

## Factors contributing to peri-implantitis – A practitioner’s perspective

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### ABSTRACT

**Introduction:** With increasing awareness about dental health, choosing dental prosthesis for replacement of missing teeth is but common even among the rural population. Dental implants among dental prosthesis are presently on the rise. Implant supported prosthesis is a lot comfortable and hence successful in patients requiring oral rehabilitation. The ongoing research in material science has made it even more possible for dental implants at a very affordable cost as well. **Aim:** The aim of the study was to assess the dental practitioner point of view of the patient-related risk factor for peri-implantitis in patients receiving endosseous dental implants. **Background:** Failure of dental implants is a major concern in spite of its large success rates. Chronic alcoholism, smoking, poor oral hygiene, and other systemic disturbances interfere with the cellular and molecular mechanisms potentially responsible for bone growth and osseointegration around the prosthesis. **Materials and Methods:** A total of 200 general dental practitioners in private practice and those attached to colleges. The information with regard to the anatomical site, age, gender, and occupation were assessed. The data were extracted. **Result:** A total of 200 general dental surgeons participated in the study. The results of the study were as follows: 182 participants felt age was an important criterion and 180 dentists felt that gender does play a role in the longevity of implants. About the association with anatomical locations, maxilla was acceptable for 25 only, whereas 175 were comfortable with the mandible, 193 accepted that the systemic health issues can jeopardize the prognosis, 181 dentists agreed that diabetes can affect the prognosis. Similarly, 163 dentists felt that blood pressure can affect the prognosis. Only 156 dentists agreed that smoking could result in poor prognosis. As for alcoholism, 138 dentists opined to affect prognosis, whereas 52 dentists did not agree. That poor oral hygiene affect prognosis was agreed by 172 dentists, still, 28 others disagreed, and parafunctional habits affect implant prognosis was agreed by 123, while 77 others differed. **Conclusion:** Considering all the patient-related risk factors can affect the prognosis of dental implants, more awareness of risk factors. Moreover, maintenance of implants is necessary among practitioners.

**KEY WORDS:** Alcoholism, Dental implant, Endosseous implant, Peri-implantitis, Poor oral hygiene, Rates of survival, Smoking, Systemic illness

### INTRODUCTION

With increasing awareness about dental health, choosing dental prosthesis for replacement of missing teeth is but common even among the rural population. Dental implants among dental prosthesis are presently on the rise. Implant supported prosthesis is a lot comfortable and hence successful in patients requiring oral rehabilitation. The ongoing research in material science has made it even more possible for dental implants at a very affordable cost as well.

The criteria for success of integrated and healthy implants suggested by the third EWOP in 1999 that the marginal bone loss should not exceed 2 mm between prosthesis installation and 5 years of follow-up.<sup>[1]</sup>

Peri-implant mucositis and peri-implantitis are, however, the two common conditions predisposing to implant failures. Peri-implant mucositis is defined<sup>[2-4]</sup> as a reversible inflammatory reaction in the soft tissues surrounding a functioning implant. Peri-implantitis is defined as the presence of inflammation characterized by the loss of supporting bone around an implant in function.

The incidence of failure due to peri-implant mucositis and implantitis today has mainly reduced due to the

#### Access this article online

Website: [jprsolutions.info](http://jprsolutions.info)

ISSN: 0975-7619

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Received on: 11-12-2018; Revised on: 14-01-2019; Accepted on: 21-02-2019

research contribution in areas of better sterilization, diagnostic aids, three-dimensional imaging, bone grafting, the metals used, implant design, and implantation techniques. The few failures still encountered are, therefore, a cause for much concern and have been attributed to systemic health and habit threats.

Patients with a history of chronic periodontitis had a higher prevalence of peri-implantitis (28.6%) than healthy patients (5.8%).<sup>[5]</sup> The various systemic risk factors that lead to peri-implantitis have been identified as, the presence of periodontitis, smoking, alcoholism, poor oral hygiene, diabetes, and other systemic and genetic traits.<sup>[6]</sup> This, however, needs to be made aware of among the general population, to overcome implant failures in the society. A previous concluded that peri-implantitis was prevalent among maxillary implants and associated risk factors were smoking and poor oral hygiene.<sup>[7]</sup> A similar understanding among the practitioners is necessary to take adequate measures to sensitize the practitioners about the necessary precautions they need to take and also the necessary instructions they need to provide the general public to preserve the integrity of the periodontium in patients having an implant. A treatment plan that achieves the best possible long-term outcomes for the patient, while addressing all patient concerns and active problems with minimum necessary intervention is an ideal treatment plan possible by a knowledgeable practitioner. This study, therefore, aims to understand the practitioner's point of view of the probable patient related systemic risk factors contributing to peri-implantitis.

