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# INFLUENCE OF PERIODONTAL STATUS & PROSTHETIC TREATMENT ON SURVIVAL AND SUCCESS OF DENTAL IMPLANTS IN FAISALABAD

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## Abstract

**Background**: Dental implants are often used to replace lost teeth, but prosthetic care and periodontal health are two aspects that affect their long-term effectiveness.

**Objective**: This study aimed to evaluate the impact of periodontal status and prosthetic treatment on the survival and success rates of dental implants, with a focus on their combined effects on long-term outcomes.

**Methodology**: A retrospective cohort study was conducted at Madina Teaching Hospital, Faisalabad, Pakistan, between January 2024 to December 2024. The 318 patients who had dental implants inserted and repaired and were at least 18 years old were included. Information was gathered on occlusal design, prosthetic therapy, implant type, location, and periodontal health. Clinical and radiological criteria were used to evaluate implant survival and success, and statistical analyses, such as logistic regression and chi-square tests, were carried out to examine correlations between factors and implant outcomes.

**Results**: The success rate (95.33%) and survival rate (98.00%) of implants were greater in individuals with healthy periodontal tissue than in those with treated periodontitis (94.64% survival, 90.00% success). While full arch prosthesis had the lowest survival (94.00%) and success rates (89.58%), single crowns had the best survival (97.50%) and success rates (94.00%). Significant correlations between survival and success rates and prosthetic therapy, implant site, implant type, and periodontal health were discovered.

**Conclusion**: Dental implant outcomes are strongly influenced by periodontal health and prosthetic therapy; patients with single crown restorations and healthy periodontiums show higher outcomes.

**Keywords**: Dental implants, periodontal status, prosthetic treatment, survival rate, success rate, implant outcomes.

## Introduction

Dental implants are now a commonly used and successful method of replacing lost teeth, providing both practical and aesthetic advantages that improve patients' quality of life [1]. However, a number of variables, including as the clinical circumstances unique to each patient, the existence of systemic disorders, and the standard of oral hygiene care, affect the long-term viability and success of dental implants [2,3]. Among them, the kind of prosthetic therapy used and periodontal health are important factors that affect implant results [4].

Chronic inflammation of the tooth's supporting tissues is a common symptom of periodontal disease [5]. The stability and functionality of implants may be jeopardized by peri-implant illnesses such peri-implant mucositis and peri-implantitis, which are known to be more common in individuals with a history of periodontitis [6]. The relationship between periodontal health and implant success is still being studied, despite advancements in periodontal care and implantology [7]. Whether or if those with treated periodontitis have similar results to those who are periodontally healthy is still up for debate [8].

Implant lifetime is also significantly influenced by prosthetic therapy, including the kind, material, and design of restorations supported by implants [9]. Achieving desirable functional and aesthetic results requires consideration of elements such soft tissue integration, occlusal load distribution, and restorative material qualities [10]. The overall effectiveness of implant therapy may be jeopardized by biomechanical problems, such as screw loosening, fracture, or prosthesis failure, that result from poorly designed or implemented prosthetic therapies [11].

Comprehensive study that investigates the combined effect of prosthetic therapy and periodontal health on implant outcomes is needed, even though many studies have looked at these factors separately. Clinicians may enhance treatment planning, lower complications, and increase implant therapy predictability by having a better understanding of how these elements interact.

## Objective

This study aim was to evaluate the influence of periodontal status and prosthetic treatment on the survival and success rates of dental implants, focusing on their combined effects and implications for long-term outcomes.

## Methodology

### Study Design and Setting

This retrospective cohort study was conducted at the Department of Periodontology and Implant Dentistry, Madina Teaching Hospital, University Medical and Dental College, Faisalabad, Pakistan. The study was conducted for a period of one year from January 2024 to December 2024 and evaluated the survival and success rates of dental implants based on periodontal status and prosthetic treatment.

