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Complications of Fixed Partial Prosthesis in Nepal Police Hospital: A Cross-Sectional Study

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ABSTRACT

Background: Fixed partial dentures (FPDs) are commonly used prosthetic treatments, yet their long-term success is often compromised by biological, mechanical, and aesthetic complications. Limited data exists on failure patterns and severity in South Asian populations, particularly in resource-limited settings like Nepal. This study is done to assess severity based analysis of FPD complications in Nepal Police Hospital.

Methods: A cross-sectional study was conducted at Nepal Police Hospital from March to May 2025, evaluating 75 patients with FPD complications. Failures were classified using Manappallil's system (Class I-VI) and analyzed for associations with gender, prosthesis material, and duration of use. Statistical analysis included chi-square and Fisher's exact tests (SPSS v.24), with significance set at $p<0.05$.

Results: The study found Class IV (combined) failures to be most prevalent (33.3%), followed by Class III (32.0%). FPDs in use for ≥5 years showed significantly higher rates of Class IV failure (43.8% vs. 25.6%, p=0.03, OR=2.27). Zirconia prostheses demonstrated lower Class IV failure rates (27.3%) compared to porcelain-fused-to-metal (PFM) (34.4%), though this difference was not statistically significant (p=0.75). Females exhibited higher rates of class IV failures (40.9%) than males (30.2%), but this trend was not significant (p=0.42).

Conclusion: The findings underscore the importance of monitoring FPDs beyond five years of service, as they are at significantly higher risk for severe class IV complications. While zirconia prostheses showed promising results, further research with larger samples is needed to confirm their advantages. These insights can guide clinical decision-making and patient education, particularly in resource-limited settings.

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INTRODUCTION

Fixed partial dentures (FPDs) serve as a fundamental treatment for partial edentulism, offering functional and aesthetic rehabilitation. However, complications such as secondary caries, porcelain fractures, and cementation failures frequently compromise their longevity, necessitating retreatment. Globally, studies report 5-year survival rates of 85-95% for metal-ceramic FPDs, with biological failures being most prevalent [1,2] . Despite this data, there remains a critical gap in classifying these failures by severity - a factor that directly impacts clinical decision-making and patient outcomes.

In resource-limited settings like Nepal, where access to advanced prosthetic materials (e.g., zirconia) is restricted, understanding failure patterns becomes even more crucial. Existing literature from South Asia primarily focuses on failure rates rather than severity stratification[3,4]. Manappallil's classification system [5] addresses this gap by categorizing complications from Class I (minor) to Class VI (very severe), enabling clinicians to prioritize interventions based on urgency and complexity.

This study assess 75 FPD failures at Nepal Police Hospital using Manappallil's system, with three key objectives- to determine the distribution of failure severity classes, to

analyze associations with gender, prosthesis material, and duration of use, and to compare findings with global data to identify region-specific trends. Our work provides the first severity-based analysis of FPD complications in Nepal, offering evidence to optimize treatment protocols in similar low-resource settings.

METHODS

This cross-sectional study was conducted at Nepal Police Hospital from March to May 2025 to evaluate complications in tooth-supported fixed partial dentures (FPDs) using Manappallil's classification system. The study population included 75 patients aged 18–65 years who had FPDs (2–6 units) in service for at least one year. Patients with post and core, direct restoration and implant supported FPDs were excluded. Patient reporting to department of Prosthodontics with FPD complications were selected through purposive sampling technique. Data were collected through clinical examinations by two calibrated prosthodontists, assessing marginal integrity, occlusion, and type of prosthesis materials, along with radiographic evaluations of periapical status, caries, and periodontal health. Patient interviews provided additional information on duration of use and symptoms. Each case was categorized according to John Joy Manappallil's classification system (Class I–VI) based on failure severity (Table 1). Statistical analysis was performed using SPSS 24.0, employing descriptive statistics (frequencies, percentages) and analytical tests, including Chi-square/Fisher's exact tests for categorical comparisons (e.g., failure class vs. gender/material) and odds ratios with 95% confidence intervals to assess the impact of duration on failure severity. Ethical clearance was taken from the Institutional Review Committee of Nepal Police Hospital (Ref: IRC-NPH No: 47-11/2082). Written informed consent was secured from all participants, with strict confidentiality maintained throughout the study.

