



# INVESTIGATING THE FREQUENCY OF IMPLANTS, FIXED PROSTHESES, AND EDENTULOUS AREAS IN THE PANORAMIC RADIOGRAPHS OF PATIENTS REFERRED TO KASHAN RADIOLOGY CENTERS IN 2017-2018

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## Abstract

### Introduction

If the patient does not replace a tooth in the edentulous area, the bone will gradually deteriorate and its replacement will become more difficult. There are various treatments to replace the lost tooth, which include movable partial prostheses, fixed partial prostheses, and implants. Each has its own advantages and disadvantages. This study was conducted with the aim of studying the frequency of implants, fixed prostheses, and edentulous areas in panoramic radiographs.

**Materials and Methods:** In this cross-sectional-descriptive study, 700 panoramic radiographs of good quality that were selected from the digital archive of private radiology centers in Kashan city were examined from patients referred in 2017 and 2018. After collecting the data and entering it into the SPSS 21 software, the frequency of implants, fixed bridges, and edentulous areas was calculated according to each of the four quadrants. Then, using descriptive statistics, Fisher's exact statistical tests, and chi-square, the relationship between the variables was investigated.

**Findings:** The results showed that only 12% of all samples did not have edentulous areas, and in 88% of cases, there were edentulous areas in at least one jaw. Also, in 90.4% of cases, the patient had no dental implant, and in the remaining samples, there was an implant in at least one jaw. In at least one jaw, 27% of patients had fixed prostheses.

**Conclusion:** Teaching dental health care, informing patients about all the available treatments to restore the function and beauty of the oral cavity and as a result increasing the quality of life, is an essential need of the society and should be prioritized in the activities of policy makers in the field of treatment and insurance organizations.

**Keywords:** dental implant, fixed prosthesis, panoramic radiography

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## **Introduction**

Teeth play a significant role in beauty, chewing and speaking, and their absence causes many problems and has significant side effects on various aspects of people's quality of life (1). Low self-confidence related to tooth loss can lead to inability to socialize, do work and daily activities (2, 3). If the patient does not replace a tooth in the edentulous area, the bone will gradually degenerate and its replacement will become more difficult (4). Clinical factors and patient conditions both affect the choice of treatment. Clinical factors include: periodontal condition, the amount of existing bone, oral hygiene, systemic conditions of the patient and the level of caries, etc., and the factors related to the patient include: the level of education and awareness of the patient, the duration of treatment and the cost (5-8). There are different types of treatments to replace missing teeth, including: movable partial prosthesis, fixed partial prosthesis and implant, each of which has its own advantages and disadvantages (9). The use of implant protheses for the restoration of complete and partial edentulism in patients, in addition to maintaining dental structures and longevity of treatment, also improves the performance of the stomatal system (10, 11). 95.3 percent of success in implants implanted in partially edentulous areas was shown after 3-7 years (12). The most important concern of the implant is the prevention of its fracture. For this reason, it is very important to provide an appropriate restorative program considering the use of a larger number of implants with larger diameters, mainly in the posterior regions (13, 14). Factors such as the physiological compatibility of the implant (15), increasing the quality of life of patients by restoring lost teeth and returning stable and durable beauty, chewing practice for edentulous patients, high and predictable success of the implant process and low amount of complications during and after Implant placement makes this process attractive to the general public (16, 17). Implants are successful in maintaining both hard and soft tissue (8, 18). The most common side effects of implant-based prosthetic treatments are cover fracture and screw loosening (19). Implants or natural teeth or both are used for the base of fixed prosthesis, both treatment plans are strongly affected by the condition of the remaining teeth, which may require other treatments before the implant

treatment (20, 21). Most implants that support implant-assisted partial dentures function successfully during follow-up periods (22). The use of dental panoramic radiography in these patients is an extremely powerful tool that has become the main imaging method in most dental offices since the 1960s. The advantage of this type of radiography is that it provides a general evaluation of the jaws and adjacent anatomical structures with a single radiographic image that is obtained in a short time and with a low dose of radiation (23). In panoramic radiographic examinations performed in completely edentulous patients, apart from pathology, many anatomical and structural conditions that may affect prosthetic treatment, such as the course of the mandibular canal, the position of the mental foramen and maxillary sinuses, and the level of bone resorption (23-25). Therefore, according to the reviewed studies that the implant is often the best treatment for replacing lost teeth, and also the increasing use of dental implants has led to progress in treatment planning for prosthetic restoration, and many patients can now receive fixed partial protheses (26). Therefore, in this study, it was decided to evaluate the frequency of implants, fixed protheses and edentulous areas according to the number of edentulous areas on both sides of the jaw and the gender of patients referred to radiology centers in Kashan in 2017-2018 and the obtained information has been provided to the country's treatment policy makers to provide the necessary arrangements for more sections of the society to benefit from this effective treatment.

