

## ORIGINAL ARTICLE

## METAL-CERAMIC PROSTHESIS PITFALLS: A CLINICAL CROSS-SECTIONAL STUDY AT A TERTIARY CARE HOSPITAL IN PAKISTAN

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**Background:** Tooth-supported Metal Ceramic Fixed Dental Prosthesis (MCFPDs) offers strength, aesthetics, and affordability, but often face minor complications. This study documents common complications of MCFPDs at a tertiary care hospital in Pakistan. **Methods:** This 12-month cross-sectional study included 150 patients with MCFDP complications. Data were collected through patient examination and records, and analyzed on SPSS-23 with Chi-square test, considering  $p \leq 0.05$  as significant. **Results:** A total of 150 patients (63 males, 87 females) with a mean age of  $38 \pm 8$  years (Range: 20–60 years) were examined for complications in tooth-supported fixed-fixed metal-ceramic prostheses. Most belonged to high (52.7%) and mid (46%) socioeconomic status (SES); 1.3% were low-income. Education levels included primary (34.7%), secondary (40%), and higher (25.3%). Among 566 MCFDP units (323 retainers, 243 pontics), complications were more frequent in the maxillary arch (56%) and in anterior (32.7%) right posterior (32.7%) and left posterior regions (30.0%). Biological failures (78.7%), mainly secondary caries (35.3%) dominated. Failures occurred mostly in general practice (96.7%), and after 12 years (22%). **Conclusion:** The most prevalent fixed dental prosthesis (FDP) complication was secondary caries, followed by periodontal compromises. Dental practitioners must ensure effective case selection, diagnosis, and treatment plan.

**Keywords:** Biological Complications, FDP, Fixed-Fixed Metal Ceramic Fixed Dental Prosthesis, Frequency, MCFDP, Removable partial denture, RPD, Technical Complications

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## INTRODUCTION

Metal-ceramic tooth-supported FDPs have been widely used since the mid-20<sup>th</sup> century for their durability, affordability and aesthetics.<sup>1,2</sup> Despite these advantages, they are associated with both biological and technical complications.<sup>1</sup> Most issues like Level-1 complications are minor and manageable, while Level-2 complications may require prosthesis removal or replacement.<sup>1,3</sup>

Tooth loss affects both functional and psychological health.<sup>4</sup> Treatment options include removable and fixed prostheses, implants, and overdentures, with patients' choices influenced by factors such as age, gender, education, and socioeconomic status (SES).<sup>4,5</sup>

Despite advances, conventional FDPs remain reliable and cost-effective. Clinical success relies on proper design, patient compliance, and regular follow-up.<sup>6,7</sup> Careful selection of pontics, retainers and connectors ensures stability and aesthetics.<sup>8</sup> Metal-ceramic prostheses, especially porcelain-fused-to-metal (PFM), remain common FDP option despite aesthetic limitations of some metal alloys.<sup>9</sup> Abutment tooth evaluation is critical, including assessment of crown height, crown-root ratio, and periodontal condition.<sup>1</sup>

Short clinical crowns may require interventions such as crown lengthening.<sup>7</sup> A ferrule of 1.5–2 mm enhances fracture resistance, often necessitating endodontic treatment.<sup>10</sup> Alternatives like

telescopic retainers and non-rigid connectors are beneficial in cases with compromised abutments or longer spans.<sup>11</sup>

Common causes of FDP failure include caries, periodontal disease, de-cementation, and material fracture.<sup>1,12</sup> Accurate margin placement and proper cement selection are vital for long-term success. Composite resin cements are favoured for their bond strength and aesthetics.<sup>13</sup> Aesthetic issues such as shade mismatch or ceramic fracture can impact outcomes but are manageable with proper planning.<sup>8,12,14</sup> Reported survival rates for FDPs remain high over extended periods when complications are proactively addressed.<sup>15</sup>

This study aims to assess clinical complications of metal-ceramic prostheses to improve management and outcomes in a tertiary care setting.

## METHODOLOGY

This 12-month (Sep 2020 to Aug 2021) cross-sectional study at Peshawar Dental College included 150 patients, using consecutive sampling, based on a 42% assumed MCFDP complication rate at 95% confidence interval. Socio-demographic data and prosthesis details usage duration and retention type were documented and clinical examination like abutment condition were undertaken to assess biological and technical complications of MCFDPs, categorized by type and severity (Level-1: manageable; Level-2: needing replacement).

Inclusion criteria were partially dentate patients aged 20–60 years with MCFDP complications, consenting to participate. Exclusion criteria were non-study site prostheses, implants, RPDs, edentulous uncooperative patients, systemic illness, or who were unable to undergo clinical examination.

Data were analyzed on SPSS-23. Descriptive stats with continuous data were expressed as Mean±SD/IQR and categorical as frequency and percentage. Chi-square test was applied and  $p \leq 0.05$  was considered statistically significant.

## RESULTS

A total of 150 patients, 63 (42%) males and 87 (58%) females were examined for common complications in tooth-supported fixed-fixed design MCFDPs. Eighteen (12%) patients from 20–30 years, 31 (20.7%) from 31–40 years, 50 (33.3%) from 41–50 years and 51 (34%) were from 51–60 years' age groups with a mean age of  $38 \pm 8$  years. Five (3.3%) failures occurred in specialist clinic (postgraduate) and 145 (96.7%) failures occurred in general clinics (undergraduate).