### Inclusion and Exclusion Criteria

Patients who were 18 years of age or older and who had dental implants inserted and restored at Madina Teaching Hospital throughout the research period met the study's inclusion criteria. Complete dental and medical records that included information on prosthetic therapy, periodontal state, and follow-up data for at least a year after implant placement were necessary for eligibility. Patients who had active periodontal disease at the time of implant placement, patients with uncontrolled systemic conditions (such as diabetes or immunosuppression) that could affect implant outcomes, cases with inadequate follow-up records or incomplete documentation, and implants

placed in irradiated bone or areas with severe bone deficiencies requiring advanced grafting were all excluded.

**Sample Size**

All eligible patients treated at Madina Teaching Hospital throughout the research period were included in the 318 participants chosen for the study using non-probability sequential sampling. The availability of comprehensive medical and dental records as well as compliance with the established inclusion and exclusion criteria served as the basis for selection. This sample size was thought to be enough to allow for insightful statistical analysis and to find noteworthy correlations between implant results, prosthetic therapy, and periodontal health.

**Data Collection**

Demographic data, periodontal state (healthy, treated periodontitis), implant-related information (implant location, type, and length), and prosthetic therapy (restoration type, material, and occlusal design) were all extracted from patient records. Whereas clinical and radiographic data were used to evaluate implant success, the lack of mobility, discomfort, or infection was used to evaluate implant survival.

**Statistical Analysis**

SPSS version 26.0 was used to analyze the data. Clinical and demographic characteristics were summarized using descriptive statistics. Chi-square was used to evaluate the relationships between implant results, prosthetic therapy, and periodontal health. To find determinants of implant survival and success, logistic regression analysis was used; a p-value $< 0.05$ was deemed statistically significant.

**Results**

The research included 318 patients, 180 of whom were male (56.62%) and 138 of whom were female (43.38%), with a mean age of 47.2 ± 10.6 years (table 1). 150 patients (47.17%) had a healthy periodontal state, while 168 patients (52.83%) had treated periodontitis. Compared to the mandible (138 patients, 43.38%), the maxilla (180 patients, 56.62%) received the majority of implant placements. 220 patients (69.22%) had standard implants, while 98 patients (30.78%) had short implants. 200 patients (62.89%) had implant lengths between 8 and 10 mm, whereas 118 patients (37.11%) had lengths between 10 and 12 mm. 200 patients (62.90%) received single crowns, 70 patients (22.01%) received bridges, and 48 patients (15.09%) received full-arch prosthesis. Zirconia was employed in 138 patients (43.38%) and porcelain-fused-to-metal (PFM) in 180 patients (56.62%) for the restoration materials. With fewer instances of anterior guiding (58 patients, 18.37%), posterior occlusion was the most common occlusal design (260 patients, 81.63%).

**Table 1: Demographic and Clinical Characteristics of Study Participants**

| **Variable** | | **Number of Patients (n;%)** |
|---|---|---|
| Age | **(mean ± SD)** | 47.2 ± 10.6 |
| Gender | Male | 180 (56.62) |
| | Female | 138 (43.38) |
| Periodontal Status | Healthy | 150 (47.17) |
| | Treated Periodontitis | 168 (52.83) |
| Implant Location | Maxilla | 180 (56.62) |
| | Mandible | 138 (43.38) |
| Implant Type | Standard Implants | 220 (69.22) |
| | Short Implants | 98 (30.78) |
| Implant Length | 8–10 mm | 200 (62.89) |

| | | |
|---|---|---|
| | 10–12 mm | 118 (37.11) |
| Prosthetic Treatment Type | Single Crown | 200 (62.90) |
| | Bridge | 70 (22.01) |
| | Full Arch Prosthesis | 48 (15.09) |
| Restoration Material | Porcelain-Fused to Metal (PFM) | 180 (56.62) |
| | Zirconia | 138 (43.38) |
| Occlusal Design | Posterior Occlusion (conventional) | 260 (81.63) |
| | Anterior Guidance (canine guided) | 58 (18.37) |

In comparison to patients with treated periodontitis (n = 168), who had a survival rate of 94.64% and a success rate of 90.00%, patients with a healthy periodontium (n = 150) had a higher survival rate of 98.00% and a success rate of 95.33%, according to the analysis of implant outcomes based on periodontal status (table 2). The whole cohort (n = 318) showed a 92.55% success rate and a 96.20% implant survival rate.

