

## ORIGINAL RESEARCH

### Assessment of influence of smoking and diabetes on implant failure rates

Insha Shehri<sup>1</sup>, Sheeba Nissar<sup>2</sup>, Karuna<sup>3</sup>, Satpal Singh<sup>4</sup>, Babbar Ali Anis<sup>5</sup>

<sup>1</sup>M.D.S Private consultant, Department of Periodontics & Implantology, Jammu and Kashmir,

<sup>2</sup>M.D.S Private consultant, Department of Periodontics & Implantology, Delhi),

<sup>3</sup>M.D.S Department of Periodontics & Implantology, Shree bankey Bihari Dental college, Ghaziabad,

<sup>4</sup>M.D.S. Private consultant, Department of Oral Medicine and Radiology, Jammu & Kashmir,

<sup>5</sup>M.D.S. Private consultant, Department of Oral Medicine and Radiology, Jammu & Kashmir

#### ABSTRACT:

**Background:** Dental implant survival is initially dependent on successful osseointegration following placement. Any alteration of this biological process by excessive surgical trauma, infection, or metabolic upset may adversely affect treatment outcomes. **Material and method:** A total of 45 patients were enrolled in this study and categorised into 3 groups: Group 1: patients who were chronic smokers (n=15), Group 2: patients with controlled diabetes(n=15), Group 3: healthy (control) patients(n=15). Once the implants were placed a strict oral hygiene protocol was instructed to the patients. The patients were evaluated every month for a duration of 6 months after implant loading to check for signs of bone loss and implant failure. Preoperative and follow up radiographs were collected and compared. SPSS software was used for statistical analysis. **Results:** In the current study it was seen that 24 patients were below 40 years of age and 21 patients were above 40 years of age. Out of 45 patients enrolled in this study 27 were males and 18 were females. 5 out of the 15 patients who were chronic smokers showed implant failure in the follow up period. In the controlled diabetes group 14 patients showed successful implant integration with only 1 patient having a failed implant. Similarly in the control group also there was only a single implant failure. A statistically significant relation was observed between the success rates of the smoker group and the diabetes group and also between the smoker and the control group with P-value of .021 and .043 respectively. However the comparison of diabetes group and the control group did not show a significant difference statistically with P value of .088 (table3). **Conclusion:** Smoking adversely affects implant survival and success whereas controlled diabetes does not seem to be a risk factor for implant success.

**Keywords:** Bone, dental implants, osseointegration, smoking, diabetes.

Received: 29 May, 2020

Revised: 5 June, 2020

Accepted: 6 June, 2020

**Corresponding author:** Dr. Insha Shehri M.D.S Private consultant, Department of Periodontics & Implantology, Jammu and Kashmir, India

**This article may be cited as:** Shehri I, Nissar S, Karuna, Singh S, Anis BA. Assessment of influence of smoking and diabetes on implant failure rates. Int J Res Health Allied Sci 2020; 6(3):94-97.

#### INTRODUCTION

A variety of conditions, including implant design (length, shape or surface texture), patient-related medical risk factors (systemic diseases or habits, such as smoking,), and surgery-related factors (surgeon's experience or surgical design) have been considered to influence the outcome for implant restoration<sup>1-3</sup>. Dental implant survival is initially dependent on successful osseointegration following placement. Any alteration of this biological process by excessive surgical trauma, infection, or metabolic upset may adversely affect treatment outcomes<sup>4</sup>.

Diabetic patients have increased frequency of periodontitis and tooth loss<sup>5</sup>, and diabetes has been considered a risky condition for dental implants with the fact that it is associated with delayed wound healing<sup>6</sup>, prevalence of microvascular disease and impaired response to infection. Accordingly, diabetes remains a relative contraindication for implant therapy<sup>7</sup>. Clinical trials of endosseous implants consistently rate smoking as a primary patient-centered risk factor for implant loss. Various studies report a failure rate of implants in smokers compared to nonsmokers, ranging from 6.5% to 20%<sup>8</sup>. The negative impact of tobacco smoking in implant

outcome may be related to multiple factors and their mechanism may be mediated through both local and systemic biologic routes<sup>9</sup>.

Since life expectancy is expected to increase with the advent of better therapies and targeted medicine, an increasing number of patients who smoke or previously smoked, or who present with diabetes or osteoporosis may require dental implant treatment<sup>10</sup>. The present study was undertaken to assess and analyse influence of smoking and diabetes on implant failure rates.

**MATERIAL AND METHOD**

The present study was undertaken to assess and analyse influence of smoking and diabetes on implant failure rates. A total of 45 patients were enrolled in this study. The patients were categorised into 3 groups:

- Group 1: patients who were chronic smokers(n=15)
- Group 2 : patients with controlled diabetes(n=15)
- Group 3: healthy (control) patients(n=15)

All the demographic details of the patients were recorded. Patients with deranged vitamin D level and

Table 1: Demographic details

Parameter	Smoking	Diabetes	Control
Age group			
• <40 years	8	9	7
• ≥40 years	7	6	8
Gender			
• Male	10	8	9
• Female	5	7	6

The current study observed smoking as a risk factor for implant failure. 5 out of the 15 patients who were chronic smokers showed implant failure in the follow up period. In the controlled diabetes group 14 patients showed successful implant integration with only 1 patient having a failed implant. Similarly in the control group also there was only a single implant failure (table 2).