There were 566 units of MCFDPs, out of which 323 were retainers and 243 were pontics. The frequency of the number of units and complications recorded in each arch (maxillary and mandibular) as well as those recorded in both regions (posterior region and anterior region) are tabulated in (Table-1).

**Table-1: Distribution of abutments/retainers, pontics, and sites of prosthetic complications**

Parameter	Frequency (%)
<b>Number of Abutments/Retainers</b>	
2	134 (89.3)
3	14 (9.3)
5	1 (0.7)
8	1 (0.7)
<b>Number of Pontics</b>	
1	82 (54.7)
2	54 (36)
3	11 (7.3)
4	1 (0.7)
7	1 (0.7)
8	1 (0.7)
<b>Number of Units</b>	
3	79 (52.7)
4	54 (36.0)
5	6 (4.0)
6	8 (5.3)
7	1 (0.7)
12	1 (0.7)
16	1 (0.7)
<b>Arch Type</b>	
Maxillary	84 (56.0)
Mandibular	66 (44.0)
<b>Location of the FPD within the Arch</b>	
Right posterior	49 (32.7)
Left Posterior	48 (30.0)
Anterior	49 (32.7)
Anterior and Posterior	4 (2.7)

Majority (118, 78.7%) of the complications were biological, whereas 32 (21.3%) were technical. Secondary caries (53, 35.3%) was the most common complication followed by periodontal disease (36, 24%), pulp pathology (29, 19.3%), and de-cementation (17, 11.3%). The least common complication was unacceptable aesthetics (15, 10%). (Table-2).

**Table-2: Biological and technical complications in relation to prosthesis duration of use [n (%)]**

Complication Level	Biological Complications 118 (78.7%)		Technical Complications 32 (21.3%)	
	Secondary caries/ pulp pathology	Periodontal complication	Decementation	Unacceptable aesthetics
Level 1	53 (35.3)	21 (14.0)	11 (7.3)	12 (8.0)
Level 2	29 (19.3)	15 (10.0)	6 (4.0)	3 (2.0)
Missing	68 (45.3)	114 (76.0)	133 (88.7)	135 (90.0)

Most (145, 96.7%) of the patients reported failures at general dental clinics (undergraduate), while (5, 3.3%) at the specialist/private clinics (postgraduate). Failures were more common after 12 years (33, 22%), 11 years (12, 8.0%), 10 years (12, 8.0%), and 6 years (12, 8.0%). (Table-3).

**Table-3: Duration of prosthesis used by the patients**

Duration (Years)	Frequency (%)	Duration (Years)	Frequency (%)
2	2 (1.3)	12	33 (22.0)
3	2 (1.3)	13	9 (6.0)
4	3 (2.0)	14	2 (1.3)
5	4 (2.7)	15	9 (6.0)
6	12 (8.0)	16	6 (4.0)
7	7 (4.7)	17	1 (0.7)
8	10 (6.7)	18	9 (6.0)
9	8 (5.3)	19	1 (0.7)
10	12 (8.0)	24	5 (3.3)
11	12 (8.0)	26	3 (2.0)

## DISCUSSION

This study evaluated complications associated with tooth-supported fixed-fixed designed MCFDPs in 150 patients, with a higher (58%) proportion of females. The majority were aged 41–60 years, with a mean age of 38 years. Similar age and gender trends were reported by Khan M *et al*<sup>16</sup>, highlighting mid-life as a common period for prosthetic intervention. This implies that middle-aged adults are most likely affected by FDP-related complications due to cumulative oral health challenges.

Anterior and right posterior regions showed the highest complication frequencies. Similarly, a recent study by Pol *et al*<sup>17</sup> found 3-unit and maxillary FDPs to be more failure-prone due to biomechanical stress and aesthetic demands. Short-span maxillary FDPs in stress-bearing zones require enhanced planning and material selection.

Biological complications exceeded technical ones. The most frequent issues were secondary caries, followed by periodontal disease, and pulp pathology.

These findings are consistent with Khan *et al*<sup>18</sup> who identified carries and periodontal breakdown as major causes of FDP failure. Therefore, biological maintenance is key to long-term FDP survival, emphasizing oral hygiene and periodic monitoring.

Decementation and aesthetic concerns were the main technical complications in our study which was depicted in an international study<sup>19</sup>. This underscores that the clinician's technique and material choice significantly influence technical success.

Although failures occurred mostly after 10 years, especially in general dental clinics in comparison to specialist/postgraduate dental settings, this finding was not found to be popular in the recent literature, though certain aspects can be influenced by the dentistry undergraduate students' limited clinical experience.<sup>20</sup> It may be deduced that specialist-led care is not as critical factor as the others were for extending FDP lifespan.

## CONCLUSION

Secondary caries, periodontal disease, de-cementation, and aesthetic concerns remain common complications in FDP, with a higher prevalence observed in females and the maxillary arch. It is recommended to prioritize thorough pre-operative assessment, proper case selection, and ongoing professional development to enhance treatment outcome.

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**ZNJ:** Concept, Study design, Data acquisition, manuscript writing

**AS:** Data acquisition, Manuscript writing, Final approval

**SHI:** Data analysis, review

**AWQ:** Literature search, Manuscript writing/review, Final approval

**AEK:** Analysis and interpretation of data, Critical review

**SWB:** Data collection, Tabulation

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