



Comparative Analysis of Dental Implant Success Rates in Smokers and Non-Smokers: A Long-term Follow-up Research

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KEYWORDS Dental implants, Smokers, Non-smokers, Long-term follow-up, Implant success rates	Abstract: Background: Restorative dentistry has been transformed by dental implants, yet there is ongoing discussion on the impact of smoking on implant success. The purpose of this research is to compare the long-term implant results of smokers and non-smokers. Methods: In a tertiary care hospital, 100 dental implant cases—50 smokers and 50 non-smokers—were retrospectively analyzed. The main outcomes that were evaluated were implant survival rates, incidence of peri-implantitis, and marginal bone loss. Comparisons between groups and statistical analysis were carried out. Results: Smokers showed higher frequency of peri-implantitis (26% vs. 12%), worse implant survival rates (92% vs. 98%), and higher marginal bone loss (2.5 mm vs. 1.1 mm) when compared to non-smokers. Conclusion: In conclusion, smoking has a major impact on the results of dental implants, highlighting the necessity of individualized treatment plans and careful postoperative monitoring. For people who smoke, educating patients about the negative effects of smoking is essential to maximizing implant success over the long run.
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Introduction

Restorative dentistry has been revolutionized by dental implantology, which offers edentulous patients a potential alternative [1]. But even with these developments, research on the long-term viability of dental implants is still underway, especially with regard to the effect of smoking on implant outcomes [2]. Smoking has been linked to poor osseointegration and higher rates of implant failure, making it a well-established risk factor for a number of illnesses [3]. However, the literature currently in publication offers contradicting data regarding the precise impact of smoking on dental implant success [4].

While some studies, like the one by Johnson and Brown (2018) [6], indicate that the impact of smoking may differ depending on specific patient factors and implant

characteristics, others, like the one by Smith et al. (2017) [5], have shown that smokers have significantly higher rates of peri-implantitis and implant failure. In spite of these differences, a thorough comparison research is still necessary to offer solid proof of this [7].

By carefully examining dental implant results in smokers and non-smokers over a prolonged follow-up period, this research seeks to close this disparity. This research aim to address the shortcomings of prior studies [8] by examining a bigger sample size and using rigorous statistical analysis to understand the relationship between smoking and implant success rates. Moreover, developing specialized intervention techniques requires an understanding of the



fundamental mechanisms via which smoking impacts osseointegration and implant stability [9].

Moreover, given the increasing number of people pursuing dental implants and the general smoking population, it becomes imperative to elucidate the effects of smoking on implant success [10]. The goal of this research is to provide important new understandings that may impact implant dentistry treatment plans and patient counseling procedures.

Material and methods

This retrospective analysis covered a cohort of 100 patients who received dental implant surgeries between 2021-2022 for a period of 18 months and was carried out at a tertiary care facility. The patient selection criteria comprised of persons who had undergone dental implant treatment for one or more missing teeth and who were at least eighteen years old. The research sample consisted of 50 individuals who smoked and 50 individuals who did not smoke. This was achieved by carefully reviewing patient records and smoking history records stored in the center's database.

A thorough examination of patient records was necessary to gather data. This review included information on smoking habits, medical history, implant characteristics (such as kind, size, and location), surgical methods used, and postoperative follow-up data. Prosthodontists and oral surgeons with extensive training carried out prosthetic surgeries and implant insertion, guaranteeing uniform protocols in every case. Marginal bone loss, peri-implantitis incidence, and implant success rates were the main outcome indicators that were evaluated. The definition of implant success was determined by predetermined standards, such as functional stability, lack of discomfort or motion, and lack of radiological indications of problems. Clinical and radiographic indications of inflammation and bone loss surrounding the implants served as the basis for the diagnosis of peri-implantitis. Standardized radiographic measurements done at predetermined intervals after implant implantation were used to quantify marginal bone loss.

The software SPSS ver 21 was used to do the statistical analysis, which included the use of inferential statistics to compare outcomes between smokers and non-smokers and descriptive statistics to describe the research population. The assessment of categorical and

continuous variables was done using chi-square tests and t-tests, respectively. In order to determine the independent impact of smoking on implant outcomes, multivariate regression analysis was also carried out to account for relevant confounders such as age, gender, and implant-related factors.

The long-term follow-up duration, which varied from 1-2 years after implant placement, allowed for a thorough assessment of implant outcomes in cohorts that included smokers and non-smokers.

Results

1. **Implant Survival Rates:** Smokers and non-smokers had significantly different implant survival rates, according to the research. The non-smoking group had a much greater implant survival rate of 98%, while the smoking group showed an implant survival rate of 92%. This disparity reveals a significant difference between the two groups' long-term dental implant success rates. The fact that smokers have a poorer survival rate raises the possibility that smoking negatively impacts the stability and durability of dental implants [table 1].

2. **Incidence of Peri-implantitis:** There was a significant difference in the incidence of this common implant-related complication between smokers and non-smokers. In the smoking group, the incidence of peri-implantitis was 26%, while it was only 12% in the non-smoking group. This research emphasizes how smokers are more likely to experience inflammatory problems surrounding implants. It implies that smoking can intensify the inflammatory response, raising the risk of developing peri-implantitis and endangering the wellbeing of the implant and surrounding tissues [table 2].

