



## Assessment of Patients Referred to Specialty Dental Hospitals for Dental Implant Procedure: A Retrospective Cohort Analysis

<sup>1</sup>Rishi Thukral, <sup>2</sup>Anuj Kumar, <sup>3</sup>MC Prasant, <sup>4</sup>Krunal M Punjabi, <sup>5</sup>Aparna Paliwal, <sup>6</sup>Kunal Patel

### ABSTRACT

**Introduction:** One of the most common and effective ways of replacing missing teeth is by dental implants. Both quality and quantity of bone along with the area of implant placement govern the prognosis of the implant procedure. Certain risk factors predispose the implant treatment to high failure rate. Hence, we assessed the implant patients who were referred from private practitioners to the specialty hospitals from 2010 to 2014.

**Materials and methods:** All the patients being referred from private clinics to the specialty dental hospital for the purpose of prosthetic rehabilitation by dental implants from June 2010 to July 2014 were included in the present study. Skilled oral and maxillofacial surgeons were appointed for performing the implant surgical procedures. Prosthetic rehabilitation was done after 6 to 8 weeks and after 10 to 14 weeks in implant cases without and with bone augmentation procedures respectively. Distribution of dental implants based on the indications, location, dimension of augmentation procedure, and complication of implants was analyzed and assessed for the level of significance.

**Results:** Of the patients, 712 were females, while the remaining were males. Most of the patients were in the age group of 50 to 59 years. As compared with completely edentulous patients, most of the patients required rehabilitation by a single implant. Maximum dental implants were placed in maxillary premolar region and mandibular first molar region. Over 1,000 cases in this study required rehabilitation by augmentation procedure.

**Conclusion:** Partially edentulous patients are most commonly referred to specialized dental hospitals for prosthetic rehabilitation by dental implants, mostly with the purpose of implant placement. Failure rate can be minimized by following strict patient selection protocols along with following a standard surgical criterion.

**Clinical significance:** Following standard surgical protocols and strict treatment planning, prognosis of the dental implant procedures can be improved to a greater extent, thereby increasing its clinical success rate.

**Keywords:** Implants, Indications, Private practitioners.

**How to cite this article:** Thukral R, Kumar A, Prasant MC, Punjabi KM, Paliwal A, Patel K. Assessment of Patients Referred to Specialty Dental Hospitals for Dental Implant Procedure: A Retrospective Cohort Analysis. *J Contemp Dent Pract* 2016;17(6):470-475.

**Source of support:** Nil

**Conflict of interest:** None

### INTRODUCTION

Nowadays, endosseous dental implants are becoming a routinely used restorative option for rehabilitation of missing teeth. Conservation of natural tooth structure along with prosthesis retrievability decides the acceptance of implant procedure by the body.<sup>1-6</sup> Survival of dental implants is dependent upon numerous factors, such as quality of bone, amount of bone, site where implant has to be placed, and stabilization of implant immediately

<sup>1</sup>Department of Oral and Maxillofacial Surgery and Dentistry, All India Institute of Medical Sciences, Bhopal, Madhya Pradesh India

<sup>2</sup>Department of Maxillofacial Surgery, Bhagwan Mahavir Medical Superspecialty Hospital, Ranchi, Jharkhand, India

<sup>3</sup>Department of Oral and Maxillofacial Surgery, RKDF Dental College and Research Centre, Bhopal, Madhya Pradesh, India

<sup>4</sup>Department of Restorative Dentistry, University of Michigan School of Dentistry, Ann Arbor, Michigan, USA

<sup>5</sup>Department of Oral Pathology and Microbiology, RKDF Dental College and Research Centre, Bhopal, Madhya Pradesh, India

<sup>6</sup>Department of Periodontics, Government Dental College and Hospital, Ahmedabad, Gujarat, India

**Corresponding Author:** Rishi Thukral, Senior Resident Department of Oral and Maxillofacial Surgery and Dentistry, All India Institute of Medical Sciences, Bhopal, Madhya Pradesh India, Phone: +919414509596, e-mail: rishithukral@yahoo.co.in

after the surgery.<sup>7-9</sup> Literature quotes studies which stresses on various risk factors that predisposes the dental implant surgeries to high failure rate. Mobility occurring in dental implant immediately after surgery or after a certain period of time is known as implant failure.<sup>10</sup> Hence, we evaluated the cohort of dental implant patients by analyzing the implant patients who were referred to the specialty hospital by private practitioners from June 2010 to July 2014.

