Alqalam Journal of Medical and Applied Sciences. 2026;9(8):2418-2422
https://doi.org/10.54361/ajmas.269813

Original article

Why Do Dental Implants Fail?: A Single Center Experience

Nuora Alhassi[1]*, Aymen Elatrash[2], Ala Darrat[3]

[1]*Department of Dental Materials, Faculty of Dentistry, University of Benghazi, Benghazi, Libya*
[2]*Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, University of Benghazi, Benghazi, Libya*
[3]*Department of Fixed Prosthodontics, Faculty of Dentistry, University of Benghazi, Benghazi, Libya*
Corresponding Email. *nuora.alhassi@uob.edu.ly*

Abstract
Dental implants demonstrate high long-term success; however, failures still occur because of multifactorial biological, mechanical, and patient-related factors. This retrospective single-center study evaluated implant failures at a private clinic in Benghazi, Libya, over eight years (2016–2023). Among 1,602 implants placed in 791 patients, 46 implants failed, yielding an overall failure rate of 2.8%. Early failures were primarily associated with smoking, impaired healing, poor bone quality, and compromised periodontal health, whereas late failures were predominantly related to parafunctional habits, particularly bruxism, resulting in prosthetic and mechanical complications. Careful preoperative assessment, periodontal management, smoking cessation, and long-term maintenance are essential to minimize implant failure and improve treatment outcomes.
Keywords: Dental Implant Failure, Peri-Implantitis, Smoking, Bruxism, Risk Factors.

Introduction

Dental implants are considered one of the most significant advancements in restorative dentistry. They not only restore function but also enhance aesthetics, improve patient confidence, and contribute positively to oral health-related quality of life. Over the past few decades, research has consistently demonstrated high survival rates for dental implants, positioning them as a preferred choice for replacing missing teeth. However, despite the high predictability of outcomes, failures still occur due to a range of biological, surgical, prosthetic, and patient-related factors [1].

Dental implants are widely regarded as the most reliable solution for edentulism, with studies indicating a success rate of 97% at 10 years and 75% at 20 years [2, 3]. However, as with other dental treatments, implants are prone to failure, and complications may occur. Being an expensive and time-consuming project, it is critical to know the possible reasons for implant failure and how to prevent them. These considerations emphasize the importance of carefully evaluating patient- and clinician-related factors before implant placement. Generally, dental implants are expected to last for several years, and any complications may take place after a significant period of their placement. Therefore, long-term follow-up associated with such complications may not occur at the same clinic where the implant was initially placed. Therefore, it is difficult to record the outcome of each case, and the overall incidence of dental implant removals remains unknown [1].

Although dental implants have a low failure rate, they still fail. Implant failures are categorized as either early, such as excessive heating of the bone during drilling, over-preparation of the surgical site, or low-density bone that interferes with the implant's primary stability. Additionally, late-onset failures may arise from an infectious source like peri-implantitis [4]. This reflects the importance of meticulous assessment of all related variables to optimize the outcomes. Additionally, in some cases, the implant may be completely osseointegrated, but it needs to be removed from a prosthetic point of view, as it is in an unrecoverable position. Overload as a result of parafunctional habits, if not addressed properly, could lead to late implant failure. Generally, late implant failures show no or minimal mobility, as the implant always has satisfactory apical osseointegration. These considerations emphasize the importance of carefully evaluating patient- and clinician-related factors before implant placement [5].

The causes of dental implant failure are diverse and may include both biological (peri-implant mucositis, peri-implantitis) and mechanical (fracture of the implant body and complete loss of osseointegration) complications. Of those, peri-implantitis is one of the most common causes for failure of the implant and has even been estimated to be 12.8% based on a meta-analysis. The peri-implantitis etiology is multifactorial and can be of bacterial origin, the most common system pathological cause or clinic -related surgical and prosthetic or biomechanical factors [6]. Surgical factors comprise malposition of the implant and inadequate bone augmentation while prosthetic factors include excess residual cement and prosthetic designs that limit effective oral cleaning. Biomechanical causes, such as occlusal overload, deep overbite and parafunctional habits might also play additional roles in the implant failure [7].