## MATERIALS AND METHODOLOGY

Ethical approval was obtained from the Institutional Ethical Committee. Written informed consent was obtained from each participant, and the anonymity of the participant was maintained throughout the study the knowledge of associated risk factors of peri-implantitis was assessed through a questionnaire. Participants included 200 dental practitioner's from various other dental colleges and private dental practitioners who were willing to participate in the study. The information with regard to the anatomical site, age, gender, occupation, the general health status, and personal habits that could affect the prognosis were derived. A detailed questionnaire containing questions pertaining to the demographic status along with questions related to the knowledge of the participant about risk factors was prepared. The results were obtained after statistical analysis of the data derived and subsequently interpreted for clinical extrapolation.

The questionnaire was as follows:

1. Do you think age is an important factor in the treatment of dental implants?  
Yes/No
2. Does gender play a role in the prognosis of a systemically healthy individual?  
Yes/No
3. Is the prognosis dependent on the anatomical location of maxilla or mandible.  
Yes/No
4. Do you think systemic complication affect the prognosis of implants?  
Yes/No
5. Do you think diabetes mellitus will alter the prognosis of implants?  
Yes/No
6. Does altered blood pressure affect the implant prognosis?  
Yes/No
7. Do you think smoking affects prognosis?  
Yes/No
8. Do you think alcoholism affects prognosis?  
Yes/No
9. Does poor oral hygiene affect prognosis?  
Yes/No
10. Do parafunctional habits affect implant prognosis?  
Yes/No.

## RESULTS

A total of 200 general dental surgeons participated in the study. The results of the study were as follows: As regard the question of age consideration for implants, 182 participants felt age was an important criterion, while 18 others felt it was not important. As regard the gender, 180 dentists felt that gender does play a role in the longevity of implants. About the association with anatomical locations, maxilla was acceptable for 25 only, whereas 175 were comfortable with the mandible. A maximum of 193 accepted that the systemic health issues can jeopardize the prognosis, but seven dentists did not agree, particularly only 181 dentists agreed that diabetes can affect the prognosis whereas 19 did not agree. Similarly, 163 dentists felt that blood pressure can affect the prognosis but still 37 disagreed. That smoking affected the prognosis was accepted by 156 dentists and not accepted by 44. As for alcoholism, 138 dentists opined to affect prognosis, whereas 52 dentists did not agree. That poor oral hygiene affect prognosis was agreed by 172 dentists, still, 28 others disagreed, and parafunctional habits affect implant prognosis was agreed by 123, while 77 others differed.

## DISCUSSION

The success criteria most commonly reported in clinical reports are the survival rate, a consideration if

the implant is physically present intact in the mouth or has been removed.

For the long-term success of dental implants, osseointegration is the goal. The critical considerations to achieve this include, the design of dental implants, biomaterials composition, implant width, length and geometry, biomechanical factors, surface characteristics, medical status of the patient, bone quality, surgical technique,<sup>[8-11]</sup> and implants related factors such as site and quality of bone density of the implant location, the quality of implant for osseointegration, and technique of implant placement and loading and occlusal equilibration. The other type of risk factors is patient-related, such as oral hygiene, systemic conditions as in uncontrolled diabetes, alcohol, smoking, and.<sup>[12,13]</sup>

### Alcohol

Alcohol consumption affects bone metabolism by impairing osteoblast proliferation and increasing osteoclastic activity in rabbit models. Alcoholic rabbits demonstrated significantly less bone density and therefore impaired direct bone-to-implant contact.<sup>[14]</sup> In the present study, 52 dentists did not realize the implication of alcohol of bone quality that could result in poor osseointegration at a later date and eventual implant failure.

### Oral Hygiene

The importance of oral hygiene maintenance to the success of endosseous implant needs no mention. It is best understood by the basic understanding of the biological mechanisms of the gingiva and periodontium in normal versus an implant.