## MATERIALS AND METHODS

This study included all the referral patients who were sent to the dental wing of the hospital by private practitioners from June 2010 to July 2014. Patients requiring sinus-lifting procedures and bone augmentation procedures due to bony defects were included in the study. Exclusion criteria were as follows:

- Patients with immunocompromised state
- Patients with any history of systemic illness
- Patients with any known drug allergy
- Patients with history of any irradiation in the area where implant placement has to be done
- Patients with history of any previous surgery in the same tooth region.

All the dental implant placement procedures were performed by skilled oral surgeons under local anesthesia. Preoperative doses of antibiotics and atropine were given as prophylactic medicines. Experienced oral surgeons placed 50% of the dental implants, while remaining implants were placed by postgraduate students under the guidance of a skilled oral surgeon. Standard procedures were followed for the placement of dental implants. Prosthetic rehabilitation procedure was performed by the private practitioners once the healing phase was over, which was 6 to 8 weeks for implant cases without bone augmentation procedures and 10 to 14 weeks for

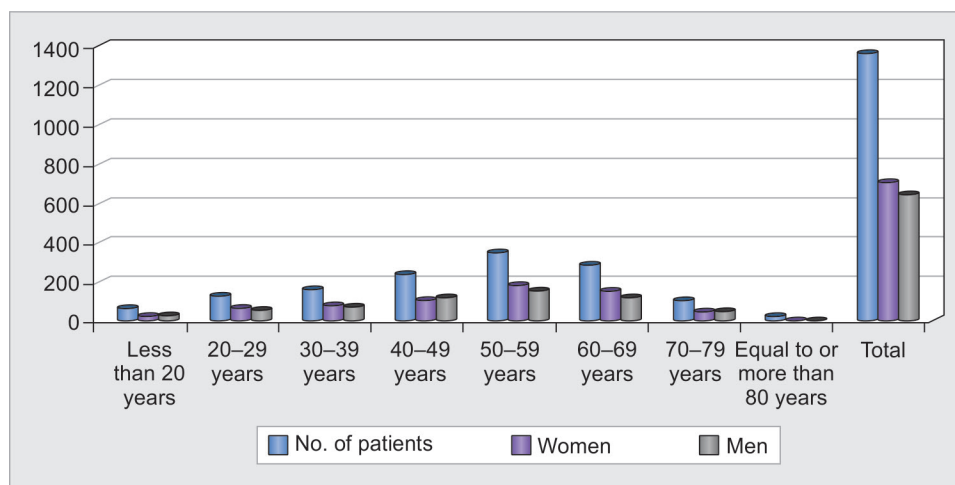
implant cases with bone augmentation procedures. All the results were analyzed by Statistical Package for the Social Sciences (SPSS) software. Following variables were assessed by statistical analysis:

- Dental implant distribution depending upon the type of indication
- Dental implant distribution depending upon the type of location
- Dental implant distribution depending upon the dimension of the dental implant
- Dental implant distribution depending upon the type of augmentation procedure
- Dental implant distribution depending upon the complications.

One-way analysis of variance test was used to assess the level of significance.