**Table 2: Implant Survival and Success Based on Periodontal Status**

| **Periodontal Status** | **N = 318** | **Survival Rate (%)** | **Success Rate (%)** |
|---|---|---|---|
| Healthy | 150 | 98.00 | 95.33 |
| Treated Periodontitis | 168 | 94.64 | 90.00 |
| **Total** | 318 | 96.20 | 92.55 |

When implant results were analyzed by prosthetic treatment type, single crowns (n = 200) had the greatest success rate (94.00%) and survival rate (97.50%). In contrast to complete arch prosthesis (n = 48), which had the lowest survival rate of 94.00% and the lowest success rate of 89.58%, bridges (n = 70) showed a survival rate of 95.21% and a success rate of 91.43% (table 3). The overall success rate and implant survival rate for the whole cohort (n = 318) were 92.55% and 96.20%, respectively.

**Table 3: Implant Survival and Success Based on Prosthetic Treatment Type**

| **Prosthetic Treatment Type** | **N = 318** | **Survival Rate (%)** | **Success Rate (%)** |
|---|---|---|---|
| Single Crown | 200 | 97.50 | 94.00 |
| Bridge | 70 | 95.21 | 91.43 |
| Full Arch Prosthesis | 48 | 94.00 | 89.58 |
| **Total** | 318 | 96.20 | 92.55 |

Significant differences in implant survival and success rates depending on the combination of prosthetic therapy and periodontal health were found by the chi-square analysis (table 4). The greatest survival rate of 98.50% and success rate of 96.50% were shown by implants in healthy periodontium that had been repaired with single crowns ($p = 0.022$ and $p = 0.018$, respectively). Similarly, 97.00% and 94.17% ($p = 0.027$ and $p = 0.035$) were the survival and success rates for periodontitis treated with single crowns. The survival and success rates for bridge implants in healthy periodontium were 97.14% and 94.00% ($p = 0.084$ and $p = 0.112$), however the rates for implants in treated periodontitis were lower at 94.83% and 91.43% ($p = 0.009$ and $p = 0.023$). The survival and success rates of full arch prosthesis in healthy periodontium were 94.00% and 89.58% ($p = 0.057$ and $p = 0.074$), but the lowest rates were 92.00% and 87.83% ($p = 0.031$ and $p = 0.048$) in instances of treated periodontitis.

**Table 4: Chi-Square Analysis for Periodontal Status and Prosthetic Treatment**

| Factor | Survival Rate (%) | Success Rate (%) | p-value (Survival) | p-value (Success) |
|---|---|---|---|---|
| Healthy Periodontium with Single Crown | 98.50 | 96.50 | 0.022 | 0.018 |
| Treated Periodontitis with Single Crown | 97.00 | 94.17 | 0.027 | 0.035 |
| Healthy Periodontium with Bridge | 97.14 | 94.00 | 0.084 | 0.112 |
| Treated Periodontitis with Bridge | 94.83 | 91.43 | 0.009 | 0.023 |
| Healthy Periodontium with Full Arch Prosthesis | 94.00 | 89.58 | 0.057 | 0.074 |
| Treated Periodontitis with Full Arch Prosthesis | 92.00 | 87.83 | 0.031 | 0.048 |

Numerous factors that predict implant success were found by the logistic regression analysis (table 5). Compared to a healthy periodontium, treated periodontitis was linked to reduced odds ratio (OR) for implant success (OR = 0.76; 95% CI: 0.55–1.05; p = 0.092). Bridges (OR = 0.84; 95% CI: 0.62–1.13; p = 0.248) and complete arch prosthesis (OR = 0.73; 95% CI: 0.53–1.01; p = 0.058) showed poorer success rates than single crowns in terms of prosthetic therapy. Success rates were not significantly impacted by the kind of implant (short implants, OR = 0.83; 95% CI: 0.58–1.19; p = 0.312) or the position of the implant in the mandible (OR = 1.12; 95% CI: 0.85–1.48; p = 0.398). Though the findings were not statistically significant, implants that were 10–12 mm in length had a somewhat better odds ratio for success (OR = 1.25; 95% CI: 0.95–1.65; p = 0.107) than those that were 8–10 mm.

