Effective Factors in Implant System Selection by Dentists in Kerman in 2018: A Cross-Sectional Study

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ABSTRACT

Background and Aim: Since different implant systems are available, dentists are confronted with the question of which criteria are essential for a proficient implant system selection. This study aimed to investigate the factors affecting implant system selection by dentists in Kerman.

Materials and Methods:A questionnaire inspecting the key factors in implant system selection was distributed among 120 dentists. Fisher's exact test was used to analyze the data.

Result: Most dentists used two implant systems at the office (52.5%). For the majority of dentists (40.8%), the first factor in choosing an implant system was the implant support services. The price of each implant (25.8%) and the satisfaction of previous cases (23.3%) were the second and third factors, respectively. For most dentists (59.2%), the least important reason for choosing an implant system was the manufacturing country. Recommendation from colleagues (24.2%) was of minor importance in implant system selection. Sixty-one (50.8%) dentists had a history of abandoning an implant system because of failure (59.0%) and lack of support from the importer (27.9%). The quality of the implant was the major cause of system selection for 68.8% of dentists and 75% of specialists (P<0.05).

Conclusion: The most important reason for choosing an implant system was post-sales services. The cost of each implant and the satisfaction of previous cases were other important factors. The least important factor was the system's manufacturer.

Keywords: Dentists, Dental Implants, Dental Implantation

Introduction:

Tooth loss is a very common problem that might occur due to trauma and disease. Therefore, the use of dental implants to replace missing teeth has a long history.[1-3] Since ancient times, humans have used dental implants to replace lost teeth. [2,4,5] The history of dental implants dates back to Ancient Greece when shells or shavings were placed into the human jawbone.[3,6,7]

Implant treatments aim to reconstruct the contour and improve the function, well-being, aesthetics, and phonetics of the patient. What makes implant dentistry unique to therapeutics is its ability to achieve these goals without causing bone atrophy.[4,8] The use of dental implants is a common method in treating edentulous and partially edentulous patients.[9]

Recently, implant treatment has become the most predictable replacement of lost teeth, which demonstrates a very high success rate.[6,10] Dental implants replace the missing teeth with minimal changes in other teeth and tissues in the mouth. [11,12] Implants with different designs, placed in bones of different qualities, have variable degrees of stability, depending on bone density and the diameter and length of the implant.[8,13] Achieving an acceptable result and best aesthetics in implant treatment depends on several factors, including the position of the three-dimensional (3D) implant, the quality of the tissue and mucosa, alignment of the implant with the surrounding tissues, and sufficient bone volume in the buccal area.[9]

The success of dental implants depends on the initial and long-term stability, integrity, design, gender, size, dimensions, implantation method, soft tissue complications, as well as mechanical properties, including abutment design and technique of using the screw.[10,14,15] In addition, the long-term success of implants depends on biocompatibility and mechanical compatibility. The manufacturers have resolved the biocompatibility problem with the optimal use of materials and manufacturing techniques. Mechanical adaptation is heavily dependent on the treatment plan. [11,16] The selection of implant type depends on factors such as jaw space, the remaining prosthetic space, emergence profile, bone volume, and occlusal pattern.[9,17]

The survival of an implant depends on several factors and varies from one patient to another. [12,18] The variables identified as the risk factors for implant failure include demographic variables (gender and age at implant placement), health status variables (smoking, history of periodontal disease and root canal therapy), anatomical variables (implant position, bone quality, implant's proximity to other teeth and implants, and the number of implants per patient), and variables specific to implants (short length, small diameter, and type of implant covering). Other variables include lack of keratinized gingiva, poor oral and dental health, plaque, and parafunction habits. [13,14,19]

Another factor contributing to implant success is the collaboration between surgeons and prosthodontists as every uncertainty in patient selection, diagnosis, and treatment design results in implant failure.[15,20]

Several studies have stated the success rate of a 20-year implant to be 92% to 98%. (16,17,21) By 2003, more than 200 brands and implant systems were introduced to the dental market by 80 manufacturers.[18,22]