## RESULTS

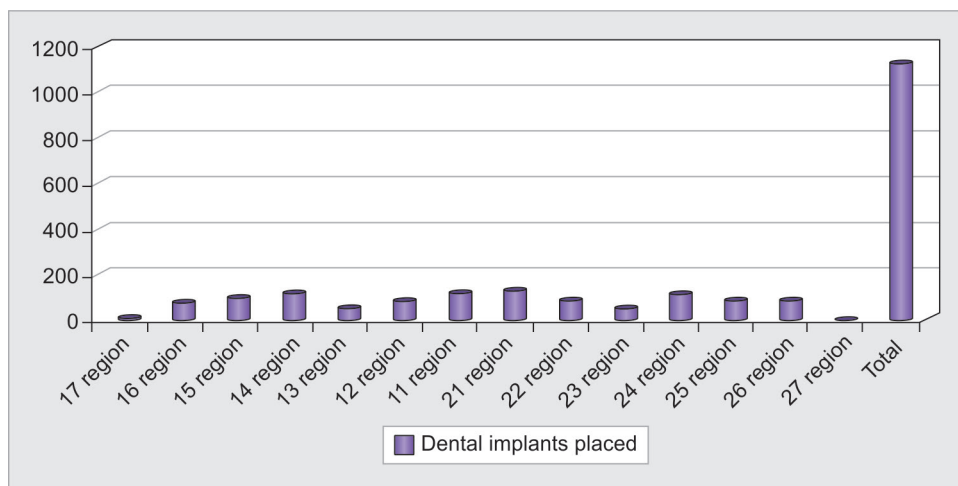
Graph 1 highlights the distribution of the implant patients according to their age. Maximum patients were in the age group of 50 to 59 years. Out of 1,360 patients in this study, 712 were females and the rest were males. Table 1 shows the distribution of all the patients according to the treatment indication. More than half of the patients required rehabilitation by a single dental implant. Maximum number of implants was placed in maxillary anterior region and mandibular posterior region (Graphs 2 and 3). About 60% of the total implants were placed in maxilla, while remaining 40% were placed in the mandible as shown in Table 2. Table 3 shows the distribution of implant cases on the basis of the dimension of the dental implants. Maximum implants were of standard width and of 10 and 12 mm length. Out of total 1,880 implant cases, 1,001 cases required augmentation procedures as shown in Table 4. A total of 752 cases required guided bony regeneration (GBR), while sinus floor elevation (SFE) was done in 224 cases.



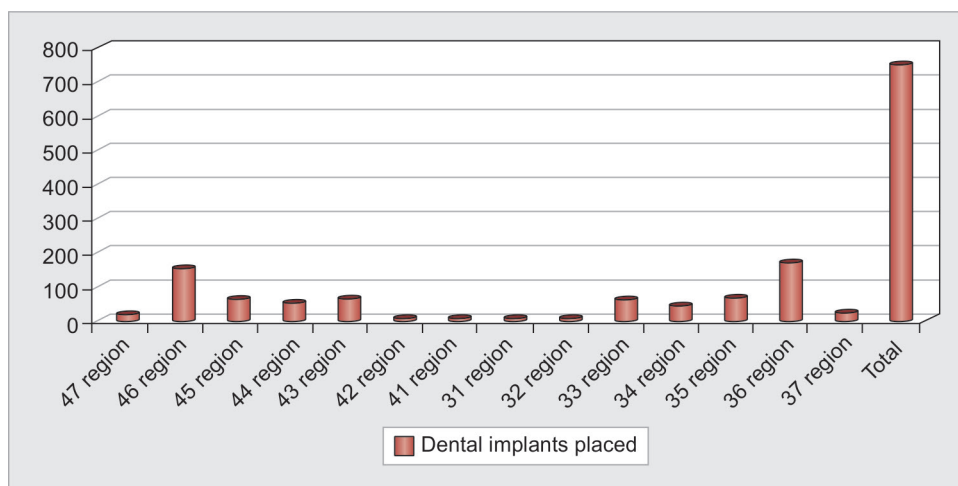
Graph 1: Distribution of patients receiving dental implants based on their age

**Table 1:** Distribution of patients and implants placed according to the indication

Area of the jaw		Total patients			Total dental implants		
		Number of patients	Percentage in single jaw	Combined percentage	Number of dental implants	Percentage in single jaw	Combined percentage
Single tooth implant	Maxilla	490	36.0	52.9	530	28.2	40.9
	Mandible	230	16.9		240	12.8	
Distal extension	Maxilla	130	9.6	21.3	240	12.8	26.6
	Mandible	160	11.8		260	13.8	
Extended edentulous	Maxilla	150	11.0	18.4	280	14.9	22.9
	Mandible	100	7.3		150	7.9	
Completely edentulous jaw	Maxilla	30	2.2	7.4	60	3.2	9.6
	Mandible	70	5.2		120	6.4	
Total		1,360	100	100	1,880	100	100



**Graph 2:** Total implants placed according to the site in the maxilla



**Graph 3:** Total implants placed according to the site in the mandible

**DISCUSSION**

Titanium implants have become the gold standard in today’s world as a main line of treatment for replacing missing teeth.<sup>11,12</sup> In these days, various other dental implants are also available in the market, but they are encountered with certain drawbacks which limits their usage over titanium implants.<sup>5</sup> Research work in the field

of implants has improved the osseointegration of dental implants with the bone by making the implant surface more hydrophilic. Hydrophilic enossal surfaces offer better and quicker results by stimulating earlier integration between the implant and the bone.<sup>13</sup> Hence, we assessed the cohort of dental implant patients who were referred to the specialty hospital by private practitioners from June 2010 to July 2014.