Implant failure can also be categorized based on its state of clinical condition. *Askary et al.* classified the implants into ailing, failing, and failed. Ailing implants are associated with only soft tissue complications and a more favorable prognosis, while failing implants show progressive bone loss but appear clinically stable. In case of failed implants, excessive mobility and bone loss higher than70% are considered as out-of-treatment. Diagnosis of failing or failed implants requires clinical and radiographic signs such as infection, probing depth, pain, mobility, changes in percussion sound and peri-implant bone loss on radiography [8]. Ensuring long-term implant success necessitates proactive strategies to address a set of potential risk factors that need to be assessed before the procedure. These factors could be

Received*: 03-06-2026 -* ***Accepted****: 01-08-2026 -* ***Published****: 07-08-2026*

related either to the dentist (preoperative, perioperative, and postoperative factors) or to the patient, which could be local risk factors, bone quality, bone quantity, smoking, irradiation, para-functional habits, bruxism, and systemic diseases. Such factors could also be related to the dental implant itself, like implant material or surface characteristics [9].

In biological terms, failures result in either early or late implant failure when osseointegration with the host tissue does not occur as expected. Early failures occur before or during the stage of healing abutments. These are essentially attributable to the insufficiency of appropriate osseointegration [10, 11]. By contrast, late failures involve the loss of a preexisting implant. Due to different etiologies, including occlusal overload or peri-implantitis [12]. Conversely, complications of the prostheses are due to mechanical failures of the implant components and/or prosthetic structures such as screw loosening, chipping, and loss of retention [13]. Implant failure is attributed to various systemic and local factors, including systemic exogenous factors, for instance, diabetes, smoking, and taking medications that may bring about prevent wound healing and osseointegration. Whereas some studies have shown harmful effects of these conditions on implant survival. yielded disparate results regarding their consequences [14].

A major gap in the literature is the lack of comprehensive epidemiological data on dental implant removal in Libya, largely due to fragmented long-term follow-up and the absence of systematic case tracking. Consequently, the incidence, patterns, and determinants of implant removal remain poorly characterized. Moreover, the influence of mechanical and structural factors, including implant diameter, angulation, positioning, and abutment type, has not been adequately investigated in the Libyan population, highlighting the need for locally relevant clinical research [15].

Dental implants have a high reliability and predictability, but failures still happen because multiple biological, surgical, prosthetic, or patient-related factors interact in this complex multifactorial situation. These have great relevance as the failure of dental implant therapy is a time-consuming, prolific, and expensive process for both the clinician and patient [1]. Thus, precise identification and prevention of the specific causes of implant failure represents a key clinical priority. Therefore, the current study aimed to assess the most common causes of implant failure and the risk factors associated with it by retrospectively evaluating a single clinic experience in Benghazi, Libya.

Methods

This retrospective clinical study was conducted to evaluate the primary causes and associated risk factors of dental implant failure by analyzing a single-center experience at the Smile Center in Benghazi. Over an eight-year observation period spanning from 2016 to 2023, a total of 1,602 dental implants were surgically placed by three experienced surgeons across a cohort of 791 patients, who were monitored collectively for a period exceeding seven years. Strict inclusion criteria dictated that only implants explicitly indicated for removal or those that had already been removed were eligible for analysis. Out of the 1,602 tracked implants, 46 met these criteria for clinical failure, resulting in an overall failure rate of 2.8%. The 46 failed implants were identified in 34 distinct patients (20 females and 14 males, aged 18–65 years). Implant-level data were analyzed for the 46 failed implants, while patient-level demographic and clinical characteristics were assessed among the 34 affected patients.

Data collection involved compiling detailed medical histories, conducting clinical evaluations, and reviewing surgical records. Furthermore, a comprehensive radiographic assessment was performed for each case utilizing intraoral periapical, panoramic, or cone-beam computed tomography (CBCT) images. To assess potential risk factors, patients were systematically categorized based on demographic data (age and gender), lifestyle habits (smoking), dental history (history of periodontal disease and parafunctional habits like bruxism), and systemic medical conditions, including controlled diabetes mellitus. Finally, to determine specific biological and mechanical failure patterns, the sample was chronologically stratified by the timing of failure. Early implant failures were defined as those occurring within the first year following placement, typically before the completion of functional loading, whereas late implant failures were defined as those occurring more than one-year post-placement after initial osseointegration had been successfully established.

