	5(83.3%)	1(16.7%)	
Dislodged crown	5(83.3%)	1(16.7%)	
Improper Crown Preparation	0(0%)	3(100%)	
Abutment Fracture	4(44.4%)	5(55.6%)	
Incorrect Margin	3(100%)	0(0%)	
Esthetic Failure	0(0%)	3(100%)	
Endodontic	9(64.3%)	5(35.7%)	

*Fisher exact test (p-value <0.05 is taken as significant)

Table-IV: Reasons for Failure of Fixed Partial Dentures Stratified by Age Group (n=54)

Variable	Age group (years)				p-value*
	21-30	31-40	41-50	51 & above	
	n(%)	n(%)	n(%)	n(%)	
Periodontal	1(10.0%)	1(10.0%)	6(60.0%)	2(20.0%)	0.46
Restorative	0(0%)	2(33.3%)	2(33.3%)	2(33.3%)	
Dislodged crown	0(0%)	0(0%)	4(66.7%)	2(33.3%)	
Improper Crown Preparation	1(33.3%)	0(0%)	0(0%)	2(66.7%)	
Abutment Fracture	2(22.2%)	0(0%)	4(44.4%)	3(33.3%)	

DISCUSSION

The main findings of the study revealed that the most common reasons for failure of FDPs were periodontal problems, followed by endodontic issues and fracture of the abutment. Other reasons for failure of FDPs were restorative issues, dislodgment of the crown, incorrect margin, and poor esthetics. Periodontal problems in FDPs arise due to inadequate design of the prosthesis, where plaque accumulates under and around the prosthesis, leading to the loss of attachment in abutment teeth, mobility of abutment teeth, and ultimately failure of FDPs.¹² Our results showed 25% of failures occurring due to periodontal problems. Furthermore, in 5.56% of cases incorrect margins were found, which can also eventually contribute to periodontal failure.

Another reason for periodontal failure can be inadequate oral hygiene of patients.¹³ Another reason for failing fixed prosthesis due to periodontal issue is a lack of proper supporting abutments and violation of Ante's law. A smaller number or weak abutments can lead to mobility due to overloading.¹⁴ Our findings showed that the most common reason for failure of fixed dental prosthesis was periodontal issue ($n=14$, 25.93%), followed by endodontic ($n=10$, 18.52%) and fracture of abutment ($n=9$, 16.67%). Chandranaik *et al.*,¹⁵ in a study on 450 participants with failed FDPs, reported that the most common reason for failure was biological (periodontal and endodontic), then mechanical and esthetics. These findings support our study. Another study conducted by Naz *et al.*, on the Karachi population also reported that the common cause of failing fixed dental prosthesis was biological.¹⁶

This study confirmed that the most common status of opposing dentition was natural, followed by FDP, and least was removable prosthesis. Opposing dentition can have a role in the failure of fixed prosthesis.² The force of natural dentition is higher than FDP and much higher than removable dentures. That may be the reason that failure was less in cases having removable dentures in the opposing arch in our study.¹⁷ Our study showed that failure of fixed dental prosthesis was more common in the mandible than in the maxilla. This can be attributed to the more mobile nature of the lower jaw and higher stress concentration. The maxillary arch can easily dissipate stresses by transferring to the cranium, while on the other hand, the mandible must absorb all stresses by itself. Similarly, Tatematsu *et al.*, studied complications

of FDPs and reported that failure is more common in the mandible.¹⁷

Our findings showed that the most common material used in these failed prostheses was porcelain fused to metal (PFM). PFM is most economical and widely used in our country. But this material has less strength than all-metal, all-ceramic, all-ceramic and zirconia. Due to porosities and stress concentration in FDPs, fracture and chipping commonly occur. Similar results were reported by Setia *et al.*¹⁸

Our study found that there was a statistically significant association between gender and reasons for failure of fixed dental prosthesis ($p=0.04$). Among males, restorative issues, crown dislodgment, and periodontal problems were more than in females. The higher failure rates of FDP in males can be attributed to stronger oral activity and higher masticatory forces.^{8,16} But it can also be more likely due to less appreciation of oral hygiene or more use of tobacco in males than in females, as shown in various studies.¹⁰ Studies similar to Weiner *et al.*, reported that failures of FDP are higher in males than in females.¹⁹

Even though patients globally are increasingly aware of the importance of oral health, in a developing nation like ours, it is still exiguous. Therefore, encouraging better oral hygiene practices and regular dental follow-up examinations may help prolong the life of the prosthesis and the abutment teeth. Patient education should also be considered in future provision of such a prosthesis. These factors can also be a subject of future studies and should be analyzed.

LIMITATION OF THE STUDY

The place of original fabrication of the FDPs was not recorded, which may have introduced unmeasured variation in prosthesis-related factors. A need to clinically consider the periodontal and endodontic health of the patient as a study variable to evaluate the patient's oral hygiene habits before recommending an FDP.

CONCLUSION

Periodontal and endodontic problems were the most common causes of fixed dental prosthesis failure, followed by abutment fracture, restorative problems, crown dislodgement, incorrect margins, and esthetic problems. These findings highlight the importance of careful assessment of abutment teeth, particularly periodontal and endodontic status, during FDP treatment planning.

ACKNOWLEDGEMENT

The authors would like to acknowledge the teamwork and support received from the Department of prosthodontics, AFID.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

QI & KJ: Data acquisition, data analysis, critical review, approval of the final version to be published.

