



## Risk Assessment in Long-term Survival Rates of Dental Implants: A Prospective Clinical Study

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### ABSTRACT

**Aim:** The present study was done to analyze the risk factors associated with dental implants in its survival rate.

**Materials and methods:** The present study was conducted on 208 patients with 425 dental implants placed. Patients were divided into four groups: group I (diabetes), group II (periodontitis), group III (smoking), and group IV (bruxism). All patients were followed for 8 to 10 years for the survival rates.

**Results:** Out of 425 dental implants, 145 were inserted in 72 males and 280 in 136 females. The difference was significant ( $p = 0.01$ ). Group I had 16 males and 36 females, group II had 20 males and 32 females, group III had 28 males and 24 females, and group IV had 8 males and 44 females. The difference was statistically significant ( $p < 0.05$ ). Out of 425 implants, 90 (21.17%) had failures: 24 dental implants (29%) in group I, 22 dental implants (15.2%) group II, 34 dental implants (27%) in group III, and 10 dental implants (13%) in group IV showed failure. The difference was significant ( $p < 0.05$ ). Success rate was 70.7% in group I, 83.3% in group II, 80.9% in group III, and 86.3% in group IV. The difference was nonsignificant ( $p > 0.05$ ).

**Conclusion:** Diabetes, periodontitis, bruxism, and smoking are among various causative factors which affect the survival rate of dental implants. These are risk factors leading to implant failures.

**Clinical significance:** Diabetes, periodontitis, bruxism, and smoking are among various causative factors which affect the survival rate of dental implants.

**Keywords:** Bruxism, Dental implant, Periodontitis, Smoking.

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### INTRODUCTION

The management of missing teeth is replacement with either removable partial denture (RPD), fixed partial denture (FPD), or dental implants. For missing of one or few teeth, RPD was considered best treatment modality. The low cost made it popular among people. However, the presence of clasps with it poses difficulty as it may impinge on soft tissue leading to trauma.<sup>1</sup> Excessive pressure of the clasp may cause mobility and abrasion of adjacent teeth. In terms of higher success rate, FPD replaced RPD. It eliminated the need of clasps. It lacks the acrylic part, hence, has no contact with gingiva. The only drawback with it was that for replacing single tooth, there was need of taking support from adjacent teeth. Teeth anterior and posterior to missing teeth required crown preparation by cutting it in all dimensions. Patient frequently complained of postoperative sensitivity.<sup>2</sup>

Dental implants have been used in dentistry for the past few years. It is considered suitable for single edentulous area. It provides better long-lasting results. There was no hypersensitivity as there was no tooth reduction as in case of FPD. Dental implants are directly placed in the bone which gets attached to it via osteointegration. Even with higher cost of dental implant, it is still the preferred options among patients.<sup>3</sup>

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The insertion of dental implant is a technique-sensitive process. The success rate is determined by the factors, such as proper osseointegration, absence of peri-implantitis, etc. Dental implant insertion following standardized technical steps leads to long-term survival rate. However, factors, such as age, gender, bone quality, type and design of dental implant, general health of the patient, medical status of the patient, history of diabetes, smoking are various factors affecting the outcome of the treatment modality. Proper meticulous oral hygiene and timely follow-ups also determine the success rates.<sup>4</sup> The present study was aimed at determining the risk factors associated with dental implants survival rate.

**MATERIALS AND METHODS**

The present study was conducted on 208 patients of both genders. It included 425 dental implants placed in both arches. All patients were followed for 8 to 10 years. All patients were informed regarding the study and written consent was obtained. Ethical clearance was taken prior to the study from the Institutional Ethics Committee.

General information, such as name, age, gender, etc., were recorded. Patients with history of smoking, diabetes, periodontitis, and bruxism were included in the study. Pregnant and medically compromised patients were excluded from the study. All were divided into four groups. Group I was diabetes group comprising 52 patients, group II was periodontitis group of 52 patients, group III was smoking group consisting of 52 patients, and group IV was bruxism group comprising 52 patients. Patients were evaluated clinically to see implant loss, mobility, bone loss, and radiographically for the presence of peri-implantitis. Results thus obtained were subjected to statistical analysis using chi-square test; p-value <0.05 was considered significant.