Results

The clinical records of 791 patients and 1,602 placed dental implants were reviewed. A total of 46 failed implants were identified, corresponding to an overall implant failure rate of 2.8%. These 46 failed implants occurred in 34 distinct patients, indicating that some patients experienced failure of more than one implant. Therefore, all 46 failed implants were included in the implant-level analysis, while patient-level demographic and clinical characteristics were evaluated among the 34 affected patients. Of the 46 failed implants, 16 (34.8%) were classified as early failures occurring within the first year after implant placement, whereas 30 (65.2%) were classified as late failures occurring more than one year after placement. The 34 patients included 20 females and 14 males, with ages ranging from 18 to 65 years. Age-group analysis showed that 7 patients were aged 18–30 years, 14 were aged 30–45 years, 6 were aged 45–60 years, and 7 were older than 60 years. Among the 34 patients, 6 had diagnosed diabetes mellitus, although their blood glucose levels were clinically controlled during the treatment period.

The underlying etiology and failure patterns differed significantly between the two chronological groups. Early implant failures were predominantly associated with patient-related lifestyle and localized healing variables, among which smoking emerged as the most prominent risk factor. Other major contributors to the early failure category included impaired healing and suboptimal bone quality. Conversely, late implant failures exhibited initial successful osseointegration but were strongly correlated with mechanical and prosthetic complications driven by parafunctional

Received: *03-06-2026 -* ***Accepted:*** *01-08-2026 -* ***Published:*** *07-08-2026*

https://doi.org/10.54361/ajmas.269813

habits, including nocturnal bruxism. These mechanical overloads in the late category resulted in progressive biological or prosthetic failures, specifically manifesting as screw loosening, screw fractures, or standalone implant body fractures. Notably, a compromised history of periodontal disease was identified as a major, statistically significant risk factor that was strongly related to implant failure in both the early and late failure groups, underscoring its persistent negative influence on overall implant prognosis.

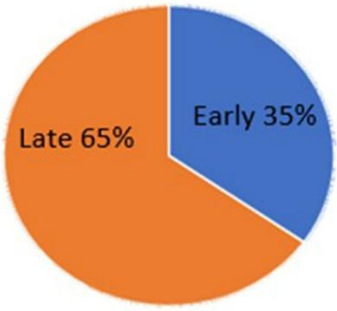

Figure 1. Incidence of implant failure.

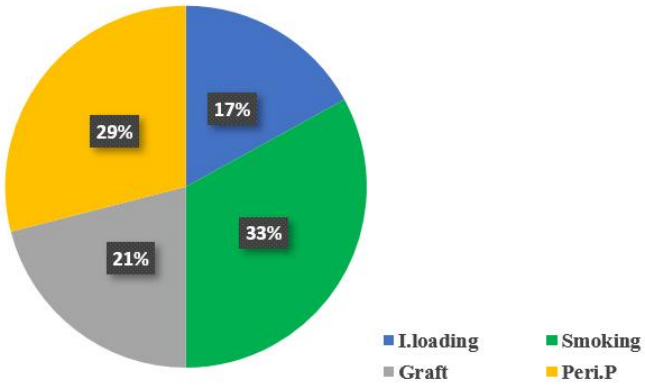

Figure 2. Most common failure causes among early category.

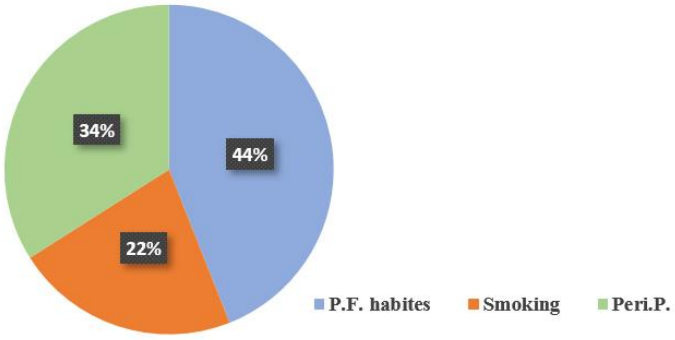

Figure 3. Most common failure causes among the late category.