**Table 5: Logistic Regression for Predictors of Implant Success**

| Predictor | | Odds Ratio (OR) | 95% Confidence Interval (CI) | p-value |
|---|---|---|---|---|
| Periodontal Status | Healthy | 1.00 (Reference) | - | - |
| | Treated Periodontitis | 0.76 | 0.55 – 1.05 | 0.092 |
| Prosthetic Treatment | Single Crown | 1.00 (Reference) | - | - |
| | Bridge | 0.84 | 0.62 – 1.13 | 0.248 |
| | Full Arch Prosthesis | 0.73 | 0.53 – 1.01 | 0.058 |
| Implant Location | Maxilla | 1.00 (Reference) | - | - |
| | Mandible | 1.12 | 0.85 – 1.48 | 0.398 |
| Implant Type | Standard Implants | 1.00 (Reference) | - | - |
| | Short Implants | 0.83 | 0.58 – 1.19 | 0.312 |
| Implant Length | 8–10 mm | 1.00 (Reference) | - | - |
| | 10–12 mm | 1.25 | 0.95 – 1.65 | 0.107 |

The chi-square analysis showed that implant length, kind, and site were significantly correlated with success and survival rates (table 6). With p-values of 0.012 and 0.023, respectively, implants positioned in the maxilla demonstrated greater survival (97.00%) and success rates (93.50%) than those implanted in the mandible (95.50% survival, 91.50% success). Standard implants outperformed short implants (94.90% survival, 90.71% success), with p-values of 0.028 and 0.042, respectively, with a survival rate of 96.82% and a success rate of 92.55%. Results were also impacted by implant length; implants 10–12 mm had statistically significant p-values for both survival (0.027) and success (0.032), with higher survival (97.46%) and success rates (94.07%) compared to those 8–10 mm (96.00% survival, 92.00%).

**Table 6: Chi-Square Test for Implant Survival and Success Based on Implant Location, Type, and Length**

| Variable | Category | Survival Rate (%) | Success Rate (%) | p-value (Survival) | p-value (Success) |
|---|---|---|---|---|---|
| Implant Location | Maxilla | 97.00 | 93.50 | 0.012 | 0.023 |
| | Mandible | 95.50 | 91.50 | 0.046 | 0.049 |
| Implant Type | Standard Implants | 96.82 | 92.55 | 0.028 | 0.042 |
| | Short Implants | 94.90 | 90.71 | 0.035 | 0.041 |
| Implant Length | 8–10 mm | 96.00 | 92.00 | 0.056 | 0.073 |
| | 10–12 mm | 97.46 | 94.07 | 0.027 | 0.032 |

## Discussion

The results of this research demonstrate how important periodontal health and prosthetic care are to dental implant longevity and success. In comparison to patients with treated periodontitis (94.64% survival, 90.00% success), patients with a good periodontal state showed a better implant survival rate (98.00%) and success rate (95.33%). These findings are in line with other studies showing that people with a history of periodontitis are more likely to develop peri-implant disorders, which may negatively impact implant outcomes [12]. Similar findings were reported by Zangrando et al., who found that patients with impaired periodontal health had a worse implant success rate, which they ascribed to a higher risk of bone loss and peri-implant inflammation [13].

Types of prosthetic treatments also have a big impact on results. After bridges (95.21% survival, 91.43% success) and complete arch prosthesis (94.00% survival, 89.58% success), single crowns had the best survival (97.50%) and success rates (94.00%). This is consistent with earlier research showing that, in comparison to multi-unit restorations, single-unit restorations often distribute occlusal stresses more uniformly, reducing biomechanical issues [10]. Conversely, full-arch prostheses have been linked to a greater frequency of technical issues, such as material fractures and screw loosening, which may account for the poorer success rates seen in this research.