**Table 1:** Distribution of patients

Gender	Males	Females	Total	p-value
Number	72	136	208	0.05
No. of implants	145	280	425	0.01

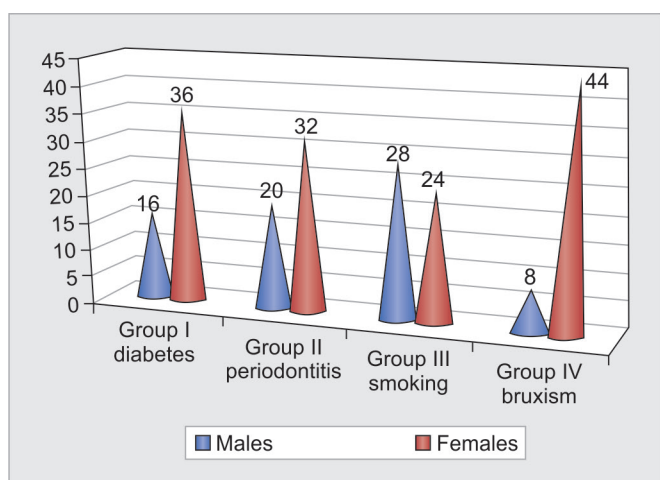
p>0.01

**RESULTS**

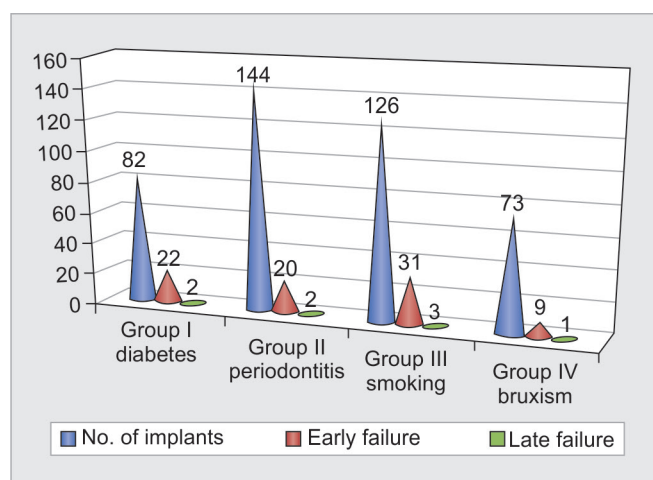
Out of 208 patients, 72 were males and 136 females (Table 1). The difference was significant (p = 0.05). Out of 425 dental implants, 145 were inserted in males and 280 in females. The difference was significant (p = 0.01). Graph 1 shows that group I was diabetes group (males: 16, females: 36), group II was periodontitis group (males: 20, females: 32), group III was smoking group (males: 28, females: 24), and group IV was bruxism group (males: 8, females: 44). The difference was statistically significant (p <0.05). Out of 425 implants, 90 (21.17%) had failures. In group I, out of 82 implants, 24 (29%) showed failures, in group II, out of 144 implants, 22 (15.2%) showed failures, in group III, out of 126 implants, 34 (27%) showed failures and in group IV, out of 73 implants, 10 (13%) showed failures. The difference was significant (p <0.05) (Graph 2). Overall success rate was 78.9%. Maximum survival rate was seen in group IV (86.3%) followed by group II (83.3%), group III (80.9%), and group I (70.7%). The difference was nonsignificant (p >0.05) (Graph 3).

**DISCUSSION**

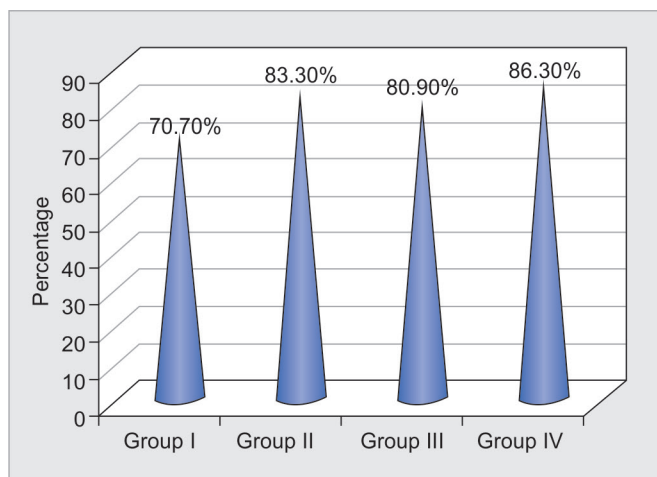
Dental implants have been gaining importance in the field of dentistry. The implant insertion in missing teeth has become choice of both patients and dentists. Though it is nowadays considered preferred management for edentulous area, complications and failures are not uncommon. Esposito et al<sup>5</sup> in their study of biological factors contributing to failures of osseointegrated oral implants



**Graph 1:** Distribution in different groups



**Graph 2:** Dental implant failures in all groups



**Graph 3:** Success/survival rate in all groups

classified failures into early and late. Early failures are due to errors in osseointegration between implant and underlying bone. Factors, such as gender, age, smoking, etc., play important role, whereas late failures are due to peri-implantitis. Factors, such as smoking, diabetes, etc., have major role.