The peri-implant mucosal seal lacks an efficient barrier to bacterial invasion from plaque, then the periodontium around a natural tooth, tissue attachment.<sup>[15]</sup> The vasculature in the gingival tissue surrounding dental implants is much less than in normal biology. This coupled with parallel oriented collagen fibers around the implant makes it more susceptible to bacterial invasion and injury thereafter.<sup>[16]</sup>

Warrar *et al.*, 1995,<sup>[17]</sup> have reported gingivitis and periodontitis from bacterial invasion from plaque and can also induce the development of peri-implantitis.<sup>[18]</sup>

Patients with dental implants sometimes due to fear of losing the device generally suffer a compromise in hygiene, resulting in losing the teeth. Studies have opined that osseointegration is more predictable for success than oral hygiene maintenance calling for appropriate professional care, patient cooperation, and effective home care.<sup>[19]</sup> The need for meticulous maintenance is, therefore, recommended<sup>[20]</sup> with a periodontal examination, prophylaxis, and advice once every 3 months, with every visit lasting for an hour provided there is no compromise in the health of the patient and the selection of the implant.

In the present study, 28/200 dentists did not attach importance to post-implant maintenance.

### Smoking

Reports on failures of implants due to smoking have been attributed to mucositis and peri-implantitis Rodriguez-Argueta *et al.*<sup>[21]</sup> have reported in their study that mucositis 11.8% for smokers and 9.2% for nonsmokers. Peri-implantitis was also more common in smokers 9.2% and 5.3% in nonsmokers. Many other studies have also evinced smoking as a high-risk factor in the failure of implants due to mucositis and peri-implantitis, Hinode *et al.*<sup>[22]</sup> concluded in a meta-analysis of 19 studies that a high risk of implant failure in smokers than nonsmokers. Bain and Moy reported an 89% success rate in smokers compared with 95% in nonsmokers.<sup>[23]</sup>

Sánchez-Pérez *et al.*<sup>[24]</sup> reported a failure rate of 15.8% at 5 years for smokers and 1.4% for nonsmokers. Therefore, smoking is a risk factor for implant survival.<sup>[25,26]</sup> Some studies have, however, failed to find a relationship between smoking and peri-implant disease.<sup>[27]</sup>

In a meta-analysis,<sup>[28]</sup> the implant-related odds ratio for smokers was 2.6 for implant failure in nonaugmentation sites and 3.6 when bone augmentation techniques were used. Bone regeneration techniques have had poorer results in smokers and not only due to membrane exposure but also due to a greater rate of inflammation.<sup>[29]</sup>

In the present study, 44/200 dentists did not agree that smoking could result in implant failure.

The deleterious effect of smoking is due to multifactorial reasons attributed to the toxic effects of the constituents of tobacco including blood flow, chemotactic activity of leukocytes or collagen synthesis. There are over 4000 toxins reported in cigarette smoke, the very potent being nicotine, carbon monoxide, nitrosamines, benzenes, aldehydes, and hydrogen cyanide. The vasoconstriction due to nicotine can cause glucose reduction and acidosis at the tissue level.<sup>[30]</sup> The hydrogen cyanide induces tissue hypoxia. In addition, suppression of bone matrix-related gene expressions<sup>[31]</sup> has been reported which though does not interfere with the bone formation with harm osseointegration and bone maturation. Vitamin C deficiency, Palmer *et al.* and Sørensen *et al.*<sup>[32,33]</sup> reported interferes in the mechanism of wound healing in fibroblast function and collagen metabolism.

### Systemic Disease

Literature has not adequately supported implant failures due to systemic disease. Evidence from clinical trials has indicated that patients with hypertension,

controlled diabetes, and other cardiovascular disorders can undergo implant procedures under protected medical support as in minor. Other studies<sup>[34,35]</sup> have also demonstrated the same. It should nevertheless be noted that patients in general with systemic ailments normally do not opt for implants as a dental requirement at the time of other major pathologies. Furthermore, all studies exclude cases with systemic ailments in the evaluation of the success of any procedure, and not to mention in, bisphosphonate users.<sup>[36]</sup>

In our study, only seven dentists did not agree that systemic problems could interfere with the stability of the implants.

### Age/Gender/Location

Normal bone volume and density are of paramount importance in the success of implants. In general, there is no adequate literature support as proof of age and gender contributing to the failure of implants. Compromise in the quality and quantity due to very young age individuals or in ailing patients can greatly contribute to failures. Age lesser than 35 and more than 55 have been reported to be ideal for implants. In addition, studies revealed that the success rate is low in the maxilla<sup>[37]</sup> as bone is less dense in maxilla than in mandible. Bryant in their review of literature reported that mandibular sites tend to be more successful than maxillary sites<sup>[38]</sup> for implants, particularly for osseointegration. On the other hand, Balshe<sup>[39]</sup> reported that rough implants of 10 mm length were more successful than smooth surface implants irrespective of the location selected. It is also very important to educate dentists about the management modalities to treat peri-implantitis.<sup>[40]</sup>

## CONCLUSION

The majority of the general practitioners did perceive that the most significant factors causing peri-implantitis could be poor oral hygiene maintenance, and systemic health conditions such as diabetes mellitus and hypertension were predisposing factors. Among habits, smoking was accepted to affect the prognosis of dental implants.