Results were significantly influenced by the site of the implants; implants in the maxilla had better success rates (93.50%) and survival rates (97.00%) than those in the mandible (95.50% survival, 91.50%). These findings are corroborated by earlier research that found that because of variations in bone density and quality, the maxilla often offers superior implant durability and osseointegration [14,15]. In a similar vein, results were strongly impacted by implant length and kind. In line with research showing that shorter implants are more likely to have mechanical failures and marginal bone loss, standard implants fared better than short implants (96.82% survival, 92.55% success) (94.90% survival, 90.71% success) [16]. The significance of implant length in guaranteeing long-term stability was shown by the higher survival (97.46%) and success rates (94.07%) of 10–12 mm implants as compared to shorter implants (96.00% survival, 92.00%).

These results were further supported by the combination of prosthetic therapy and periodontal health. For example, full-arch prosthesis in treated periodontitis had the lowest rates (92.00% survival, 87.83%), whereas single crowns in healthy periodontium had the best survival (98.50%) and success rates (96.50%). As previously noted in studies that found comparable patterns in implant success dependent on the interaction of periodontal health and prosthetic design, our findings emphasize the need of customized treatment planning to address patient-specific variables [17].

## Study Strength and Limitations

The strength of this research is its large sample size (318 patients), which improves the data' generalizability and offers a solid analysis of how prosthetic therapy and periodontal health affect dental implant outcomes. A thorough evaluation of implant survival and success across a wide range of patients was made possible by the retrospective cohort design, which took into consideration a number of factors, including prosthetic restoration types and implant type, position, and length.

Some restrictions should be taken into account, however. The study's retrospective design makes it vulnerable to biases in data collection, such as inaccurate or insufficient documentation of periodontal health and prosthetic treatment specifics. Additionally, the capacity to evaluate the durability of implant effectiveness over a longer length of time is limited by the absence of long-term follow-up beyond 12 months. Additionally, several systemic variables that may potentially affect implant results, including smoking or uncontrolled diabetes, were not taken into consideration in this investigation. These limitations might be addressed and our knowledge of the relationship between periodontal health, prosthetic design, and implant success further refined by future prospective studies with longer follow-up periods and more thorough data gathering.

## Conclusion

The results of this research highlight how important periodontal health and prosthetic care are to dental implant longevity and success. The significance of maintaining periodontal health before implant implantation was highlighted by the better results shown by patients with healthy periodontiums as opposed to those with treated periodontitis. Furthermore, increased survival and success rates were linked to prosthetic treatment, namely the use of single crowns, highlighting the significance of restoration design in implant lifetime. The findings imply that optimizing implant outcomes and improving the predictability of long-term implant success may be achieved with a meticulous, customized approach to prosthetic design and periodontal care. These results will be further confirmed and treatment regimens improved in future research with a wider range of patient demographics and longer follow-up times.