Since different implant systems are available, dentists are confronted with the issue of choosing one system for treatment. Although there are some primary requirements for the clinical use of implant systems, ultimately, the dentist chooses the implant system for treatment.[19,23] Due to the lack of consensus and the lack of documents related to the best implant system, dentists are confronted with the question of which criteria to use to select an implant system.[20,24,25] Dentists choose an implant system according to various factors, such as the scientific evidence available, the cost-effectiveness, cost of each implant, post-sales services, the brand, recommendation by colleagues, the manufacturing country, dentist's previous experiences, the complexity of the surgical and prosthetic stages, the Food and Drug Administration (FDA) and CE standards, the quality, and surface properties of the implant. [19,26]

Considering the information gap related to the priority of dentists for implant system selection in Iran, this study aimed to investigate the factors affecting implant system selection by dentists in the city of Kerman in 2018.

Materials and Methods
Materials and Methods
The present analytical cross-sectional study involved dentists working with dental implants in the city of Kerman in 2018.
Data collection:
The method of collecting data was field-based; therefore, the information was collected by interviewing and the completion of the questionnaire by 120 dentists from Kerman city, who were involved with implantation.

Dentists working in the field of implants, who were willing to participate, were included in the study while dentists who refused to cooperate and complete the questionnaire were excluded along with incomplete questionnaires.

Questionnaire preparation:

The questions were designed after identifying the research objectives. The questionnaire included demographic variables (age and gender) and questions about determining the criteria for the selection of implant systems. The answers were evaluated based on the prioritization. In this questionnaire, 10 criteria for the selection of implant systems were mentioned. The dentists were asked to specify their criteria in order of priority.[27-29] Both Likert and Guttman scales were used to prepare the questionnaire and to choose the questions.[27-29] The purpose of the research was explained to the dentists, and informed consent was obtained for participation in the study. Then, the questionnaires were distributed among the dentists. After the completion of the questionnaires, the answers were evaluated according to the order of criteria selection and priorities.

Content Validity:

The most important factor to be taken into consideration in the evaluation of a test is its validity. The first step in determining the validity of a test is to examine its content validity. Content validity depends on the logical analysis of the content of a test and its determination based on individual and mental judgments. Content validity is of two types: formal and logical validity. (30,31) To test the content validity of a test, two methods are used: content validity ratio (CVR) and content validity index (CVI).

The minimum acceptable value for the CVI is 0.79. If the CVI is less than 0.79, the item should be deleted. In this study, the CVI was used to determine content validity.

Reliability:

Reliability is one of the technical features of a measurement tool. The concept is concerned with how much the measurements under the same conditions give the same results. The range of trust is from zero (no relation) to +1 (full relation). If research is not reliable, it is difficult to interpret the results with certainty or generalize them to other conditions.

There are several methods to determine reliability. In this study, Cronbach's alpha coefficient, which is one of the methods of internal consistency, was used to determine the reliability of the questionnaire.[32] To this end, using the data obtained from the questionnaire and SPSS 19 software (SPSS Inc., Chicago, IL, USA), the confidence coefficient was calculated using Cronbach's alpha according to the following formula:

Ra: Coefficient of validity

J: Number of questionnaires or tests

: The variance of the J test

: Total test variance

The coefficients of reliability for the questionnaire of effective factors in selecting implant systems were calculated and were all higher than 0.7, which indicated the accuracy of the measurements used in this study.

Statistical analysis:

SPSS software (version 22; SPSS Inc., Chicago, IL, USA) was used to analyze the data. To evaluate the distribution of the obtained grades, Kolmogorov-Smirnov method was utilized. Fisher's exact test was used to analyze the data.[33] The significance level was set at 0.05.

Results

The analysis was carried out at two descriptive and inferential levels. At the descriptive level, the mean and standard deviation (SD) and frequency distribution tables were used, and at the inferential level, Fisher's exact test was used to compare the opinions of dentists based on gender, work experience, and specialty. The tests were performed at a 5% error level using SPSS version 22.