**Table 2:** Total implants placed according to the different regions in the jaws

Region	Total number of implants placed (%)
Anterior maxillary region	526 (28.0)
Posterior maxillary region	601 (32.0)
Anterior mandibular region	243 (12.9)
Posterior mandibular region	510 (27.1)
Total implants placed in anterior region	769 (40.9)
Total implants placed in posterior region	1,111 (59.1)
Total implants placed in maxillary region	1,127 (60.0)
Total implants placed in mandibular region	753 (40.0)

**Table 4:** Distribution of dental implants divided on the basis of augmentation procedures used

Dental implant procedure		Number of dental implants	Total dental implants
GBR	Simultaneous	620	752
	Staged		
SFE	Simultaneous osteotome technique	40	224
	Simultaneous window technique	115	
	Staged window technique	70	
SFE and GBR	Simultaneous	25	25
Total implants with augmentation procedures		1,001	1,001
Total implants without augmentation procedures		879	879

Patients reporting in the dental clinics have mostly partial edentulous areas as compared with completely edentulous ridges as shown in Table 1. Less than 10% of the total patients in this study had completely edentulous jaws. As far as treatment was concerned, more than half of the patients were referred by the practitioners for rehabilitation of a single tooth. Maximum numbers of implants were placed in mandibular first molar region and maxillary first premolar region, both of which collectively accounted for approximately 30% of all implants placed (Graphs 2 and 3). Similar results were reported by Bernard et al<sup>14</sup> and Sulzer et al,<sup>15</sup> who also observed predominantly partial edentulous patients in comparison with completely edentulous jaws. One of the common problems being encountered while doing dental implant surgeries is the lack of availability of enough bone for doing implant procedures.<sup>16</sup> To overcome this, one of the methods is GBR that stimulates osteogenic and pluripotential cell's migration into the bone defect site impeding bone formation.<sup>17-20</sup> Due to resorption of bone following maxillary posterior teeth extraction in the

**Table 3:** Total implants placed according to the different types of implants

Type of dental implant placed	Number of dental implants placed (%)	
Type	Standard (4.1 mm)	1,020 (54.2)
	Standard (4.8 mm)	255 (13.5)
	Standard (3.3 mm)	285 (15.5)
	Wide neck	160 (8.5)
	Narrow neck	30 (1.5)
	Tapered	125 (6.6)
	Any other	5 (0.2)
Length (mm)	14	50 (2.7)
	12	805 (42.8)
	10	825 (43.9)
	8	160 (8.5)
	6	40 (2.1)

immediate time period, there is decrease in dimensions of bone. Dental implant procedures are difficult in such situations due to fall in vertical bone height, leading to decrease in the distance of bone from the maxillary sinus.<sup>21,22</sup> Elevation of maxillary sinus floor is the solution for such problems. It is of two types: Direct sinus lifting and indirect sinus lifting.<sup>23</sup> Most of the dental implants placed were of standard dimension (4.1 mm) and were of 10 mm length (Table 3). Augmentation procedures were performed in more than 1,000 dental implants out of total of 1,880 implants. Guided bony regeneration was done in 752 dental implant cases, while SFE was performed in 224 implant cases. Our results were in correlation with the results of Bornstein et al<sup>24</sup> who also observed similar findings in their study. Fairbairn and Leventis<sup>25</sup> retrospectively analyzed the protocols for bone augmentation procedures in cases in which early dental implant placements were done. They evaluated 497 patients that required early placement of dental implants after extraction along with bone augmentation. They observed that only three implants failed before the loading phase of dental implants and three failed a year after the loading phase, giving a final dental implant survival rate of more than 98%. From the results, they concluded that in relation to bone regeneration and implant placement, the current standard protocol allowed high long-term success rate. Gac and Grunder<sup>26</sup> analyzed the survival and failure rate of dental implants with hydrophobic and hydrophilic enossal surfaces. They assessed 1,063 patients in which 2,918 dental implants were placed. On an average, the patients were followed up to 2.1 and 4.5 years for INICELL and TST implants respectively. They observed a significantly lower failure rate of hydrophilic implants as compared with hydrophobic implants. From the results, they concluded that for better results in early placed implants, hydrophilic implants offer better results. Derks et al<sup>27</sup> evaluated the effectiveness

