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Original Article

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A demographic analysis of patients undergoing dental implant surgery

Abstract

Aim: One of the fundamental goals of modern dentistry is to provide effective treatment options that meet both the aesthetic and functional needs of patients. In this regard, dental implant procedures have become increasingly integrated into routine clinical practice. The purpose of this study is to evaluate dental implant applications in terms of demographic and clinical parameters in patients treated for tooth loss.
Materials and Methods: This retrospective study included panoramic radiographs of 500 randomly selected dental implants placed in patients who presented to our clinic. Each implant was evaluated based on its jaw location (maxilla or mandible), anterior or posterior positioning, presence of augmentation procedures, and the patient's age and gender.
Results: A total of 500 dental implants were analyzed. The mean age of the patients was 54.04 ± 11.5 years. Among these implants, 56.6% were placed in the maxilla and 43.4% in the mandible, with the majority of maxillary implants located in the posterior region. The most common augmentation technique in the maxilla was open sinus lifting (23.3%), while horizontal grafting was most frequently performed in the mandible (4.6%). Augmentation procedures were more common in the posterior regions than in the anterior regions.
Conclusion: Dental implant procedures show variability depending on both patient-related and anatomical factors. Accurate preoperative assessment of these variables is critical to ensure clinical success. Bone deficiencies, particularly in the posterior regions, highlight the necessity of augmentation techniques and emphasize the importance of region-specific surgical planning.

Keywords: Dental implants, demography, bone transplantation

INTRODUCTION

Dental implant applications are increasingly recognized in dental practice as a modern treatment option that offers both aesthetic and functional solutions for tooth loss. Technological advancements, the use of biocompatible materials, and improvements in surgical techniques have more common increased the success rates of dental implants, making them applicable to a broader range of patients (1,2). Particularly, the growing elderly population and the increasing importance individuals place on quality of life have led to a rise in demand for implant surgery (3). This trend underscores the necessity of thoroughly examining and analyzing the demographic characteristics of patients undergoing implant treatment (4).

The success of dental implants depends on multiple factors. Among these, systemic health status, bone quality and quantity, smoking habits, oral hygiene practices, and surgical techniques are prominent (5). However, there is growing scientific evidence that demographic characteristics of patients also influence treatment outcomes and long-term success. Variables such as age, gender, socioeconomic status, and educational level have been shown to play important roles in the planning, application, and follow-up phases of implant therapy (6,7).

Age is one of the most critical demographic variables to consider in implant treatment. It is well-documented that implant patients span a wide age range. Studies have shown that individuals in middle and older age groups tend to seek

implant therapy more frequently. This trend may be associated with the higher incidence of tooth loss with increasing age and the growing functional and aesthetic needs of aging individuals (8). Nevertheless, factors such as decreased bone density and the presence of systemic diseases in elderly patients can affect treatment outcomes. Thus, age-related variables should be considered during implant planning (9). When examining gender distribution, differences in implant application rates between male and female patients have been observed. Some studies report that female patients pursue implant treatment more often due to aesthetic concerns, whereas other studies have found no significant gender-based differences (10). Although gender is generally not considered a direct determinant of implant success, hormonal differences may indirectly influence bone metabolism and healing processes, as noted in the literatüre (11).

Data regarding the intraoral distribution of implants provide important insights for treatment planning. The posterior mandible and posterior maxilla are the most common sites for implant placement (12). This is likely due to the prevalence of tooth loss and the concentration of chewing forces in these regions. In contrast, implant placement in anterior areas is more commonly driven by aesthetic concerns. Additionally, the number and location of implants planned may vary depending on whether the patient is completely or partially edentulous (1).

The aim of this study was to evaluate dental implant applications in patients treated for tooth loss by analyzing demographic and clinical parameters, including patient age, gender, implant location within the jaws, regional distribution (anterior/posterior), and the need for augmentation procedures.

MATERIALS AND METHODS

This retrospective study received approval from the Ethics Committee for Non-Interventional Clinical Research at Eskişehir Osmangazi University (approval number: 09, date: 09/09/2025).

Within the scope of this research, a total of 500 dental implants were evaluated. The total number of implants placed during the study period was 2000, and 500 implants were randomly selected for inclusion in the study. These implants were randomly selected among cases treated at the Faculty of Dentistry, Eskişehir Osmangazi University, between 20 May 2013 and 17 June 2025. The analysis in this study was performed at the implant level, as multiple implants may belong to a single patient.

Each implant was assessed using panoramic radiographs and classified based on its anatomical location(whether placed in the maxilla or mandible) as well as its position in either the anterior or posterior region of the jaw. In addition, augmentation procedures performed before or during the surgery were recorded. Augmentation procedures were determined based on both panoramic radiographs and corresponding clinical records. Patient-related data, including age and gender, were also recorded.