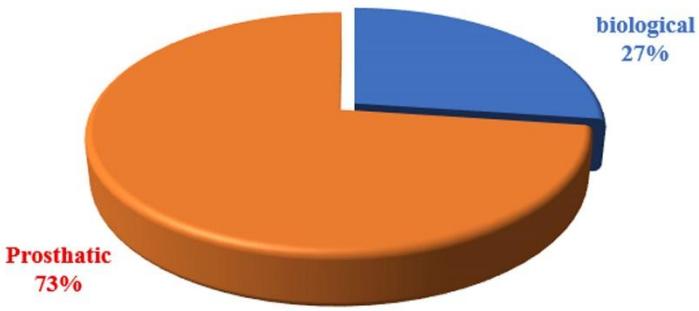

Figure 4. Failure manners of the late category.

Received*: 03-06-2026 -* ***Accepted****: 01-08-2026 -* ***Published****: 07-08-2026*

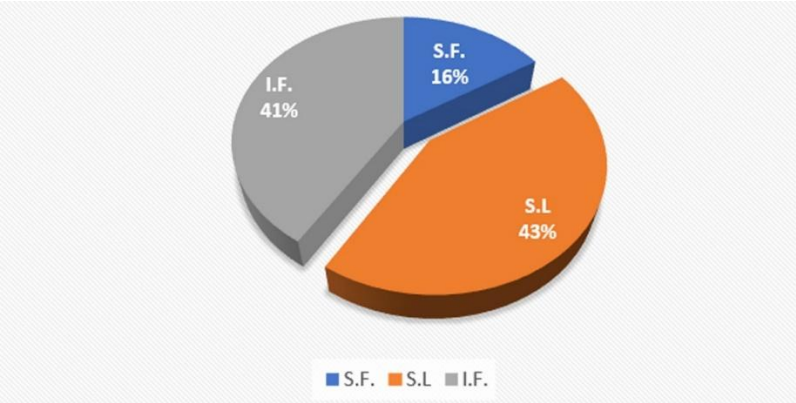

Figure 5. Nature of prosthetic failure.

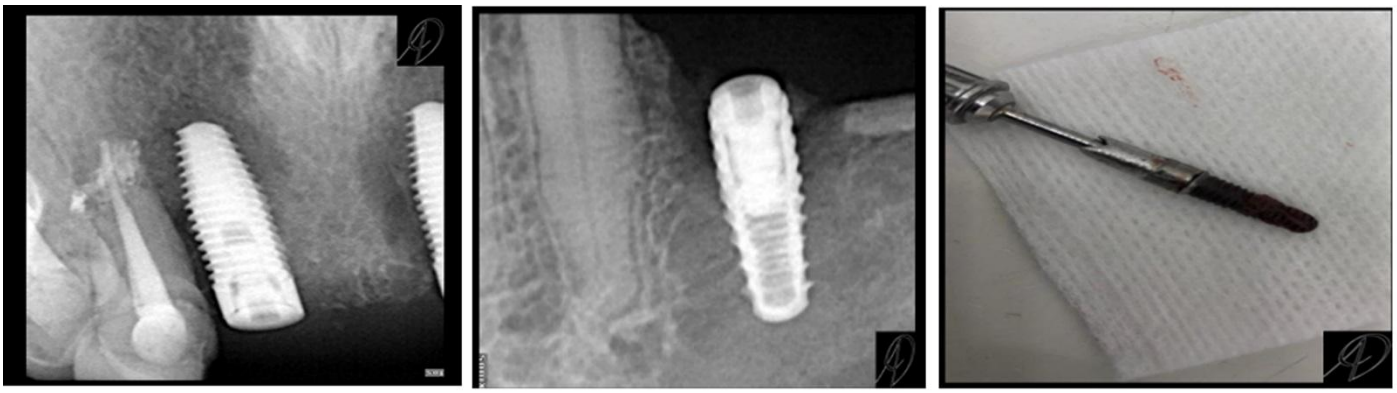

Figure 6. Compromised periodontal condition strongly related with both groups.