In this study, out of 208 patients, males were 72 and females were 136. Out of 425 dental implants, 145 were inserted in males and 280 in females. Shenoff et al<sup>6</sup> in their study assessed 178 dental implants in 89 type II diabetic and concluded that type II diabetic patients can be considered for dental implant therapy. Similarly, a study by Kandasamy et al<sup>7</sup> analyzed 200 patients (males: 88, females: 112) in which 650 dental implants were inserted. Jung et al<sup>8</sup> evaluated success rate of 6,385 dental implants inserted in 3,755 patients over 9 years.

In this study, we classified patients into four groups. Group I was diabetes group, group II was periodontitis group, group III was smoking group, and group IV was bruxism group. Each group had 52 patients. A study by Kandasamy et al<sup>7</sup> classified patients into group I (smoking), group II (bruxism), group III (periodontal disease), group IV (diabetes), group V (bone augmentation), and group VI (bone height group). Albrektsson et al<sup>9</sup> in their research concluded that an implant without peri-implant radiolucency, without mobility, bone loss <0.2 mm per year after the first year of loading, absence of pain, and infection are signs of success rate.

In this study, we found 90 dental implants (21.17%) had failures. In group I, the failure rate was 29%. The success rate found to be 70.7%. A study by Loo et al<sup>10</sup> evaluated 255 dental implants in 138 diabetic patients and found only second-degree mobility 90 days following surgery as compared with 46 dental implants in control group. The difference of mobility in both groups was nonsignificant. Diabetes is a multiorgan metabolic disease characterized by excessive blood glucose level

due to either lack of insulin or failure of body to respond to insulin receptors. Diabetes leads to poor healing and excessive tooth loss. Dowell et al<sup>11</sup> in their study determined the success rate of dental implants: 30 implants in 20 patients with type II diabetes mellitus. Authors found three complications in patients with glycated hemoglobin level between 7.4 and 8.3. They concluded that in controlled diabetes, there was no significantly higher risk of complications as compared with normal individuals. Olson et al<sup>12</sup> assessed the success rate of two-stage endosseous root-form implants (three different implant systems) placed in the mandibular symphysis of 89 male type II diabetic subjects in year 2000 and found 14% of dental implant failures inserted in 40 patients over 4 years and no statistically significant difference in failure rates between the three different implant systems used.

Periodontitis is the inflammatory disease characterized by excessive bone loss, tooth mobility, pockets formation, and bleeding gums. It is due to cytokines released in response to bacteria. Karoussis et al<sup>13</sup> analyzed the survival rate of implants in control group and treated periodontitis group. They did not find significant difference in survival rate in both groups. However, the probing depth was higher in treated periodontitis group as compared with healthy individuals. Quirynen et al<sup>14</sup> evaluated the effect of supportive periodontal therapy and implant surface roughness on implant outcome in patients with a history of periodontitis and found that patients who received periodontal therapy in the past had lower implant failure rates. Mengel et al<sup>15</sup> assessed bone loss in 14 patients with 41 implants. Author found average of 1.29 mm bone loss over 3 years follow-up period. De Boever et al<sup>16</sup> found 0.17 mm bone loss in mesial and distal surfaces of 59 implants and reported 84.8% survival rates. We found that there was 15.2% failure rate in group II. The success rate was 83.3%.

In this study, group III showed 27% failure. Heitz-Mayfield and Huynh-Ba<sup>17</sup> in their study assessed periodontitis and smoking as risks for implant therapy and suggested that smoking is the biggest contributing factors leading to implant failure. Similarly, Klokkevold and Han<sup>18</sup> in their study concluded that smoking, diabetes, and periodontitis affect outcomes of implant treatment. They found that impaired neutrophil level, altered oxygen supply, and decreased blood flow to tissues are due to excessive smoking, which in turns affects the survival rate of implant. Bain and Moy<sup>19</sup> conducted a retrospective study on smokers and nonsmokers and found success rate of 88.72 and 95.23% respectively. We found 80.9% of success rate.

We found 13% failures in group IV. Bruxism is a para-functional condition characterized by night grinding of



teeth. This leads to severe attrition of all teeth along with patients that may manifest with temporomandibular joint pain, clicking sound, limited, and painful mouth opening. Patient often feels muscular pain. Studies have suggested the role of anxiety, stress, and incomplete sleep as contributing factors. Hartshorne<sup>20</sup> in his study found biological and technical complications in bruxism subjects as compared with nonbruxism subjects and concluded it one of the leading causes of implant failure. We found 86.3% success rate in patients with bruxism.

## CONCLUSION

Dental implants are quite common in today's life. The successful implant leads to patient as well as dentist satisfaction. However, risk factors, such as diabetes, periodontitis, bruxism, and smoking have deleterious effects on survival rate of dental implants. Counseling the diabetic patients regarding the habits and oral hygiene is necessary to improve the success rates of implants.

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