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## Analysis of prevalence and risk factors of peri-implantitis

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### Abstract

**Background:** Dental implants perforate the mucosa and are continually exposed to oral microflora. Various systemic or local circumstances may negatively affect the predictability of dental implants, leading to peri-implant inflammation, bone resorption and, ultimately, implant loss.

**Material and methods:** In this study 160 patients were included who had received a missing tooth replacement in the form of a dental implant atleast 3 years prior to the commencement of this study. Based on the age the patients were divided into 2 groups: Group 1: 25-45 years of age and Group 2: 46-65 years of age. Their pre-treatment and immediate post treatment clinical and radiographic records were collected. Prevalence of peri-implantitis was based on radiographic and clinical evaluation. All the assimilated data was recorded in Microsoft excel sheets.

**Results:** Out of 160 patients who were included in this study, 18 developed peri-implantitis. The percentage of patients who developed periodontitis was 11.25%. The data collected showed that old age was a significant risk factor for the development of peri-implantitis. Diabetes and smoking both proved to be a predominant risk factor .72.22% and 66.67% of the patients who developed peri-implantitis had diabetes and a history of smoking respectively. Out of 18 patients who developed peri-implantitis, 13 had a previous history of periodontitis as well.

**Conclusion:** A lot of risk factors are responsible for the prevalence of peri-implantitis and a thorough treatment planning keeping in mind these predisposing factors can help to reduce this risk.

**Keywords:** dental implant, peri-implantitis, dual acid etch, diabetes

### Introduction

Dental implants have become one of the main treatment options to replace missing teeth. However, in the last decades increasing cases of patients with clinical evidence of inflammation around peri-implant tissues has become widespread. Peri-implant inflammation is one of the most common complications of soft and hard tissues surrounding implants. Peri-implant mucositis is a reversible process of gingival inflammation induced by bacterial plaque. These peri-implant soft tissues have typical characteristics of redness, swelling and bleeding on probing without the loss of supporting bone <sup>[1]</sup>. Dental implants perforate the mucosa and are continually exposed to oral microflora. Oral bacteria colonize dental implant surfaces and may form pathogenic biofilms <sup>[2]</sup>.

Peri-implantitis is a disease progressing around the implant that affects both soft and hard tissues and is accompanied by bone resorption. It is important to distinguish between the dynamic bone resorption that occurs from the bone remodeling following osseointegration and loading compared to the resorption that causes bone loss following a biological complication <sup>[3]</sup>. A number of risk factors for peri-implantitis have been identified in the literature, ranging from microbial biofilm retentive elements associated with the design of the implant-supported prosthesis, to systemic predispositions and environmental exposures such as pre-existing periodontitis, cigarette smoking <sup>[4]</sup>.

Considering that treatment of peri-implantitis is restrained, challenging and costly, preventive maintenance seems to be one of the key factors to reduce its incidence and thus increase implant success rates <sup>[5]</sup>. The purpose of this current clinical study was to evaluate the prevalence of peri-implantitis and its associated risk factors.

### Material and methods

In this study 160 patients were included who had received a missing tooth replacement in the

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form of a dental implant atleast 3 years prior to the commencement of this study. The purpose of this current clinical study was to evaluate the prevalence of peri-implantitis and its associated risk factors. The detailed demographic data of the patients were obtained.

Based on the age the patients were divided into 2 groups:

- **Group 1:** 25-45 years.
- **Group 2:** 46-65 years.