of dental implant therapy in Swedish population. They assessed 4,716 patients who were provided with implant-supported rehabilitation therapy. From the results, they concluded that dental implants less than 10 mm dimension also show higher odds ratios for early implant loss. They also concluded that the late implant loss is also influenced by brand of the dental implant. Shenava et al<sup>28</sup> analyzed the correlation of osseous healing around dental implants and smoking. They retrospectively assessed 3,260 dental implant patients along with their smoking habits. From the results, they concluded that although talking in strict terms, smoking is not a contraindication to dental implants, it has a significant impact on the prognosis and survival of dental implants. Meraw et al<sup>29</sup> retrospectively reviewed the various grafting techniques used along with placement of endosseous implants. They reviewed all the partially edentulous cases from 1993 to 1997 treated by prosthetic rehabilitation. They assessed the total dental implants placed along with the patient's age, gender, and type of grafting done. From the results, they concluded that complications following dental implant surgeries in conjunction with grafts are relatively infrequent and are also not very severe.

## CONCLUSION

From the above results, it can be concluded that most of the cases reporting in the clinics are of partial edentulous areas rather than completely edentulous. Further, failure rates of dental implants can be minimized by following strict standard surgical protocols and using various augmentation procedures. Future research is advocated to further explore this field to improve the outcomes.