Inclusion Criteria

Patients aged 18 years and older who underwent implant surgery within the specified study period and had complete clinical records, including demographic data and available panoramic radiographs, were included in the study.

Exclusion Criteria

Patients under the age of 18, those treated outside the specified study period, individuals without available panoramic radiographs, and cases in which implant surgery was not performed were excluded from the dataset.

Implant Classification

The positioning of each implant was determined through radiographic evaluation and categorized into maxillary or mandibular placements. Further classification into anterior and posterior regions was made based on the treated tooth location. The anterior region was defined as the incisor and canine area, whereas the posterior region included the premolar and molar regions . Augmentation procedures identified on radiographs were also noted and classified by type.

Patient Grouping

Patients were evaluated according to age and gender. Since the analysis was descriptive and performed at the implant level, no predefined age-group categorization was used; age was analyzed as a continuous variable and reported as range and mean ± standard deviation.

Statistical Analysis

The statistical analysis was conducted using IBM SPSS Statistics version 20 software (IBM Corp., Chicago, IL, USA). Only descriptive statistical methods were applied to evaluate the distribution of demographic and clinical variables, including patient age, gender, implant location within the jaws, and the presence or absence of bone augmentation procedures. The purpose of the study was descriptive in nature; therefore, inferential statistical analyses examining associations between variables were not performed.

RESULTS

This retrospective analysis focused primarily on the total number of dental implants assessed. Out of 500 implants evaluated, 241 (48.2%) were placed in male patients, whereas 259 (51.8%) were placed in female patients. The ages of individuals who underwent implant therapy ranged from 20 to 80 years, with a calculated mean age of 54.04 ± 11.5 years.

With respect to anatomical distribution, 283 implants (56.6%) were inserted into the maxillary arch and 217 implants (43.4%) into the mandibular arch. Within the maxilla, 80 implants (28%) were positioned in the anterior region and 203 (72%) in the posterior region. In the mandible, 63 implants (29%) were located anteriorly and 154 (71%) posteriorly.

The distribution of augmentation procedures is shown in Table 1. The open sinus lift was identified as the most commonly performed augmentation technique in the maxilla, applied in 23.3% of cases. In contrast, in the mandible, the most frequently used augmentation method was horizontal bone grafting, performed in 4.6% of instances.

Table 2 presents the distribution of augmentation methods according to anatomical regions. Horizontal and vertical grafting was the predominant approach in the anterior region, used in 3.5% of implants, while in the posterior region, open sinus lift was the most frequently performed procedure, accounting for 18.2% of the cases.

Table 1. Overview of augmentation techniques applied to the jaws

Jaw	Augmentation Procedure	Frequency (n)	Percent (%)
Maxilla	None	169	59.7
	Closed sinus lift	37	13.1
	Open sinus lift	66	23.3
	Horizontal graft	5	1.8
	Horizontal + vertical graft	6	2.1
	Total	283	100
Mandible	None	205	94.5
	Horizontal graft	10	4.6
	Horizontal + vertical graft	2	0.9
	Total	217	100

Table 2. Comparison of augmentation techniques in anterior and posterior jaw segments

Localization	Augmentation procedure	Frequency (n)	Percent (%)
Anterior	None	130	90.9
	Closed sinus lift	3	2.1
	Open sinus lift	1	0.7
	Horizontal graft	4	2.8
	Horizontal + vertical graft	5	3.5
	Total	143	100
Posterior	None	244	68.3.5
	Closed sinus lift	34	9.5
	Open sinus lift	65	18.2
	Horizontal graft	11	3.1
	Horizontal + vertical graft	3	0.8
	Total	357	100

DISCUSSION

Dental implant surgery is a commonly utilized and highly successful treatment modality for the rehabilitation of missing teeth and early tooth loss (13). Over recent years, the indications for implant therapy have expanded in parallel with evolving patient profiles and increasing clinical needs, leading to its widespread adoption in the treatment of complete, partial, and single edentulism cases (4). In this study, a total of 500 dental implants were evaluated, and the demographic and anatomical distributions of patients receiving these implants were analyzed.

The age range of patients evaluated in the study was between 20 and 80 years, with a mean of 54.04 ± 11.5 years. This finding is consistent with previous studies reporting that the mean age of patients receiving dental implants is typically within the fifth and sixth decades of life. For example, Cem Bural et al. (14) reported a mean age of 52.12 ± 13.79 years in a large retrospective analysis of implant patients . Similarly, other demographic studies have shown that implant placement is most frequently performed in individuals between 50 and 60 years of age (15). These findings suggest that implant therapy is predominantly provided to middle-aged and

older adults, likely due to the increasing prevalence of tooth loss with advancing age and the growing need for functional oral rehabilitation in this population (16).