The average duration of implant treatment performed by dentists was 4.5±2.6 years. 26.6% of the participants were specialists, and 73.3% were general dentists. Two implant systems were the most frequent in the office (52.5%).

For the majority of dentists (40.8%), the priority for selecting an implant system was the post-sales services of the company. On the other hand, for the majority of dentists (59.2%), the least important reason for choosing an implant system was the manufacturing country. The most important criterion in choosing a brand for most clinicians (52.5%) was the presence of official representation and post-sales services in the country. 50.8% of dentists had a history of abandoning an implant system. The main reason (59.0%) was the lack of support from the importing company, and poor service was the second cause (27.9%). Fisher's exact test did not show any significant difference between male and female dentists for the priority and the least important reason for choosing an implant system (P>0.05). The most important criterion for choosing an implant brand for 52.6% of male dentists and 52.3% of female dentists was the presence of official representation and post-sales services for implants. Fisher's exact test did not show any significant difference between male and female dentists (P>0.05; Table1).

The most important reason for choosing an implant system for 42.2% of dentists with less than 5 years of experience and 36.7% of dentists with more than 5 years of experience was post-sales services and support from the companies. Fisher's exact test did not show any significant difference between these two groups in terms of the priority in the choice of an implant system (P>0.05). According to 62.2% of dentists with less than 5 years of experience and 50% of dentists with more than 5 years of experience, the least important factor in choosing an implant system was the manufacturing country. Fisher's exact test showed no significant difference in the least important reason for selecting an implant system between the two groups (P>0.05). According to Fisher's exact test, there was no significant difference between dentists with less than 5 years and more than 5 years of experience (P>0.05; Table 2).

The most important reason for choosing an implant system for 46.9% of general dentists and 38.6% of specialists was post-sales services and support of the companies. Fisher's exact test did not show any significant difference between general dentists and specialists for the priority in choosing an implant system (P>0.05). The least important factor in choosing an implant system based on the opinion of 62.5% of general dentists and 58% of specialists was the manufacturer. Fisher's exact test did not show any significant difference in the selection of an implant system between the opinions of general dentists and specialists (P>0.05). The most important criterion for selecting an implant brand for 43.8% of general dentists and 55.7% of specialists was the presence of official representation and post-sales services. Fisher's exact test did not show any significant difference between general dentists and specialists for choosing a brand (P>0.05). The implant quality was important for 68.8% of general dentists and 75% of specialists. The result of Fisher's exact test showed a significant difference between general dentists and specialists in this respect (P<0.05). Accordingly, the importance of accepting the cost of the implant treatment by patients was significantly higher for general dentists than for specialists. The importance of ease of the procedure was significantly higher for specialists (Table 3).

According to Fisher's exact test, there was no significant difference between male and female dentists in any of the factors related to the selection of implant systems (P>0.05; Table 4).

There was a significant difference in the effect of implant design on the choice of an implant system between dentists with experience less and more than 5 years (P<0.05), which indicates that the effect of implant design on choosing an implant system was significantly higher on dentists with more than 5 years of experience. Fisher's exact test did not show any significant difference between dentists with less and more than 5 years of experience (P>0.05; Table 5). There was a significant difference between specialists and general dentists in choosing an implant system (P<0.05). The effect of factors related to choosing an implant system was significantly higher on specialists. In other cases, there was no significant difference in the selection of an implant system by clinicians. According to Fisher's exact test, there was no significant difference between specialists and general dentists in this respect (P>0.05; Table 6).