Table 2. Implant success in different groups.

Prognosis	Smoking	Diabetes	Control
Success	10	14	14
Failure	5	1	1

In a comparison between the different groups of this study a statistically significant relation was observed in the success rates of the smoker group and the diabetes group with P-value of .021. A statistically significant relation was also observed between the smoker and the control group (P=.043). However the comparison of diabetes group and the control group did not show a significant difference statistically with P value of .088 (table3).

Table 3. Statistical comparison

Comparison	P-value
Smoker vs Diabetes	.021
Smoker vs Control	.043
Diabetes vs Control	.088

calcium levels were excluded from the study. Only those patients with healthy gingival and good bony volume and architecture were included. The purpose of the study was explained to the patients and a written consent was obtained. Once the implants were placed a strict oral hygiene protocol was instructed to the patients. The patients were evaluated every month for a duration of 6 months after implant loading to check for signs of bone loss and implant failure. Preoperative and follow up radiographs were collected and compared. Entire data was recorded in the Microsoft excel sheets. SPSS software was used for statistical analysis. Chi square test and student T test were use to compare the variables. P-value of less than0.05was considered significant.

**RESULTS**

In the current study it was seen that 24 patients were below 40 years of age and 21 patients were above 40 years of age. Age wise distribution of patients in the smoking, diabetes and control group was given in table 1. Out of 45 patients enrolled in this study 27 were males and 18 were females. Gender wise distribution of patients in the three groups was given in table 1.

## DISCUSSION

Dental osseointegrated implants are generally considered as effective and predictable restorations for the replacement of missing teeth. However, although highly desirable outcomes and the long-term survival of dental implant treatments are well documented in numerous studies, implant failures still occur for various reasons<sup>11</sup>.

The ability to anticipate outcomes is an essential part of risk management in an implant practice. Recognizing conditions that place the patient at a higher risk of failure will allow the surgeon to make informed decisions and refine the treatment plan to optimize the outcomes<sup>12</sup>. With the dramatic advancements in materials science and surgical techniques, increasing attention is focused on patient-related conditions as risk factors for dental implant failure<sup>13</sup>.

In a recent systematic review of the literature, it was found that smoking adversely affects implant survival and success and is more pronounced in areas of poor quality, trabecular bone. Type 2 diabetes may have an adverse effect on implant survival rates, but a definitive conclusion could not be made because of the limited number of studies included in the review.<sup>14</sup>

In the current study it was seen that 24 patients were below 40 years of age and 21 patients were above 40 years of age. Age wise distribution of patients in the smoking, diabetes and control group was given in table 1. Out of 45 patients enrolled in this study 27 were males and 18 were females. Gender wise distribution of patients in the three groups was given in table 1. Hui Chen et al undertook a meta-analysis to evaluate the association between smoking, radiotherapy, diabetes and osteoporosis and the risk of dental implant failure. A comprehensive research on MEDLINE and EMBASE, up to January 2013, was conducted to identify potential studies. References of relevant studies were also searched. Screening, data extraction and quality assessment were conducted independently and in duplicate. A random-effects meta-analysis was used to pool estimates of relative risks (RRs) with 95% confidence intervals (CIs). A total of 51 studies were identified in this meta-analysis, with more than 40,000 dental implants placed under risk-threatening conditions. The pooled RRs showed a direct association between smoking (n = 33; RR = 1.92; 95% CI, 1.67-2.21) and radiotherapy (n = 16; RR = 2.28; 95% CI, 1.49-3.51) and the risk of dental implant failure, whereas no inverse impact of diabetes (n = 5; RR = 0.90; 95% CI, 0.62-1.32) on the risk of dental implant failure was found. The influence of osteoporosis on the risk of dental implant failure was direct but not significant (n = 4; RR = 1.09; 95% CI, 0.79-1.52). The subgroup analysis indicated no influence of study design, geographical location, length of follow-up, sample size, or mean age of recruited patients. Smoking and radiotherapy were associated with an increased risk of dental implant failure. The relationship between diabetes and

osteoporosis and the risk of implant failure warrant further study.<sup>15</sup>

The current study observed smoking as a risk factor for implant failure. 5 out of the 15 patients who were chronic smokers showed implant failure in the follow up period. In the controlled diabetes group 14 patients showed successful implant integration with only 1 patient having a failed implant. Similarly in the control group also there was only a single implant failure (table 2). V Moraschini et al investigated the hypothesis that there is no difference in implant failure rate or marginal bone loss between type 1 or 2 diabetes subjects and non-diabetic subjects. An electronic search was conducted, without restrictions on date or language, in the PubMed/MEDLINE, Cochrane Central Register of Controlled Trials, Web of Science, and EMBASE databases, and in the grey literature, through August 2015. The eligibility criteria included prospective and retrospective cohort studies and randomized controlled trials. The initial search resulted in 1093 titles from PubMed/MEDLINE, 164 from the Cochrane Central Register of Controlled Trials, 134 from Web of Science, 228 from EMBASE, and four from the grey literature. Following the search and selection process, 14 studies published between 2000 and 2015 were included in this systematic review. According to the risk of bias analysis, all studies were classified as high quality. The results of this systematic review suggest that the number of implant failures does not differ between diabetic and non-diabetic subjects. Additionally, the results of the comparison between type 1 and 2 diabetes subjects showed no difference in the number of failures. With regard to marginal bone loss, there was a statistically significant difference favouring non-diabetic subjects<sup>16</sup>.