AS & MOA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

QA & MS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

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.

REFERENCES

- Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of severe tooth loss: a systematic review and meta-analysis. *J Dent Res* 2014; 93(7 Suppl): 20S-28S. <https://doi.org/10.1177/0022034514537828>
- Goodday RH. Management of fractures of the mandibular body and symphysis. *Oral Maxillofac Surg Clin North Am* 2013; 25(4): 601-616. <https://doi.org/10.1016/j.coms.2013.07.004>
- Helal O, Göstemeyer G, Krois J, Fawzy El Sayed K, Graetz C, Schwendicke F. Predictors for tooth loss in periodontitis patients: systematic review and meta-analysis. *J Clin Periodontol* 2019; 46(7): 699-712. <https://doi.org/10.1111/jcpe.13127>
- Dewan H, Haroon TM, Mogla S, Gupta A, Loganathan J, Ahammed AN, et al. Assessment of Failure Rate of Fixed Partial Dentures: A Clinical Study. *J Pharm Bioallied Sci* 2022; 14(Suppl 1): S262-S263. <https://doi.org/10.4103/jpbs.jpbs.718.21>
- Sailer I, Pjetursson BE, Zwahlen M, Hammerle CH. A systematic review of the survival and complication rates of all-ceramic and metal-ceramic reconstructions after an observation period of at least 3 years. Part II: fixed dental prostheses. *Clin Oral Implants Res* 2007; 18(Suppl 3): 86-96. <https://doi.org/10.1111/j.1600-0501.2007.01468.x>
- Tay ABG, Lai JB, Lye KW, Wong WY, Nadkarni NV, Li W, et al. Inferior alveolar nerve injury in trauma-induced mandible fractures. *J Oral Maxillofac Surg* 2015; 73(7): 1328-1340. <https://doi.org/10.1016/j.joms.2015.01.026>
- Swain PK. Failure rate in fixed partial denture patients - a clinical study. *J Adv Med Dent Sci Res* 2018; 6(10): 13-18. <https://doi.org/10.21276/jamdsr>
- Vlăduțu DE, Părvănescu V, Ștefăruță A, Rădulescu VM, et al. Risk Factors Associated with Complications in Fixed Partial Dentures. *J Clin Med* 2026; 15(4): 1471. <https://doi.org/10.3390/jcm15041471>
- Zavanelli AC, Mazaro JVQ, Nóbrega PI, Falcón-Antenucci RM, Zavanelli RA. Data collection about failures in fixed partial dentures: 1-year monitoring. *RGO Rev Gaúch Odontol* 2018; 66(3): 250-256. <https://doi.org/10.15090/1981-863720180003000093482>
- Shah DS, Vaishnav K, Duseja S, Joshi R. Clinical evaluation of fixed dental prosthesis failures in indian population: an in vivo study. *Adv Hum Biol* 2014; 4(3): 37-43.
- Riaz W, Aslam A, Aziz S. Assessment of grades of failures of conventional fixed dental prosthesis based on severity. *Prof Med J* 2018; 25(8): 1184-1189. <https://doi.org/10.29309/TPMJ/18.4529>
- Khan K, Shahzadi A, Gul M, Naz N, Faisal M, Faryal S. Complications associated with metal ceramic prosthesis in fixed partial denture used in Peshawar. *J Health Rehabil Res* 2024; 4(1): 967-972. <https://doi.org/10.61919/jhrr.v4i1.524>
- Schüz B, Sniehotta FF, Wiedemann A, Seemann R. Adherence to a daily flossing regimen in university students: effects of planning when, where, how and what to do in the face of barriers. *J Clin Periodontol* 2006; 33(9): 612-619. <https://doi.org/10.1111/j.1600-051X.2006.00967.x>

Dental Prosthesis Failure in Patients

14. De Backer H, Van Maele G, De Moor N, Van den Berghe L, De Boever J. A 20-year retrospective survival study of fixed partial dentures. *Int J Prosthodont* 2006; 19(2): 52-58.
 15. Chandranaik MB, Thippanna RK. Fixed partial denture failures: a clinical survey for evaluation of the factors responsible. *CODS J Dent* 2017; 9(2): 41-45.
<https://doi.org/10.5005/jp-journals-10063-0031>
 16. Naz A, Musharraf H, Jawad A, Kumar B, Lone MA. Assessment of failure of prosthesis in fixed prosthodontics among patients reporting to a teaching dental hospital of Karachi. *J Pak Dent Assoc* 2020; 29(3): 105-109.
<https://doi.org/10.25301/JFDA.293.105>
 17. Tatematsu M, Mori T, Kawaguchi T, Takeuchi K, Hattori M, Morita I, et al. Masticatory performance in 80-year-old individuals. *Gerodontology* 2004; 21(2): 112-119. <https://doi.org/10.1111/j.1741-2358.2004.00015.x>
 18. Setia S, Pannu P, Gambhir RS, Galhotra V, Ahluwalia P, Sofat A. Correlation of oral hygiene practices, smoking and oral health conditions with self-perceived halitosis amongst undergraduate dental students. *J Nat Sci Biol Med* 2014; 5(1): 67-72.
<https://doi.org/10.4103/0976-9668.127291>
 19. Wiener RC, Wu B, Crout RJ, Plassman BL, McNeil DW, Wiener MA, et al. Hygiene self-care of older adults in West Virginia: effects of gender. *J Dent Hyg* 2012; 86(3): 231-238.
-