## **Procedure**

The present study is a retrospective descriptive study. In the archive section of these centers, panoramic radiographs of 700 patients referred to Dey private radiology and Tamin Ejtemaie center in Kashan city in 2017-2018 were examined. Sampling was done by census. The samples included in the study were people over 20 years of age (to exclude mixed dentition), who had at least one case of edentulism, implants, or a fixed partial prosthesis, and whose panoramic radiographs were of good quality. In this study, panoramic radiographs with unfavorable quality, dental periods of mixed dentition, quadrants with severe pathological and periodontal lesions, or those with remaining roots in the edentulous area, were omitted. In order to conduct the study, the graphs were provided to the researcher without the name of the patient. After assigning a code to

each patient, the researcher gathered information such as age, gender, involved side and jaw, extent of edentulous areas, and the presence of implants and fixed bridges and entered it into the SPSS-21 software for analysis. While providing descriptive statistics to check the frequency of edentulous areas, implants, and fixed bridges, Fisher's and Chi-square statistical tests were used to check the relationship between variables.  $p < 0.05$  was considered a significant level. This study was approved by the ethics committee of Kashan University of Medical Sciences with the code of ethics IR.KAUMS.MENT.REC.1398.084.

Results

Out of the 700 panoramic radiographs reviewed, 395 (56.4%) were women and 305 (43.6%) were men, with an average age of 54 years. Table 1 shows the descriptive findings of the study. As it is clear from the table, out of all the examined samples, there were implants in 67 cases (9.6%), and in 12 cases (1.7%), both jaws were involved in implants.

189 cases (27%) had partial fixed protheses, and in 6 cases (0.9%) both jaws were involved in partial fixed protheses. Also, out of all examined samples, 616 cases (88%) had edentulous areas, and in 77 cases (11%), all half-jaws were involved in edentulism.

Table 1. Frequency distribution of implants, fixed bridges, and edentulous areas according to the number of involved jaws

	Number Of Half-Jaws Involved		Frequency	
			No.	Percent
Implant	Yes	1	20	2.9
		2	26	3.7
		3	9	1.3
		4	12	1.7
		Total	67	9.6
	No	633	90.4	
Fixed Bridge	Yes	1	113	16.1
		2	50	7.1
		3	20	2.9
		4	6	0.9
		Total	189	27
	No	511	73	
Edentulous Areas	Yes	1	247	35.3
		2	197	28.1
		3	95	13.6
		4	77	11
		Total	616	88
	No	84	12	
Total			700	100

Table 2 shows the findings of the study in relation to the frequency of implants, fixed bridges, and edentulous areas according to the

type of half-jaw involved. In this table, half jaw number one means the upper right quadrant; number two, the upper left quadrant; number three, the lower left quadrant; and number four,

the lower right quadrant. As it is clear from the table, the highest frequency of implants is seen in the upper jaw with 86 cases (12.2%), and the highest frequency of fixed protheses is seen in the left upper half jaw with 103 cases (14.7%). Also, in edentulism, the right lower jaw has the

highest number with 376 cases (53.7%). In other words, the rate of placement of teeth (first with fixed prothesis and then with implants) is higher in the upper jaw, and the rate of edentulous areas is higher in the lower jaw.

Table 2. Frequency distribution of implants, fixed bridges, and edentulous areas according to the type of half jaw involved

The Type Of Half-Jaw Involved	Implants	Fixed Bridges	Edentulous Areas
1	43 (6.1%)	81 (11.6%)	236 (33.7%)
2	43 (6.1%)	103 (14.7%)	252 (36%)
3	35 (5%)	61 (8.7%)	357 (52.9%)
4	26 (3.7%)	52 (7.4%)	376 (53.7%)

Table 3 shows the findings of the study in relation to the frequency of implants, fixed bridges, and edentulousness based on the type of jaw involved in each gender. As shown in the table, the number of implants in men is higher than in women (92 people vs. 55 people). In both genders, most implants were placed in the upper jaw, so that the highest amount of implants was seen in women in the left upper jaw with 18 cases (4.6%) and in men in the right upper jaw with 30 cases (9.8%). There was a statistically significant relationship between the frequency of implants in the upper jaw and left lower half jaw and gender (P value<0.05).