Discussion

The findings of this retrospective study align closely with international literature identifying smoking as a primary contributor to early implant failure. Nicotine's well-documented vasoconstrictive properties reduce localized blood flow and oxygen supply to healing tissues, which significantly impairs the early stages of osseointegration. Furthermore, smoking compromises the host immune response and diminishes collagen production, thereby prolonging the overall healing process and increasing patient susceptibility to peri-implant diseases [16]. Our data proposes a strong relationship between early implant failure and smoking habits, reinforcing previous studies by Bain and Moy, which suggested that smoking causes both systemic and local injury to tissues, resulting in decreased tissue oxygenation that negatively impacts bone healing and regeneration. As the primary active component in cigarettes, nicotine reduces the proliferation of red blood cells, macrophages, and fibroblasts—all of which are cellular elements essential to the cascade of osseointegration. While certain historical studies have failed to demonstrate a statistically significant direct impact of smoking on implant survival, substantial modern literature implies that smoking is deeply associated with secondary complications such as marginal bone loss, peri-implantitis, and compromised bone quality and quantity, which ultimately degrade the long-term success rate of the implant [17].

In contrast to the biological failures seen early on, late implant complications in this cohort were heavily driven by mechanical and functional overloads. Parafunctional habits, including nocturnal bruxism, exert excessive, non-axial mechanical loads on fully osseointegrated dental implants. Over time, this chronic stress leads to progressive marginal bone loss, severe prosthetic complications, or catastrophic structural failures, such as implant body fractures [18]. Existing dental literature widely recognizes parafunctional habits as a key risk factor for late-stage implant failure, with some studies reporting that more than 77% of all documented implant body fractures occur in patients presenting with clinical signs of chronic bruxism. Interestingly, while our study established a clear link between parafunctional habits, prosthetic breakdown, and peri-implantitis, other mechanical variables—such as implant diameter, placement angulation, cross-sectional position, and the specific type of prosthetic abutment—were not investigated in this dataset.

When evaluating both chronological failure groups collectively, a compromised periodontal condition emerged as a pervasive risk factor strongly related to implant failure across the board [1]. This underscores the critical need for comprehensive, proactive risk-management protocols prior to surgical intervention. Implementing systematic clinical strategies—such as mandatory preoperative smoking cessation counseling, meticulous active periodontal disease management, and the routine fabrication of protective occlusal night guards for patients with diagnosed bruxism—can significantly mitigate mechanical and biological risks, thereby reducing the incidence of implant failure and improving long-term clinical predictability [19].

While the study offers important insight, it has several key limitations that should be borne in mind when interpreting the results. First, the retrospective analysis was limited to a single clinical center, which of course would potentially lead to

Received: *03-06-2026 -* ***Accepted:*** *01-08-2026 -* ***Published:*** *07-08-2026*

tracking limitations; due to the long-life expectancy of dental implants, patients suffering from late complications may decide to be treated in other centers, making it very difficult to register all events or calculate an absolute global rate of implant failure [20]. This analysis was also restricted since it did not explore numerous pertinent mechanical and surgical factors that directly impact implant prognosis, including: the diameter of an implant, the angulation of its placement where on cross section numerically or profiled, and which particular kind of prosthetic abutment utilized [11]. Moving past these limitations, prospective study designs with robust epidemiologic data will be integral for future work with much larger patient cohorts and multicenter tracking networks. Additional studies should also examine the unique effects of different implant material properties, surface topographies, and restorations. In the end, large-scale, long-term survival studies done on increasingly diverse and heterogeneous patient groups will be necessary to develop risk-management strategies in implant dentistry that can be more broadly generalized.

Conclusion

This single-center study conducted in Benghazi, Libya highlighted the multifactorial nature of dental implant failure. While early implant failures were predominantly associated with smoking and compromised periodontal health, late failures were strongly correlated with parafunctional habits, particularly bruxism. The overall failure rate of 2.8% seen in our study is consistent with international data, reaffirming that dental implants remain an exceptionally reliable treatment modality. Additionally, meticulous preoperative evaluation, patient education, and long-term maintenance protocols are critical factors in optimizing positive outcomes.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this manuscript.