Table 1. Comparison of the reasons and criteria for choosing an implant system based on the gender of the dentist

Variable	Group	Male		Female		P-value
		Number	%	Number	%	
The most important reason for choosing an implant system	Cost of each implant	18	23.7	13	29.5	.844
	Post-sales service	30	39.5	19	43.2	
	Brand	3	3.9	1	2.3	
	Recommendation by colleagues	5	6.6	1	2.3	
	Manufacturing country	1	1.3	1	2.3	
	Satisfaction of previous patients	19	25.0	9	20.5	
The most insignificant reason for choosing an implant system	Cost of each implant	5	6.6	2	4.5	.428
	Post-sales service	2	2.6	1	2.3	
	Brand	6	7.9	1	2.3	
	Recommendation by colleagues	15	19.7	14	31.8	
	Manufacturing country	47	61.8	24	54.5	
	Satisfaction of previous patients	1	1.3	2	4.5	
An important criterion in choosing a brand	Implant manufacturer	6	7.9	1	2.3	.684
	Existence of official representation and post-sales service	40	52.6	23	52.3	
	Having FDA and CE standard	16	21.1	11	25.0	
	The success or failure of different implant brands	14	18.4	9	20.5	
	Ease of work for the clinician	10	13.2	7	15.9	.895
	Patient's awareness and right to choose an implant	0	0.0	0	0.0	
	Acceptance of the cost of the implant by the patient	6	7.9	4	9.1	
	Implant quality	56	73.7	32	72.7	
	Ability to achieve the goals without causing bone atrophy	4	5.3	1	2.3	
Total		76	100.0	44	100.0	

FDA=Food and Drug Administration

Table 2. Comparison of the reasons and criteria for selecting an implant system based on the experience of the dentist

Variable	Group	<5 years		>5 years		P-value
		Number	%	Number	%	
The most important reason for choosing an implant system	Cost of each implant	23	25.6	8	26.7	.915
	Post-sales service	38	42.2	11	36.7	
	Implant brand	3	3.3	1	3.3	
	Recommendation by colleagues	5	5.6	1	3.3	
	Manufacturing country	1	1.1	1	3.3	
	Satisfaction of previous patients	20	22.2	8	26.7	
The most insignificant reason for choosing an implant system	Cost of each implant	5	5.6	2	6.7	.463
	Post-sales service	3	3.3	2	6.7	
	Implant brand	5	5.6	11	36.7	
	Recommendation by colleagues	18	20.0	0	0.0	
	Manufacturing country	56	62.2	15	50.0	
	Satisfaction of previous patients	3	3.3	0	0.0	
An important criterion in choosing a brand	Implant manufacturer	5	5.6	2	6.7	.091
	Existence of official representation and post-sales service	52	57.8	11	36.7	
	Having FDA and CE standard	20	22.2	7	23.3	
	The success or failure of different implant brands	13	14.4	10	33.3	
	Ease of work for the dentist	11	12.2	6	20.0	.356
	Patient's awareness and right to choose the implant	0	0.0	0	0.0	
	Acceptance of cost of the implant by the patient	9	10.0	1	3.3	
	Implant quality	65	72.2	23	76.7	
	Ability to achieve the goals without causing bone atrophy	5	5.6	0	0.0	
Total		90	100.0	30	100.0	

FDA=Food and Drug Administration

Table 3. Comparison of the reasons and criteria for choosing an implant system based on the dentist's specialty

Variable	Group	General dentist		Specialist		P-value
		Number	%	Number	%	
The most important reason for choosing an implant system	Cost of each implant	6	18.8	25	28.4	.620
	Post-sales service	15	46.9	34	38.6	
	Implant brand	1	3.1	3	3.4	
	Recommendation by colleagues	3	9.4	3	3.4	
	Manufacturing country	0	0.0	2	2.3	
	Satisfaction of previous patients	7	21.9	21	23.9	
The most insignificant reason for choosing an implant system	Cost of each implant	2	6.3	5	5.7	.946
	Post-sales service	1	3.1	2	2.3	
	Implant brand	2	6.3	5	5.7	
	Recommendation by colleagues	6	18.8	23	26.1	
	Manufacturing country	20	62.5	51	58.0	
	Satisfaction of previous patients	1	3.1	2	2.3	
An important criterion in choosing a brand	Implant manufacturer	1	3.1	6	6.8	.098
	Existence of official representation and post-sales service	14	43.8	49	55.7	
	Having FDA and CE standard	6	18.8	21	23.9	
	The success or failure of different implant brands	11	34.4	12	13.6	
	Ease of work for the dentist	1	3.1	16	18.2	.003
	Patient's awareness and right to choose the implant	0	0.0	0	0.0	
	Acceptance of the cost of the implant by the patient	7	21.9	3	3.4	
	Implant quality	22	68.8	66	75.0	
	Ability to achieve the goals without causing bone atrophy	2	6.3	3	3.4	
Total		90	100.0	30	100.0	