In a comparison between the different groups of this study a statistically significant relation was observed in the success rates of the smoker group and the diabetes group with P-value of .021. A statistically significant relation was also observed between the smoker and the control group (P=.043). However the comparison of controlled diabetes group and the control group did not show a significant difference statistically with P value of .088 (table3). R H Wallace examined the effect of tobacco use on the failure rates of dental implants. A review of 56 dental implant patients with a total of 187 endosseous dental implants, placed over a four year period, demonstrated a significant association between increased implant failure rates and cigarette smoking with failure rates of 16.6% in smokers compared to 6.9% in non-smokers. Also implant length was shown to be a significant factor with shorter implants (< or = 10 mm) being more susceptible to failure in smokers. A chi-square test was used for data analysis. Current recommendations that should be given to implant patients who smoke are included.<sup>17</sup>

## CONCLUSION

From the above study the author concluded that smoking adversely affects implant survival and success whereas controlled diabetes does not seem to be a risk factor for implant success. Further studies are recommended.

## REFERENCES

1. Klokkevold PR, Han TJ (2007) How do smoking, diabetes, and periodontitis affect outcomes of implant treatment? *Int J Oral Maxillofac Implants* 22 Suppl.: 173–202.
2. Naert I, Koutsikakis G, Quirynen M, Duyck J, van Steenberghe D, et al. (2002) Biologic outcome of implant-supported restorations in the treatment of partial edentulism. Part 2: a longitudinal radiographic study. *Clin Oral Implants Res* 13: 390–395.
3. Lekholm U, Gunne J, Henry P, Higuchi K, Linde'n U, et al. (1999) Survival of the Brånemark implant in partially edentulous jaws: a 10-year prospective multicenter study. *Int J Oral Maxillofac Implants* 14: 639–645
4. Accursi GE. (2000). Treatment outcomes with osseointegrated Brånemark implants in diabetic patients: a retrospective study (thesis). Toronto, ON: University of Toronto.
5. Khader YS, Dauod AS, El-Qaderi SS, Alkafajei A, Batayha WQ. (2006). Periodontal status of diabetics compared with non-diabetics: a meta-analysis. *J Diabetes Complications* 20:59-68.
6. Rothwell BR, Richard EL. (1984). Diabetes mellitus: medical and dental considerations. *Spec Care Dent* 4:58-65
7. Michaeli E, Weinberg I, Nahlieli O. (2009). Dental implants in the diabetic patient: systemic and rehabilitative considerations. *Quintessence Int* 40:639-645.
8. Sanchez-Perez A, Moya-Villaescusa MJ, Caffesse RG. Tobacco as a risk factor for survival of dental implants. *J Periodontol.* 2007;78:351–9.
9. Levin L, Schwartz-Arad D. The effect of cigarette smoking on dental implants and related surgery. *Implant Dent.* 2005;14:357–61.
10. Buser D, von Arx T, ten Bruggenkate CM, Weingart D (2000) Basic surgical principles with ITI implants. *Clin Oral Implants Res* 11 Suppl.: 59–68.
11. Naert I, Koutsikakis G, Quirynen M, Duyck J, van Steenberghe D, et al. (2002) Biologic outcome of implant-supported restorations in the treatment of partial edentulism. Part 2: a longitudinal radiographic study. *Clin Oral Implants Res* 13: 390–395
12. Chrcanovic BR, Albrektsson T, Wennerberg A. (2014). Reasons for failures of oral implants. *J Oral Rehabil* 41:443-476.
13. Moy PK, Medina D, Shetty V, Aghaloo TL (2005) Dental implant failure rates and associated risk factors. *Int J Oral Maxillofac Implants* 20: 569–577.
14. Klokkevold PR, Han TJ. How do smoking, diabetes, and periodontitis affect outcomes of implant treatment? *Int J Oral Maxillofac Implants.* 2007;22:173-202.
15. Chen H, Liu N, Xu X, Qu X, Lu E. Smoking, radiotherapy, diabetes and osteoporosis as risk factors for dental implant failure: a meta-analysis. *PLoS One.* 2013;8(8):e71955. Published 2013 Aug 5. doi:10.1371/journal.pone.0071955
16. Moraschini V, Barboza ES, Peixoto GA. The impact of diabetes on dental implant failure: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg.* 2016;45(10):1237-1245. doi:10.1016/j.ijom.2016.05.019
17. Wallace RH. The relationship between cigarette smoking and dental implant failure. *Eur J Prosthodont Restor Dent.* 2000;8(3):103-106.