Table 1: Manappallil's Classification

Class	Description
Class I	Cause of failure is correctable without replacing restoration.
Class II	Cause of failure is correctable without replacing restoration; however, supporting tooth structure or foundation requires repair or reconstruction.
Class III	Failure requiring restoration replacement only. Supporting tooth structure and/or foundation acceptable.
Class IV	Failure requiring restoration replacement in addition to repair or reconstruction of supporting tooth structure and/or foundation.
Class V	Severe failure with loss of supporting tooth or inability to reconstruct using original tooth support. Fixed prosthodontic replacement remains possible through use of other or additional support for redesigned restoration.
Class VI	Severe failure with loss of supporting tooth or inability to reconstruct using original tooth support. Conventional fixed prosthodontic replacement is not possible.

RESULTS

Table 2: Patient Distributions According to Failure Classes

Class	Frequency	Percentage
I	6	8.0%
II	12	16.0%
III	24	32.0%
IV	25	33.3%
V	5	6.7%
VI	3	4.0%

Table 2 shows that Class III (32%) and IV (33.3%) failures dominated, indicating most failures required prosthesis replacement. Low Class I (8%) suggests minor issues (e.g., cementation, porcelain fracture) were less common than combined biological, mechanical/aesthetic failures. Class V-VI (6.7%,4%) represents irreversible failures which include periodontal involvement, emphasizing the need for early detection to prevent abutment loss.

Table 3: Failure Classes Distribution by Gender

Class	Male (n=53)	Female (n=22)	p-value
I	5 (9.4%)	1 (4.5%)	0.659
II	9 (17.0%)	3 (13.6%)	1.000
III	18 (34.0%)	6 (27.3%)	0.790
IV	16 (30.2%)	9 (40.9%)	0.424
V	3 (5.7%)	2 (9.1%)	0.630
VI	2 (3.8%)	1 (4.5%)	1.000

Total: p=0.842.

Table 3 shows that no significant gender difference in failure severity patterns. Males showed lower very severe failures (V-VI) (9.5% vs. 13.6%), though underpowered to confirm.

Table 4: Failure class distribution and Material-Based Analysis

Class	PFM (n=64)	Zirconia (n=11)	p-value
I	5 (7.8%)	1 (9.1%)	1.000
II	10 (15.6%)	2 (18.2%)	1.000

Class	PFM (n=64)	Zirconia (n=11)	p-value
III	21 (32.8%)	3 (27.3%)	1.000
IV	22 (34.4%)	3 (27.3%)	0.747
V	4 (6.3%)	1 (9.1%)	0.560
VI	2 (3.1%)	1 (9.1%)	0.380

Total p=0.913

Table 4 shows that Zirconia had showed lower Class IV failures (27.3% vs. PFM's 34.4%), but statistically insignificant (p=0.747). No material differences in minor (Class I-II) or severe (V-VI) failures (all p>0.05).

Table 5: Failure Class Distribution and Duration of Use analysis

Class	<5 Years (n=43)	≥5 Years (n=32)	p-value	OR [95% CI]
I	5 (11.6%)	1 (3.1%)	0.229	0.24 [0.03–2.14]
II	8 (18.6%)	4 (12.5%)	0.541	0.62 [0.17–2.29]
III	15 (34.9%)	9 (28.1%)	0.629	0.73 [0.27–1.96]
IV	11 (25.6%)	14 (43.8%)	0.030*	2.27 [0.86–6.02]
V	3 (7.0%)	2 (6.3%)	1.000	0.89 [0.14–5.70]
VI	1 (2.3%)	2 (6.3%)	0.560	2.83 [0.24–33.0]

Total p=0.048*

Table 5 shows that FPD in use ≥5 years had 2.3× higher odds of Class IV failures (OR=2.27, p=0.03). Class I failures were 4× less likely in long-term use (OR=0.24), though insignificant (p=0.229). Overall distribution differed significantly (p=0.048), driven by Class IV.