References

1. AlRowis R, Albelaihi F, Alquraini H, Almojel S, Alsudais A, Alaqeely R. Factors Affecting Dental Implant Failure: A Retrospective Analysis. Healthcare. 2025;13:1356.
2. Rakic M, Galindo-Moreno P, Monje A, Radovanovic S, Wang HL, Cochran D, et al. How frequent does peri-implantitis occur? A systematic review and meta-analysis. Clin Oral Investig. 2018;22:1805–16.
3. Abreu M-E-R, Viegas V-N, Ibrahim D, Valiati R, Heitz C, Pagnoncelli R-M, et al. Treatment of comminuted mandibular fractures: a critical review. Med Oral Patol Oral Cir Bucal. 2009;14:E247-51.
4. Canullo L, Schlee M, Wagner W, Covani U. International Brainstorming Meeting on Etiologic and Risk Factors of Peri-implantitis, Montegrotto (Padua, Italy), August 2014. Int J Oral Maxillofac Implants. 2015;30:1093–104.
5. Romito GA, Dos Reis INR, Hassan MA, Villar CC, Francisco H, Pannutti CM. Patient- and Clinician-Reported Outcomes and Outcome Measures Evaluating Timing of Implant Placement in the Edentulous Maxilla: A Systematic Review of Clinical Studies. Clin Oral Implants Res. 2026;37 Suppl 3 Suppl 30:S302–31.
6. Javiya P, Zadeh SMEH, Chandwani N, Vaz M, Pandit MK, Laddha R. Peri-implantitis: Etiology, prevention and management strategies. Bioinformation. 2025;21:2753–7.
7. Berzaghi A, Testori T, Scaini R, Bortolini S. Occlusion and Biomechanical Risk Factors in Implant-Supported Full-Arch Fixed Dental Prostheses—Narrative Review. J Pers Med. 2025;15:65.
8. el Askary AS, Meffert RM, Griffin T. Why do dental implants fail? Part I. Implant Dent. 1999;8:173–85.
9. Ionfrida JA, Stiller HL, Kämmerer PW, Walter C. Dental Implant Failure Risk in Patients with Bruxism—A Systematic Review and Meta-Analysis of the Literature. Dentistry Journal. 2025;13.
10. Insua A, Monje A, Wang HL, Miron RJ. Basis of bone metabolism around dental implants during osseointegration and peri-implant bone loss. Journal of Biomedical Materials Research - Part A. 2017;105:2075–89.
11. Lages FS, Douglas-de Oliveira DW, Costa FO, Vinhas AS, Aroso C, Salazar F, et al. Review of the mechanical behavior of different implant–abutment connections. Int J Environ Res Public Health. 2020;20:26–33.
12. Ishak MI, Daud R, Ibrahim I, Mat F, Mansor NN. Biomechanical Overloading Factors Influencing the Failure of Dental Implants: A Review. In: Structural Integrity. 2022. p. 127–42.
13. Sailer I, Karasan D, Todorovic A, Ligoutsikou M, Pjetursson BE. Prosthetic failures in dental implant therapy. Periodontology 2000. 2022;88:130–44.
14. Dutta SR, Passi D, Singh P, Atri M, Mohan S, Sharma A. Risks and complications associated with dental implant failure: Critical update. Natl J Maxillofac Surg. 2020;11:14–9.
15. Khaled Gerged. Diagnostic Challenges of Peri-Implant Lesions in Libya. AlQalam J Med Appl Sci. 2026;9:1564–8.
16. Knuutinen A, Kokkonen N, Risteli J, Vähäkangas K, Kallioinen M, Salo T, et al. Smoking affects collagen synthesis and extracellular matrix turnover in human skin. Br J Dermatol. 2002;146:588–94.
17. Lee SB, Lee BA, Choi SH, Kim YT. Long-term outcomes after peri-implantitis treatment and their influencing factors: a retrospective study. J Periodontal Implant Sci. 2022;52.
18. Yoon Y, Kim JE, Kim E, Park S, Kang I, Kwon YD. Stability of the Implant–Alveolar Bone Complex According to the Peri-Implant Bone Loss and Bone Quality: A Finite Element Analysis Study. Appl Sci. 2024;14.
19. Do TA, Le HS, Shen YW, Huang HL, Fuh LJ. Risk factors related to late failure of dental implant—A systematic review of recent studies. International Journal of Environmental Research and Public Health. 2020;17.
20. Abdel-Halim M, Issa D, Chrcanovic BR. The impact of dental implant length on failure rates: A systematic review and meta-analysis. Materials. 2021;14.

Received*: 03-06-2026 -* ***Accepted****: 01-08-2026 -* ***Published****: 07-08-2026*