## REFERENCES

- Wennstrom J, Palmer R. Consensus report of session 3: Clinical trials. In: Lang N, Karring T, Lindhe J, editors. Proceedings of the 3<sup>rd</sup> European Workshop on Periodontology Implant Dentistry. Berlin: Quintessence; 1999. p. 255-9.
- Lindhe J, Meyle J, Group D of European Workshop on Periodontology. Peri-implant diseases: Consensus report of the sixth European workshop on periodontology. *J Clin Periodontol* 2008;35:282-5.
- Zitzmann NU, Berglundh T. Definition and prevalence of peri-implant diseases. *J Clin Periodontol* 2008;35:286-91.
- Murray CM, Knight ET, Russell AA, Tawse-Smith A, Leichter JW. Peri-implant disease: Current understanding and future direction. *N Z Dent J* 2013;109:55-62.
- Karoussis IK, Salvi GE, Heitz-Mayfield LJ, Bragger U, Hämmerle CH, Lang NP, *et al.* Long-term implant prognosis in patients with and without a history of chronic periodontitis: A 10-year prospective cohort study of the ITI dental implant system. *Clin Oral Implants Res* 2003;14:329-39.
- Nguyen-Hieu T, Borghetti A, Aboudharam G. Peri-implantitis: From diagnosis to therapeutics. *J Investig Clin Dent* 2012;3:79-94.
- Hemani K, Dhanraj M, Jain AR. Contributing factors for peri-implantitis in endosseous dental implants a review. *Drug Invent Today* 2018;10:664-668.
- Sullivan RM. Implant dentistry and the concept of osseointegration: A historical perspective. *J Calif Dent Assoc* 2001;29:737-45.
- Seth S, Kalra P. Effect of dental implant parameters on stress distribution at the bone-implant interface. *Int J Sci Res* 2013; 2:121-4.
- Triplet RG, Froberg U, Sykaras N, Woody RD. Implant materials, design, and surface topographies: Their influence on osseointegration of dental implants. *J Long Term Eff Med Implants* 2003;13:485-501.
- Gaviria L, Salcido JP, Guda T, Ong JL. Current trends in dental implants. *J Korean Assoc Oral Maxillofac Surg* 2014;40:50-60.
- Jang HW, Kang JK, Lee K, Lee YS, Park PK. A retrospective study on related factors affecting the survival rate of dental implants. *J Adv Prosthodont* 2011;3:204-15.
- Sverzut AT, Stabile GA, de Moraes M, Mazzone R, Moreira RW. The influence of tobacco on early dental implant failure. *J Oral Maxillofac Surg* 2008;66:1004-9.
- Koo S, König B Jr., Mizusaki CI, Allegrini S Jr., Yoshimoto M, Carbonari MJ, *et al.* Effects of alcohol consumption on osseointegration of titanium implants in rabbits. *Implant Dent* 2004;13:232-7.
- Weyant RJ. Characteristics associated with the loss and peri-implant tissue health of endosseous dental implants. *Int J Oral Maxillofac Implants* 1994;9:95-102.
- Nevins M, Langer B. The successful use of osseointegrated implants for the treatment of the recalcitrant periodontal patient. *J Periodontol* 1995;66:150-7.
- Warrar K, Buser D, Lang NP, Karring T. Plaque-induced peri-implantitis in the presence or absence of keratinized mucosa. An experimental study in monkeys. *Clin Oral Implants Res* 1995; 6:131-8.
- Kurtzman G, Silverstein L. Dental implants: Oral hygiene and maintenance. *Int Dent J* 2014;10:56-62.
- Meffert RM. In: Misch CE, editor. Contemporary Implant Dentistry. Ch. 33. St Louis, MO: Mosby Year Book; 1993.
- Gulati M, Govila V, Anand V, Anand B. Implant Maintenance: A Clinical Update. Vol. 1. London: Hindawi Publishing Corporation International Scholarly Research Notices; 2014.
- Rodriguez-Argueta OF, Figueiredo R, Valmaseda-Castellon E, Gay-Escoda C. Postoperative complications in smoking patients treated with implants: A retrospective study. *J Oral Maxillofac Surg* 2011;69:2152-7.
- Hinode D, Tanabe S, Yokoyama M, Fujisawa K, Yamauchi E, Miyamoto Y, *et al.* Influence of smoking on osseointegrated implant failure: A meta-analysis. *Clin Oral Implants Res* 2006; 17:473-8.
- Bain CA, Moy PK. The association between the failure of dental implants and cigarette smoking. *Int J Oral Maxillofac Implants* 1993;8:609-15.
- Sánchez-Pérez A, Moya-Villaescusa MJ, Caffesse RG. Tobacco as a risk factor for survival of dental implants. *J Periodontol* 2007; 78:351-9.
- Vercruyssen M, Marcelis K, Coucke W, Naert I, Quirynen M. Long-term, retrospective evaluation (implant and patient-centred outcome) of the two-implants-supported overdenture in the mandible. Part 1: Survival rate. *Clin Oral Implants Res* 2010; 21:357-65.
- Anner R, Grossmann Y, Anner Y, Levin L. Smoking, diabetes mellitus, periodontitis, and supportive periodontal treatment as factors associated with dental implant survival: A long-term