In examining the frequency distribution of fixed bridges, the results of Table 3 show that the amount of fixed prothesis in women is most frequent in the left upper jaw (58 cases, 14.7%), and the right lower jaw has the lowest frequency (29 cases, 7.3%). Also, the highest amount of fixed prothesis in men is in the left upper jaw with 45 cases (14.8%) and the lowest in the

right lower jaw with 23 cases (7.5%). The percentage of fixed protheses was higher in men than in women, and in both genders, the highest frequency of fixed protheses was seen in the upper jaw (left upper jaw). As it is known, there is no significant relationship between the frequency of the fixed bridge in each jaw and the gender of the person (P value > 0.05).

The highest prevalence of edentulism in men was seen in the left lower jaw (164 cases, 53.8%), and the lowest in the right upper jaw (102 cases, 33.4%). Also, the highest rate of edentulism in women was in the right lower jaw (219 cases, 55.4%), and the lowest was in the right upper jaw (134 cases, 33.9%). The rate of edentulism in women was higher than in men, and the highest frequency of edentulism in both genders was in the lower jaw. There was no statistically significant relationship between the frequency of edentulousness in each half-jaw and gender (P value > 0.05) (Table 3).

Table 3. Distribution of the frequency of implants, fixed bridges, and edentulousness according to the type of the involved half jaw by gender

	Gender	Frequency			
		1	2	3	4
<b>Implant</b>	Woman	13(3.3%)	18(4.6%)	14(3.5%)	<b>10(2.5%)</b>
	Man	30 (9.8%)	25(8.2%)	21(6.9%)	<b>16(5.2%)</b>
	Total	43(6.1%)	43 (6.1%)	35 (5%)	<b>26(3.7%)</b>
	Pvalue	<0.001	0.047	0.044	<b>0.60</b>
<b>Fixed Bridge</b>	Woman	44(11.1%)	58(14.7%)	32(8.1%)	<b>29(7.3%)</b>
	Man	37(12.1%)	45(14.8%)	29(9.5%)	<b>23(7.5%)</b>
	Total	81(11.6%)	103(14.7%)	61(8.7%)	<b>52(7.4%)</b>
	Pvalue	0.684	0.979	0.513	<b>0.921</b>
<b>Edentulous Areas</b>	Woman	134 (33.9)	135(34.2%)	206(52.2)	<b>219(55.4)</b>
	Man	102 (33.4)	117 (38.4)	164(53.8)	<b>157(51.5)</b>
	Total	236 (33.7)	252 (36)	370(52.9)	<b>376(53.7)</b>
	Pvalue	0.894	0.253	0.671	<b>0.297</b>

According to the results of Table 4, the prevalence of implants and fixed prostheses is higher in men than in women, while the prevalence of edentulousness is higher in women than in men. The rate of edentulism is higher than that of fixed prostheses and

implants, and the frequency of treatment with fixed prostheses is higher than that of implants. The results of the table indicated that there is a statistically significant relationship between the frequency of implants in at least one half-jaw and gender (P value = 0.022).

Table 4. Frequency distribution of implant, fixed bridge and edentulousness according to gender in at least one half jaw.

Presence in at Least One Jaw Gender	Implant		Fixed Bridge		Edentulous Areas	
	No	Yes	No	Yes	No	Yes
<b>Woman</b>	366(92.7%)	29 (7.3%)	289(73.2%)	106(26.8%)	44(11.1%)	351(88.9%)
<b>Man</b>	267(87.5%)	38(12.5%)	222(72.8%)	83(27.2%)	40(13.1%)	265(86.9%)
<b>Total</b>	633(90.4%)	67 (9.6%)	511 (73%)	189(27%)	84 (12%)	616 (88%)
<b>P Value</b>	0.022		0.911		0.425	

### Discussion

In this study, out of 700 samples, 305 were men and 395 were women, ranging in age from 20 to