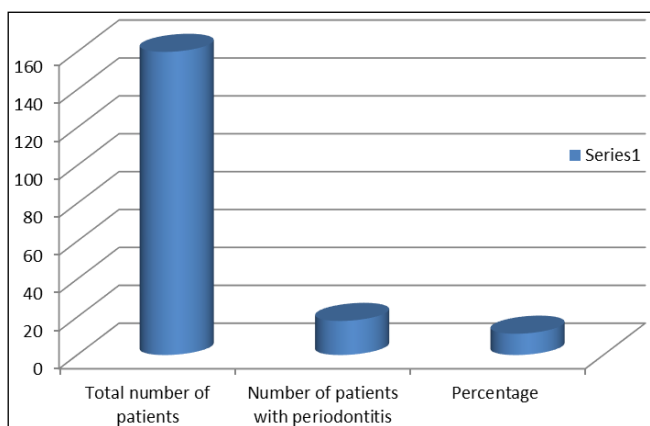
Their pre-treatment and immediate post treatment clinical and radiographic records were collected. On recall appointments a fresh radiograph and current clinical status of and around the implant apparatus was evaluated and recorded. Prevalence of peri-implantitis was based on radiographic and clinical evaluation. A bone loss of upto the 4<sup>th</sup> implant thread was considered to be a sign of peri-implantitis. Similarly a pocket depth beyond 4mm and presence of bleeding on gingival probing was used as a clinical indication of peri-implantitis. Various predisposing factors and their influence in the development of peri-implantitis were also assessed like the surface of dental implant, previous history of periodontitis before implant surgery, smoking and history of diabetes. The implants used in these patients were all dual acid-etched (DAE) implants. Based on the design specification the DAE implants were categorised into two groups:

- Hybrid design implants: DAE surface includes all areas from the apex to the top of the third coronal thread. From here to seating platform was a machined surface.
- Fully etched implants: DAE surface from the apex to the seating platform.

All the assimilated data was recorded in Microsoft excel sheets. The data was statistically analysed by using SPSS software. Chi-square test was used for statistical analysis. P value of less than .05 was considered significant.

**Results**

This current clinical study was conducted to evaluate the prevalence of peri-implantitis and its associated risk factors. From the data collected it was found that out of 160 patients who were included in this study, 18 developed peri-implantitis. The percentage of patients who developed periodontitis was 11.25% (graph 1).



**Graph 1:** Percentage of patients with peri-implantitis

The data collected showed that old age was a significant risk factor for the development of peri-implantitis. Out of 18 patients with peri-implantitis, 11 belonged to the older age group of 46-65 years (61.11%). The remaining cases of peri-implantitis (38.88%) were from the younger age group of 25-

45 years. Gender on the other had did not prove to be a significant risk factor for development of peri-implantitis (table 1). Diabetes and smoking both proved to be a predominant risk factor .72.22% and 66.67% of the patients who developed peri-implantitis had diabetes and a history of smoking respectively. This relation was statistically significant (table 1).

**Table 1:** Predisposing factors for development of peri-implantitis

Parameter		Number of peri-implantitis patients	Percentage of patients	p-value
Age group (years)	25-45 years	7	38.88%	.039
	46-65 years	11	61.11%	
Gender	Males	10	55.55%	.087
	Females	8	44.44%	
Diabetic status	Present	13	72.22	.019
	Absent	5	27.77%	
Smoking habit	Smokers	12	66.67%	.041
	Non-smokers	6	33.33%	
Previous history of periodontitis	Present	13	72.22%	.019
	Absent	5	27.77%	
Surface of implant	Hybrid design implants	10	55.55%	.087
	Fully etched implants	8	44.44%	

Out of 18 patients who developed peri-implantitis, 13 had a previous history of periodontitis as well. This was statistically significant with P-value of .01. The surface of implant however did not pose a significant risk to the development of peri-implantitis. The hybrid design implants accounted for 55.55% cases of peri-implantitis and the fully etched implants accounted for 44.44% cases of peri-implantitis. (Table 1).

**Discussion**

The use of oral implants has become integral to comprehensive dental care. Today, the application of oral implants in replacing one or several missing teeth, in partially edentulous patients represents a frequent indication [6]. Peri-implant disease at functional osseointegrated implants comprises 2 pathologies of infectious nature: peri-implant mucositis, affecting the peri-implant soft tissues, and peri-implantitis, which is accompanied by an additional loss of peri-implant bone [7-8]. Given the possible systemic ramifications of chronic inflammation, it is essential to better understand peri-implant disease prevalence and risk factors so that peri-implant inflammation can be prevented or treated. These peri-implant diseases may lead to discomfort, surgical and non-surgical treatment and their associated costs, negative effects on systemic health, or eventual loss of the implant [9-10].