## REFERENCES

1. Van Steenberghe D, Lekholm U, Bolender C, Folmer T, Henry P, Herrmann I, Higuchi K, Laney W, Linden U, Astrand P. The applicability of osseointegrated oral implants in the rehabilitation of partial edentulism: a prospective multicenter study on 558 fixtures. *Int J Oral Maxillofac Implants* 1990 Fall;5(3):272-281.
2. Buser D, Belser UC, Lang NP. The original one-stage dental implant system and its clinical application. *Periodontol* 2000 1998 Jun;17(1):106-118.
3. Albrektsson T, Lekholm U. Osseointegration: current state of the art. *Dent Clin North Am* 1989 Oct;33(4):537-554.
4. Albrektsson T. A multicenter report on osseointegrated oral implants. *J Prosthet Dent* 1988 Jul;60(1):75-84.
5. Adell R, Lekholm U, Rockler B. A 15-year study of osseointegration in the treatment of the edentulous jaw. *J Oral Surg* 1981 Dec;10(6):387-416.
6. Ahlqvist I, Borg K, Gunne J, Nilson H, Olsson M, Åstrand P. Osseointegrated implants in edentulous jaws: a 2-year longitudinal study. *Int J Oral Maxillofac Implants* 1990 Summer; 5(2):155-163.
7. Lekholm U, Zarb GA. Patient selection and preparation. In: Brånemark P-I, Zarb GA, Albrektsson TA, editors. *Tissue-integrated prostheses: osseointegration in clinical dentistry*. Chicago (IL): Quintessence; 1985. p. 199-210.
8. Misch CE. Dentistry of bone: effect on treatment plans, surgical approach, healing, and progressive bone loading. *Int J Oral Implantol* 1990;6(2):23-31.
9. Spiekermann H. *Implantology*. New York (NY): Thieme; 1995. p. 91-124.
10. Duyck J, Naert I. Failure of oral implants: aetiology, symptoms and influencing factors. *Clin Oral Investig* 1998 Sep;2(3):102-114.
11. Buser D, Janner SFM, Wittneben J-G, Brägger U, Ramseier ChA, Salvi GE. 10-year survival and success rates of 511 titanium implants with a sandblasted and acid-etched surface: a retrospective study in 303 partially edentulous patients. *Clin Implant Dent Relat Res* 2012 Dec;14(6):839-851.
12. Östman PO, Hellman M, Sennerby L. Ten years later. Results from a prospective single-centre clinical study on 121 oxidized (TiUnite™) Brånemark implants in 46 patients. *Clin Implant Dent Relat Res* 2012 Dec;14(6):852-860.
13. Stadlinger B, Lode AT, Eckelt U, Range U, Schlottig F, Hefti T, Mai R. Surface-conditioned dental implants: an animal study on bone formation. *J Clin Periodontol* 2009 Oct;36(10): 882-891.
14. Bernard JP, Belser UC, Marchand D, Gebran G. Implants et edentements partiels: aspects chirurgicaux et prothétiques. *Cahiers Proth* 1996;96:85-95.
15. Sulzer TH, Bornstein MM, Buser D. Aktuelles Indikationspektrum in der oralen Implantologie an einer Überweisungsklinik. Eine retrospektive 3-Jahres-Analyse bei 737 Patienten mit 1176 Implantaten. *Schweiz Monatsschr Zahnmed* 2004; 114:444-450.
16. Lekholm U, Adell R, Lindhe J, Brånemark PI, Eriksson B, Rockler B, Lindvall AM, Yoneyama T. Marginal tissue reactions at osseointegrated titanium fixtures. (II) A cross-sectional retrospective study. *Int J Oral Maxillofac Surg* 1986 Feb;15(1):53-61.
17. Dahlin C, Linde A, Gottlow J, Nyman S. Healing of bone defects by guided tissue regeneration. *Plastic Reconstr Surg* 1988 May;81(5):672-676.
18. Dahlin C, Sennerby L, Lekholm U, Linde A, Nyman S. Generation of new bone around titanium implants using a membrane technique: an experimental study in rabbits. *Int J Oral Maxillofac Implants* 1989 Spring;4(1):19-25.
19. Becker W, Becker BE. Guided tissue regeneration for implants placed into extraction sockets and for implant dehiscences: surgical techniques and case report. *Int J Periodontics Restorative Dent* 1990;10(5):376-391.
20. Becker W, Becker BE, Handlesman M, Celletti R, Ochsenbein C, Hardwick R, Langer B. Bone formation at dehiscenced dental implant sites treated with implant augmentation material: a pilot study in dogs. *Int J Periodontics Restorative Dent* 1990;10(2):92-101.
21. Raja SV. Management of the posterior maxilla with sinus lift: review of techniques. *J Oral Maxillofac Surg* 2009 Aug;67(8):1730-1734.
22. Daniel D, Rao SG. Evaluation of increase in bone height following maxillary sinus augmentation using direct and indirect technique. *J Dent Implant* 2012 Jan;2(1):26-31.
23. Pal US, Sharma NK, Singh RK, Mahammad S, Mehrotra D, Singh N, Mandhyan D. Direct vs indirect sinus lift procedure: a comparison. *Natl J Maxillofac Surg* 2012 Jan-Jun;3(1):31-37.

24. Bornstein MM, Halbritter S, Harnisch H, Weber HP, Buser D. A retrospective analysis of patients referred for implant placement to a specialty clinic: indications, surgical procedures, and early failures. *Int J Oral Maxillofac Implants* 2008 Nov-Dec;23(6):1109-1116.
25. Fairbairn P, Leventis M. Protocol for bone augmentation with simultaneous early implant placement: a retrospective multicenter clinical study. *Int J Dent* 2015;2015:589135.
26. Gac OL, Grunder U. Six-year survival and early failure rate of 2918 implants with hydrophobic and hydrophilic enossal surfaces. *Dent J* 2015;3(1):15-23.
27. Derks J, Håkansson J, Wennström JL, Tomasi C, Larsson M, Berglundh T. Effectiveness of implant therapy analyzed in a Swedish population: early and late implant loss. *J Dent Res* 2015 Mar;94(Suppl 3):44S-51S.
28. Shenava S, Singh P, Babu CS, Kumar V, Jyoti B, Sharma S. Co-relation between smoking and bone healing around dental implants: a clinical study. *J Int Oral Health* 2016;8(2):1-3.
29. Meraw SJ, Eckert SE, Yacyshyn CE, Wollan PC. Retrospective review of grafting techniques utilized in conjunction with endosseous implant placement. *Int J Oral Maxillofac Implants* 1999 Sep-Oct;14(5):744-747.