88 years. The presence of edentulous areas was the most frequent, and fixed protheses and implants were in the second and third categories in terms of frequency. This is consistent with a study by Peeran et al., who reported similar findings (27). Battistuzzi et al., in their study, which was conducted with the aim of gaining knowledge about the position and frequency of prosthetic treatments and the consequences of edentulism on oral function, taking into account the age and economic status of people, showed that the percentage of prosthetic use in people with an unsuitable economic status is lower than that in people with a suitable economic status, and almost 60% of all edentulous areas have not been treated with protheses. The economic status of the patient is considered an important and effective factor in performing prosthetic treatment procedures (28). In addition to the high cost, the complex treatment method and having less knowledge about the implantation method can be seen as other reasons for the increase in edentulous areas (29, 30). Also, the fear of implant complications can be one of the reasons for the lower acceptance of this treatment method. Examples include complications related to surgery, complications related to cosmetic issues, mechanical complications, and biological complications. While surgical complications are mostly related to the complications during implant placement, cosmetic complications are related to the visible areas of the implant-based prothesis. Mechanical complications are related to the intolerance of the implant and its components against the applied forces. Biological complications include pathology of soft and hard tissues around the implant (31). Dentists can greatly reduce the incidence of these complications through clinical evaluation and radiographic imaging, along with other factors such as patient education, patient preparation, and risk assessment (32). The higher frequency of edentulous areas compared to fixed bridges and implants in the present study can also explain the fact that people's use, request, and acceptance of fixed protheses and implant treatments are low, which can be attributed to economic problems. Economic problems can be mentioned as the main reason for not treating edentulous areas. Since implant materials and devices are rarely produced in our country, the price of implants is expensive due to commercial imports and the dentist's salary. On the other hand, in Iran, implants have little insurance coverage. All these cases can be effective in terms of using implants and

switching to fixed protheses in Iran.

In our study, edentulous cases were more common in women than in men. Barbato et al. also reported a higher incidence of tooth loss among women (33). Following more edentulous cases in women, there were more bridges and implants in men. So that out of the 147 implant quadrants that existed, 92 areas were related to men and 55 areas were related to women, and 297 quadrants had fixed protheses, 134 of which were for men and 163 for women. A retrospective study by Manohar et al. also showed that men were more willing than women to implant in edentulous areas (34). Of course, the results of some studies contradicted our study and showed that women received more bridges and implants than men (clinical and radiographic evaluation of Maximus one-piece implants with immediate non-functional loading in the placement of upper lateral teeth and lower incisors) (35). Edentulousness is one of the most common dental problems that may arise as a result of dental and periodontal diseases and is faced by the majority of people (36). Since Edentulousness affects various aspects of life, including performance, appearance, interpersonal relationships, and even job opportunities among people (37), Men are less likely to have it because of their job positions and greater community presence.

In the current study, 0.01% of all the samples obtained were missing all the teeth, but if there is enough alveolar bone remaining, the treatment method of "implant-based prothesis" can be suggested. In this method, implants can be planted as a base for connected bridges. This is a suitable method for completely edentulous areas, the advantages of which can be the non-degeneration of the alveolar ridge, its high strength, its stability, and its permanence in the jaw, as well as the ease of chewing, which can replace the treatment method "normal (removable) prothesis."

In this study, most cases of fixed protheses and implants were reported in the upper jaw and most cases of edentulous areas in the lower jaw. The results of the study by Naert et al. (29) and Teofilo et al. (38) are also in line with this finding. According to their report, the patients who received prosthetic treatment were mainly people who had edentulous areas in the upper jaw. One of the reasons why the majority of bridges and implants are seen in the upper jaw and the majority of edentulous cases are seen in the lower jaw is the increased impact of tooth loss on beauty. When it comes to the anterior region, especially the anterior part of the upper jaw, esthetics is of great importance because it shapes

the patient's smile and creates self-confidence. Therefore, bridge and implant treatments are the most ideal treatment options for replacing a missing tooth in the anterior region of the upper jaw (34).

### Research Limitations

This study has several limitations. Since this was a retrospective study, the sample size was very small and limited to a specific geographic location. Many parameters, such as the cause of tooth loss, the reasons for treatment selection, knowledge about the patient's use of removable prostheses, and knowledge and attitude toward different prosthesis management, were not considered. For future studies, a cohort study with these parameters and larger geographical locations is required.

### Conclusion

Given the low frequency of treatments with fixed prostheses and implants and the existence of high statistics in Edentulous areas, it is expected that society will have a high need for treatment with one of these two methods. It is also necessary to inform the patients about all available treatments to restore the functional and aesthetic condition of the oral cavity, to improve their attitude toward prosthetic treatment, and, as a result, to increase their quality of life. In addition, presenting the results of this type of research to decision-making authorities in the field of treatment and insurance organizations can be effective in making major decisions in the field of oral and dental health, so that in the coming years, we will see fewer Edentulous cases and replace these areas with fixed prosthetics and implant treatments.

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