This current clinical study was conducted to evaluate the prevalence of peri-implantitis and its associated risk factors. From the data collected it was found that out of 160 patients who were included in this study, 18 developed peri-implantitis. The percentage of patients who developed periodontitis was 11.25% (graph 1). Claudio Marcantonio *et al.*, conducted a study with a purpose to estimate the prevalence of peri-implantitis, as well as to determine possible risk factors associated with its development in patients treated with oral implants. A great variation has been observed in the literature regarding the prevalence of peri-implantitis according to the diagnostic criteria used to define peri-implantitis. The prevalence ranges from 4.7 to 43% at implant level, and from 8.9 to > 56% at patient level. Many

risk factors that may lead to the establishment and progression of peri-implantitis have been suggested. There is strong evidence that presence and history of periodontitis are potential risk factors for peri-implantitis. Cigarette smoking has not yet been conclusively established as a risk factor for peri-implantitis, although extra care should be taken with dental implant in smokers. Other risk factors, such as diabetes, genetic traits, implant surface roughness and presence of keratinized mucosa still require further investigation. They concluded that Peri-implantitis is not an uncommon complication following implant therapy. A higher prevalence of peri-implantitis has been identified for patients with presence or history of periodontal disease and for smokers. Until now, a true risk factor for peri-implantitis has not been established. Supportive maintenance program is essential for the long-term success of treatments with oral implants <sup>[11]</sup>.

The data collected in this study showed that old age was a significant risk factor for the development of peri-implantitis. Out of 18 patients with peri-implantitis, 11 belonged to the older age group of 46-65 years (61.11%). The remaining cases of peri-implantitis (38.88%) were from the younger age group of 25-45 years. Gender on the other had did not prove to be a significant risk factor for development of peri-implantitis (table 1). Diabetes and smoking both proved to be a predominant risk factor .72.22% and 66.67% of the patients who developed peri-implantitis had diabetes and a history of smoking respectively. This relation was statistically significant (table 1). Pjetursson *et al.*, investigated the prevalence of peri-implantitis in periodontitis susceptible patients with 3 to 23 years of follow-up time. For PD  $\geq$  5 mm, peri-implantitis prevalence was registered at 22.2 and 38.6% for implants and patients, respectively. When adopting PD  $\geq$  6 mm, peri-implantitis was present in 8.8 and 17.1% of the implants and patients, respectively. In addition, it was also reported that patients who were enrolled in an effective supportive periodontal therapy program showed a smaller rate of peri-implant disease than patients who did not receive systematic hygiene care; and that peri-implantitis incidence was significantly related to persisting residual pockets (PD  $\geq$  5 mm) after completing of the maintenance program <sup>[12]</sup>.

Out of 18 patients who developed peri-implantitis, 13 had a previous history of periodontitis as well. This was statistically significant with P-value of .01. The surface of implant however did not pose a significant risk to the development of peri-implantitis. The hybrid design implants accounted for 55.55% cases of peri-implantitis and the fully etched implants accounted for 44.44% cases of peri-implantitis. (Table 1) Zetterqvist *et al.*, compared the incidence of peri-implantitis in fully acid-etched implants with hybrid implants (implants with only the apical and the mid-third portions acid-etched). After a 5-year-follow-up time, overall peri-implantitis prevalence was 0.37% and no significant difference was found for peri-implantitis prevalence between the fully acid-etched group and the hybrid group <sup>[13]</sup>.

## Conclusion

The present study concluded that a lot of risk factors are responsible for the prevalence of peri-implantitis and a thorough treatment planning keeping in mind these predisposing factors can help to reduce this risk. Further studies on this issue are recommended.

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