DISCUSSION

This study provides important insights into failure patterns of fixed partial dentures (FPDs) in a Nepalese population using Manappallil's classification system. Our findings reveal that Class IV (combined biological, mechanical/aesthetic failures,33.3%) and Class III(mechanical/aesthetic failures, 32.0%) were the most prevalent, indicating the most complications required prosthesis replacement. These results align with but also differ meaningfully from previous studies in several key aspects.

When compared to Iswalhia study[6], our study showed a higher proportion of Class IV failures (33.3% vs 24%) but lower Class V failures (6.7% vs 15%) and Class VI failure (4% vs 11%). This discrepancy may reflect differences in patient demographics, as our study population was younger (age above 30 years in Iswalhia study) and potentially had better periodontal health. Similar to Alfirdie et al. [7] and Alalwani et al.[8], we observed that combined biological-mechanical/aesthetic complications (Class IV) dominated, reinforcing Goodacre et al.'s (9) assertion that such combined failures are the most common challenge in fixed prosthodontics.

Though statistically insignificant due to the small zirconia sample (n=11), zirconia showed lower Class IV (27.3% vs. 34.4%) and Class III (27.3% vs. 32.8%) failure rates than PFM restorations, supporting Pjetursson et al.'s [10]findings that zirconia restoration and metal ceramic restoration has comparable biological outcomes but fewer aesthetic complications. However, Sailer et al[11] caution against zirconia as a first-line option due to technical complications, warranting further study with larger samples.

The most clinically significant finding was the 2.3-fold increased odds of Class IV failures in FPDs used ≥5 years (OR=2.27, p=0.03). This strongly aligns with Creugers et al's [12] meta-analysis showing survival rate of conventional bridges decreases significantly after 5 years. Our data suggests this threshold may be even more pronounced in resource-limited settings where maintenance care is often delayed. The progression from Class I (8.0%) to Class IV (33.3%) failures highlights the importance of the "failure cascade" described by Manappallil, where minor issues left untreated lead to catastrophic failures. Backer et al.[13] also emphasized that early intervention within 2 years can prevent catastrophic failures.Similarly Bidra A et al[14] also gave importance of follow up visits including oral hygiene instruction and intervention to minimize caries and periodontal diseases in FPD abutments and surrounding structures, highlighting the need for structured recall systems in Nepal.

While no significant gender differences were found, females had numerically higher Class IV failures (40.9% vs. 30.2%), possibly due to delayed treatment-seeking behavior, as noted by Shrestha et al.[15] in Nepalese women. This may reflect sociocultural factors in healthcare access rather than biological differences.

This warrants targeted patient education about early reporting of minor complications, particularly for women. Recall systems should prioritize FPDs beyond 5 years of service to intercept severity of failures. Zirconia may offer clinical benefits (fewer biological/aesthetic issues), but cost and technical sensitivity must be considered. Fabrication protocols need emphasis on marginal precision to prevent Class III and Class IV failures.

LIMITATIONS AND FUTURE RESEARCH:

This study, while providing valuable insights into FPD failure patterns in a Nepalese cohort, has several limitations that should be acknowledged. The single-center design may limit the generalizability of findings to broader populations, as patient demographics and treatment protocols can vary across regions. The small sample size of zirconia prostheses (n=11) reduced statistical power for material comparisons, potentially masking clinically relevant differences between zirconia

and PFM restorations.

Future research should address these limitations through multi-center studies with larger, matched cohorts to validate material performance trends, particularly for zirconia prostheses. Studies should also explore socioeconomic and cultural variables to better understand gender-based trends in treatment-seeking behaviour and failure severity.

CONCLUSIONS

This study provides critical insights into the failure patterns of fixed partial dentures (FPDs) in a Nepalese population, emphasizing the importance of severity-based classification using Manappallil's system. The high prevalence of Class IV (combined failures, 33.3%) and Class III (mechanical/aesthetic issues, 32.0%) underscores the need for improved clinical protocols, particularly for long-term FPD maintenance. Notably, prostheses beyond 5 years of service demonstrated 2.3× higher odds of severe failure, reinforcing the necessity of structured recall systems for early intervention. While zirconia prostheses showed promising trends (27.3% Class IV failures vs. 34.4% for PFM), larger studies are needed to confirm material-specific advantages.

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CONFLICT OF INTEREST

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