FDA=Food and Drug Administration

Table 4. Comparison of various factors affecting the choice of an implant system based on the gender of the clinician

	Gender	Yes		No		No difference		No idea		P-value
		Number	%	Number	%	Number	%	Number	%	
Single-stage or two-stage	M	36	47.4	30	39.5	7	9.2	3	3.9	.529
	F	23	52.3	19	43.2	2	4.5	0	0.0	
Implant design	M	26	34.2	43	56.6	4	5.3	2	2.6	.125
	F	7	15.9	32	72.7	4	9.1	1	2.3	
Implant surface	M	63	82.9	9	11.8	1	1.3	2	2.6	.871
	F	38	86.4	6	13.6	0	0.0	0	0.0	
Patient gender and age	M	14	18.4	57	75.0	3	3.9	2	2.6	.791
	F	10	22.7	32	72.7	2	4.5	0	0.0	
Systemic disease	M	26	34.2	46	60.5	3	3.9	1	1.3	.518
	F	10	22.7	32	72.7	1	2.3	1	2.3	
Parafunctional habit	M	24	31.6	44	57.9	3	3.9	3	3.9	.892
	F	14	31.8	26	59.1	3	6.8	1	2.3	
Smoking	M	36	47.4	34	44.7	4	5.3	2	2.6	.486
	F	16	36.4	25	56.8	2	4.5	0	0.0	
Tooth type	M	25	32.9	40	52.6	11	14.5	0	0.0	.363
	F	13	29.5	28	63.6	3	6.8	0	0.0	
Type of edentulism	M	32	42.1	39	51.3	5	6.6	0	0.0	.706
	F	16	36.4	26	59.1	2	4.5	0	0.0	
Bone density in the edentulous area	M	63	82.9	12	15.8	1	1.3	0	0.0	1.00
	F	36	81.8	7	15.9	1	2.3	0	0.0	
Implant area	M	28	36.8	41	53.9	6	7.9	1	1.3	.425
	F	11	25.0	30	68.2	2	4.5	1	2.3	
Prosthesis space	M	46	60.5	26	34.2	4	5.3	0	0.0	.453
	F	30	68.2	11	25.0	2	4.5	1	2.3	
Emergence profile	M	13	17.1	53	69.7	6	7.9	4	5.3	.610
	F	10	22.7	31	70.5	1	2.3	2	4.5	
Bone quality	M	69	90.8	5	6.6	1	1.3	1	1.3	.265
	F	36	81.8	7	15.9	1	2.3	0	0.0	
Bone volume	M	61	80.3	13	17.1	1	1.3	1	1.3	.246
	F	29	65.9	12	27.3	2	4.5	1	2.3	
Bone pattern	M	56	73.7	18	23.7	2	2.6	0	0.0	.705
	F	30	68.2	12	27.3	2	4.5	0	0.0	
Occlusal pattern	M	19	25.0	50	65.8	1	1.3	6	7.9	.598
	F	7	15.9	33	75.0	1	2.3	3	6.8	

M=Male, F=Female

Table 5. Comparison of different factors affecting the choice of an implant system based on the work experience of the dentist