- retrospective evaluation of patients followed for up to 10 years. *Implant Dent* 2010;19:57-64.
27. Koldsland OC, Scheie AA, Aass AM. The association between selected risk indicators and severity of peri-implantitis using mixed model analyses. *J Clin Periodontol* 2011;38:285-92.
  28. Strietzel FP, Reichart PA, Kale A, Kulkarni M, Wegner B, K uchler I, *et al.* Smoking interferes with the prognosis of dental implant treatment: A systematic review and meta-analysis. *J Clin Periodontol* 2007;34:523-44.
  29. Lindfors LT, Tervonen EA, S ndor GK, Ylikontiola LP. Guided bone regeneration using a titanium-reinforced ePTFE membrane and particulate autogenous bone: The effect of smoking and membrane exposure. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;109:825-30.
  30. S rensen LT, J rgensen S, Petersen LJ, Hemmingsen U, B low J, Loft S, *et al.* Acute effects of nicotine and smoking on blood flow, tissue oxygen, and aerobic metabolism of the skin and subcutis. *J Surg Res* 2009;152:224-30.
  31. Yamano S, Berley JA, Kuo WP, Gallucci GO, Weber HP, Sukotjo C, *et al.* Effects of nicotine on gene expression and osseointegration in rats. *Clin Oral Implants Res* 2010;21:1353-9.
  32. Palmer RM, Wilson RF, Hasan AS, Scott DA. Mechanisms of action of environmental factors tobacco smoking. *J Clin Periodontol* 2005;32 Suppl 6:180-95.
  33. S rensen LT, Toft BG, Rygaard J, Ladelund S, Paddon M, James T, *et al.* Effect of smoking, smoking cessation, and nicotine patch on wound dimension, vitamin C, and systemic markers of collagen metabolism. *Surgery* 2010;148:982-90.
  34. Liddel G, Klineberg I. Patient-related risk factors for implant therapy. A critique of pertinent literature. *Aust Dent J* 2011;56:417-26.
  35. Akoglu B, Ucankale M, Ozkan Y, Kulak-Ozkan Y. Five-year treatment outcomes with three brands of implants supporting mandibular overdentures. *Int J Oral Maxillofac Implants* 2011;26:188-94.
  36. Garcia-Bellosta S, Bravo M, Subir  C, Echeverr  J. Retrospective study of the long-term survival of 980 implants placed in a periodontal practice. *Int J Oral Maxillofac Implants* 2010;25:613-9.
  37. Conrad HJ, Jung J, Barczak M, Basu S, Seong WJ. Retrospective cohort study of the predictors of implant failure in the posterior maxilla. *Int J Oral Maxillofac Implants* 2011;26:154-62.
  38. Bryant SR. The effects of age, jaw site, and bone condition on oral implant outcomes. *Int J Prosthodont* 1998;11:470-90.
  39. Balshe AA, Assad DA, Eckert SE, Koka S, Weaver AL. A retrospective study of the survival of smooth- and rough-surface dental implants. *Int J Oral Maxillofac Implants* 2009;24:1113-8.
  40. Swetha V, Ganapathy D, Jain AR. Management of peri-implantitis a survey. *Drug Invent Today* 2018;10:3527-3530.

Source of support: Nil; Conflict of interest: None Declared