3. **Marginal Bone Loss:** Smokers had significantly more marginal bone loss than non-smokers, which is an important sign of implant durability and osseointegration. Smokers showed a 2.5 mm average marginal bone loss, but non-smokers showed a far lower average of 1.1 mm. This significant difference in bone loss indicates that smokers have poorer bone remodeling and maintenance around their implants. The smoking group has had significant bone loss, which suggests that the integrity of the implant may be impaired. This could lead to difficulties for the long-term success of the implant, requiring close



monitoring and customized therapies to prevent additional bone degradation [table 3].

Taken together, these results highlight how smoking negatively affects a number of dental implant outcomes. When compared to non-smokers, smokers showed greater rates of peri-implantitis, marginal bone loss, and

worse implant survival rates. The findings highlight the necessity of individualized treatment plans and strict postoperative care guidelines, particularly for smokers, in order to increase dental implants' long-term stability and success.

Table 1: Demographic Characteristics

Characteristic	Smoking Group (n=50)	Non-Smoking Group (n=50)
Age (mean \pm SD)	45 \pm 6	43 \pm 5
Gender (Male/Female)	28/22 (56%/44%)	30/20 (60%/40%)
Implant Location	Molar: 20, Premolar: 15, Anterior: 15	Molar: 18, Premolar: 17, Anterior: 15

Table 2: Implant Outcomes

Outcome Measure	Smoking Group (n=50)	Non-Smoking Group (n=50)
Implant Survival Rate (%)	92%	98%
Peri-implantitis (%)	26%	12%
Marginal Bone Loss (mm)	2.5mm	1.1mm

Table 3: Complications and Adverse Events

Complication Type	Smoking Group (n=50)	Non-Smoking Group (n=50)
Infection	12	4
Implant Mobility	6	1

Discussion

The investigation's findings shed light on the intricate relationship between smoking and dental implant performance. The intricate impacts of smoking on the functionality and longevity of dental implants are exemplified by the variations in implant survival rates, peri-implantitis incidence, and marginal bone loss between smokers and non-smokers.

The poorer implant survival rates among smokers in comparison to non-smokers support earlier findings that smoking has a negative impact on implant stability and osseointegration [1, 2]. This phenomenon's molecular processes include reduced blood flow, hampered wound healing, and a changed immunological response brought on by cigarette smoke's constituents [3, 4]. All of these things work against the implant's ability to integrate with the surrounding bone tissue, which lowers the success rate of implants in smokers.

Studies that relate smoking to an increased risk of periodontal diseases are consistent with the significantly greater incidence of peri-implantitis among smokers [5, 6]. Smoking's immunosuppressive effects lead to a

dysregulated inflammatory response, which facilitates bacterial colonization and the eventual deterioration of the tissue around the implants [7]. Smokers' increased inflammatory state accelerates the development of peri-implantitis, making it extremely difficult to manage and preserve implant health in this population.

Smoking also has a negative effect on bone remodeling and maintenance around dental implants, as evidenced by the significant difference in marginal bone loss between smokers and non-smokers [8, 9]. The long-term stability of implants is compromised by excessive bone loss, which may result in implant failure or the need for additional operations such bone grafting or implant revision surgeries [10]. Changes in osteoblastic and osteoclastic activity are the mechanisms behind bone resorption in smokers, upsetting the delicate balance of bone remodeling processes [11].

These findings have consequences for implant dentistry that go beyond the clinical setting and impact patient counseling and treatment planning. Because smoking carries more hazards, a customized strategy is required to reduce these obstacles and maximize implant results.



To increase implant success rates, dental professionals should prioritize smoking cessation programs in preoperative evaluations and postoperative care guidelines [12, 13]. It is imperative to inform patients about the deleterious impact of smoking on oral health and the particular hazards linked to dental implants in order to promote positive behavioral modifications and improve treatment results.

Even though this research emphasizes how smoking negatively affects dental implant outcomes, there are some important caveats to be aware of. The results' generalizability may be impacted by the research's retrospective design and its small sample size. Furthermore, confounding variables such as differences in patient characteristics, implant kinds, and surgical methods might have affected the outcomes. It is necessary to do more extensive prospective studies with larger sample numbers and long-term follow-ups in order to confirm these results and fully explain the underlying molecular mechanisms.

Additionally, comparative studies examining how well smoking cessation programs work to enhance implant outcomes would be extremely helpful in directing evidence-based treatment procedures. To improve implant success rates in this high-risk population, novel strategies such as supplementary therapy or modifications to implant designs specifically designed for smokers need investigation [14, 15].

Conclusion

This research's conclusion emphasizes how smoking has a significant negative influence on dental implant outcomes. Smoking has a negative impact on osseointegration and implant durability, as evidenced by lower implant survival rates, a higher incidence of peri-implantitis, and greater marginal bone loss in smokers. These results highlight the need for individualized treatment plans and strict postoperative care protocols, especially for smokers.

Improving implant success rates and reducing related dangers require significant efforts in patient education and smoking cessation programs. In order to maximize implant results over the long run, dentists should give priority to counseling patients on quitting smoking. Further investigation into novel therapies and smoker-specific implant designs is necessary to address the issues associated with smoking in implant dentistry. To

improve the success and longevity of dental implants in smokers, a comprehensive approach including patient education, individualized care, and ongoing improvements in implantology is necessary.

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