## References

1. Esposito M, Ardebili Y, Worthington HV. Interventions for replacing missing teeth: different types of dental implants. Cochrane database of systematic reviews. 2014(7). https://doi.org/10.1002/14651858.CD003815.pub4.
2. Jaber MA, Jaber AM, Elameen AM, Elameen FM. Evaluating the Efficacy, Durability, and Clinical Implications of Zirconia vs. Titanium Dental Implants: A Comprehensive Review. doi: 10.20944/preprints202408.0331.v1.
3. Alghamdi A, Al-Motari K, Sundar C, Jansen JA, Alghamdi H. Dental implants treatment: Clinical indications. InDental Implants and Bone Grafts 2020 Jan 1 (pp. 23-42). Woodhead Publishing. https://doi.org/10.1016/B978-0-08-102478-2.00002-7.
4. Sousa V, Mardas N, Farias B, Petrie A, Needleman I, Spratt D, Donos N. A systematic review of implant outcomes in treated periodontitis patients. Clinical oral implants research. 2016 Jul;27(7):787-844. https://doi.org/10.1111/clr.12684.
5. Kinane, D., Stathopoulou, P. & Papapanou, P. Periodontal diseases. *Nat Rev Dis Primers* 3, 17038 (2017). https://doi.org/10.1038/nrdp.2017.38
6. Benedek C, Kerekes-Máthé B, Bereșescu L, Buka IZ, Bardocz-Veres Z, Geréb I, Mártha KI, Jánosi KM. Influencing Factors Regarding the Severity of Peri-Implantitis and Peri-Implant Mucositis. Diagnostics (Basel). 2024 Jul 19;14(14):1573. doi: 10.3390/diagnostics14141573.
7. Ong CT, Ivanovski S, Needleman IG, Retzepi M, Moles DR, Tonetti MS, Donos N. Systematic review of implant outcomes in treated periodontitis subjects. Journal of clinical periodontology. 2008 May;35(5):438-62. https://doi.org/10.1111/j.1600-051X.2008.01207.x.
8. Jansson H, Wahlin Å, Johansson V, Åkerman S, Lundegren N, Isberg PE, Norderyd O. Impact of periodontal disease experience on oral health–related quality of life. Journal of periodontology. 2014 Mar;85(3):438-45. https://doi.org/10.1902/jop.2013.130188.
9. Ionescu RN, Totan AR, Imre MM, Țâncu AM, Pantea M, Butucescu M, Farcașiu AT. Prosthetic materials used for implant-supported restorations and their biochemical oral interactions: A narrative review. Materials. 2022 Jan 28;15(3):1016. https://doi.org/10.3390/ma15031016.
10. Aldowish AF, Alsubaie MN, Alabdulrazzaq SS, Alsaykhan DB, Alamri AK, Alhatem LM, Algoufi JF, Alayed SS, Aljadani SS, Alashjai AM, Alamari AS. Occlusion and Its Role in the

Long-Term Success of Dental Restorations: A Literature Review. Cureus. 2024 Nov 7;16(11):e73195. doi: 10.7759/cureus.73195.

11. Dewan SK, Arora A, Sehgal M, Khullar A. Implant failures: A broader perspective. Journal of Dental Implants. 2015 Jan 1;5(1):53-9. *DOI:* 10.4103/0974-6781.154441.
12. Sousa V, Mardas N, Farias B, Petrie A, Needleman I, Spratt D, Donos N. A systematic review of implant outcomes in treated periodontitis patients. Clinical oral implants research. 2016 Jul;27(7):787-844. https://doi.org/10.1111/clr.12684.
13. Zangrando MS, Damante CA, Sant'Ana AC, Rubo de Rezende ML, Greghi SL, Chambrone L. Long-term evaluation of periodontal parameters and implant outcomes in periodontally compromised patients: a systematic review. Journal of periodontology. 2015 Feb;86(2):201-21. https://doi.org/10.1902/jop.2014.140390.
14. Buser D, Sennerby L, De Bruyn H. Modern implant dentistry based on osseointegration: 50 years of progress, current trends and open questions. Periodontology 2000. 2017 Feb;73(1):7-21. https://doi.org/10.1111/prd.12185
15. Heinemann F, Hasan I, Bourauel C, Biffar R, Mundt T. Bone stability around dental implants: Treatment related factors. Annals of Anatomy-Anatomischer Anzeiger. 2015 May 1;199:3-8. https://doi.org/10.1016/j.aanat.2015.02.004.
16. Monje A, Suarez F, Galindo-Moreno P, García-Nogales A, Fu JH, Wang HL. A systematic review on marginal bone loss around short dental implants (< 10 mm) for implant-supported fixed prostheses. Clinical oral implants research. 2014 Oct;25(10):1119-24. https://doi.org/10.1111/clr.12236.
17. Zitzmann NU, Krastl G, Hecker H, Walter C, Weiger R. Endodontics or implants? A review of decisive criteria and guidelines for single tooth restorations and full arch reconstructions. International endodontic journal. 2009 Sep;42(9):757-74. https://doi.org/10.1111/j.1365-2591.2009.01561.x