When analyzing the gender distribution, 51.8% of implants were placed in female patients and 48.2% in male patients, indicating a relatively balanced distribution with a slight predominance among females. Previous epidemiological studies have also reported comparable or slightly higher implant utilization rates among women, which has been attributed to greater aesthetic concerns and higher utilization of dental care services (4,17). Regarding anatomical distribution, 56.6% of the implants were placed in the maxilla and 43.4% in the mandible. Although the mandible generally presents with higher bone density and more favorable conditions for osseointegration, several studies have reported a higher frequency of implant placement in the maxilla. This may be related to increased tooth loss in the posterior maxilla, as well as greater aesthetic demands in the anterior maxillary region (18,19).

Further regional analysis showed that in the maxilla, 72% of implants were placed in the posterior region and 28% in the anterior; in the mandible, 71% were in the posterior and 29% in the anterior region. The predominance of posterior placement can be attributed to the higher frequency of tooth loss in these areas due to functional stresses such as mastication. Vehemente et al. (20) also reported that the posterior regions were the most common sites for implant placement, rather than the anterior esthetic zones.

When augmentation procedures were analyzed, open sinus lift was the most frequently used method in the maxilla, while horizontal bone augmentation was more commonly performed in the mandible. Additionally, augmentation procedures were observed more frequently in posterior regions than in anterior sites. This distribution can be explained by the anatomical limitations and vertical bone deficiencies commonly encountered in posterior areas, particularly in the maxilla due to sinus pneumatization following tooth loss. Previous studies have consistently reported that reduced residual bone height in the posterior maxilla often necessitates sinus floor elevation procedures (21,22). Furthermore, lateral window (open sinus lift) techniques are widely preferred in cases with insufficient vertical bone height, especially in posterior maxillary regions (23).

In anterior regions, the most frequently used augmentation approach was a combination of horizontal and vertical grafting. This can be attributed to the high esthetic demands and the frequent presence of insufficient alveolar ridge volume in the anterior maxilla, which often require three-dimensional augmentation procedures (24,25). In addition, the anatomical complexity of peri-implant hard and soft tissues in the anterior region further increases the difficulty of augmentation procedures and necessitates careful treatment planning to achieve optimal esthetic outcomes (1,26).

When planning implant surgery, variables such as patient age, gender, anatomical site of placement, and bone volume should be meticulously evaluated, as they directly influence both surgical outcomes and long-term success (27). The elevated augmentation rate observed in the posterior maxilla highlights the need for careful preoperative planning in this region, mainly due to limited bone height and the proximity of the maxillary sinus (23). In summary, the findings of this study are largely consistent with previously published retrospective analyses. Previous studies have shown that implant procedures are more frequently performed in older patients and posterior regions, where augmentation procedures are often required (13,27). Long-term follow-up studies have also highlighted the increasing use of advanced surgical techniques and emphasized the importance of demographic and clinical variables in individualized treatment planning (28,29).

Based on the data gathered in this study, retrospective evaluation of dental implant procedures provides valuable insights that can guide clinicians. Moreover, these findings underscore the necessity of future studies involving larger patient samples to validate these results and enhance evidence-based approaches to implant therapy.

This study has some limitations. Due to its retrospective design, the findings depend on the accuracy and completeness of existing clinical and radiographic records. In addition, the use of panoramic radiographs may limit the precision of anatomical assessments compared to three-dimensional imaging methods. Moreover, images were evaluated by a single experienced examiner; therefore, interobserver agreement analysis was not applicable. Nevertheless, formal intraobserver reliability assessment was not performed, which should be considered a limitation of the present study. In addition, no power analysis was conducted.

CONCLUSION

This retrospective analysis demonstrated that dental implant placement was performed predominantly in the posterior regions of both jaws, with the maxilla receiving a greater proportion of implants than the mandible. The higher frequency of augmentation procedures in the posterior maxilla, particularly open sinus lift surgery, reflects the anatomical challenges commonly encountered in this region. These findings highlight the importance of individualized treatment planning based on regional anatomical characteristics rather than a standardized surgical approach. Understanding the demographic profile of implant patients and the distribution of augmentation requirements may contribute to more predictable surgical planning, improved resource allocation, and enhanced clinical decision-making. Future multicenter prospective studies with larger cohorts are needed to further clarify the influence of demographic and anatomical factors on implant treatment patterns and long-term clinical outcomes.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that there is no financial support.

Ethical Approval
The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Eskişehir Osmangazi University Ethics Committee (approval number: 2015/09, date: 09.09.2025).

Informed Consent
The requirement for informed consent was waived by the Ethics Committee due to the retrospective nature of the study.

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