	Experience (years)	Yes		No		No difference		No idea		P-value
		Number	%	Number	%	Number	%	Number	%	
Single-stage or two-stage	≤ 5	45	50.0	35	38.9	7	7.8	3	3.3	.890
	>5	14	46.7	14	46.7	2	6.7	0	0.0	
Implant design	≤ 5	19	21.1	62	68.9	5	5.6	3	3.3	.023
	>5	14	46.7	13	43.3	3	10.0	0	0.0	
Implant surface	≤ 5	74	82.2	12	13.3	1	1.1	2	2.2	.899
	>5	27	90.0	3	10.0	0	0.0	0	0.0	
Patient gender and age	≤ 5	18	20.0	69	76.7	2	2.2	1	1.1	.180
	>5	6	20.0	20	66.7	3	10.0	1	3.3	
Systemic disease	≤ 5	24	26.7	62	68.9	2	2.2	2	2.2	.209
	>5	12	40.0	16	53.3	2	6.7	0	0.0	
Parafunctional habit	≤ 5	28	31.1	53	58.9	4	4.4	4	4.4	.756
	>5	10	33.3	17	56.7	2	6.7	0	0.0	
Smoking	≤ 5	40	44.4	42	46.7	5	5.6	2	2.2	.848
	>5	12	40.0	17	56.7	1	3.3	0	0.0	
Tooth type	≤ 5	32	35.6	48	53.3	10	11.1	0	0.0	.329
	>5	6	20.0	20	66.7	4	13.3	0	0.0	
Type of edentulism	≤ 5	34	37.8	51	56.7	5	5.6	0	0.0	.609
	>5	14	46.7	14	46.7	2	6.7	0	0.0	
Bone density in the edentulous area	≤ 5	76	84.4	13	14.4	1	1.1	0	0.0	.414
	>5	23	76.7	6	20.0	1	3.3	0	0.0	
Implant area	≤ 5	27	30.0	56	62.2	5	5.6	2	2.2	.455
	>5	12	40.0	15	50.0	3	10.0	0	0.0	
Prosthesis space	≤ 5	58	64.4	27	30.0	4	4.4	1	1.1	.823
	>5	18	60.0	10	33.3	2	6.7	0	0.0	
Emergence profile	≤ 5	18	20.0	65	72.2	3	3.3	4	4.4	.201
	>5	5	16.7	19	63.3	4	13.3	2	6.7	
Bone quality	≤ 5	79	87.8	9	10.0	1	1.1	1	1.1	.704
	>5	26	86.7	3	10.0	1	3.3	0	0.0	
Bone volume	≤ 5	69	76.2	18	20.0	1	1.1	2	2.2	.292
	>5	21	70.0	7	23.3	2	6.7	0	0.0	
Bone pattern	≤ 5	66	73.3	22	24.4	2	2.2	0	0.0	.383
	>5	20	66.7	8	26.7	2	6.7	0	0.0	
Occlusal pattern	≤ 5	19	21.1	63	70.0	0	0.0	8	8.9	.121
	>5	7	23.3	20	66.7	2	6.7	1	3.3	

Table 6. Comparison of different factors influencing the choice of an implant system based on the dentist's specialty

	Specialty	Yes		No		No difference		No idea		P-value
		Number	%	Number	%	Number	%	Number	%	
Single-stage or	Specialist	9	28.1	19	59.4	4	12.5	0	0.0	.013
two-stage	General dentist	50	56.8	30	34.1	5	5.7	3	3.4	
Implant design	Specialist	16	50.0	11	34.4	3	9.4	2	6.3	<.001
	General dentist	17	19.3	64	72.7	5	5.7	1	1.1	
Implant surface	Specialist	27	84.4	4	12.5	0	0.0	1	3.1	.749
	General dentist	74	84.1	11	12.5	1	1.1	1	1.1	
Patient gender and	Specialist	7	21.9	22	68.8	3	9.4	0	0.0	.297
age	General dentist	17	19.3	67	76.1	2	2.3	2	2.3	
Systemic disease	Specialist	13	40.6	16	50.0	1	3.1	2	6.3	.033
	General dentist	23	26.1	62	70.5	3	3.4	0	0.0	
Parafunctional	Specialist	13	40.6	13	40.6	1	3.1	4	12.5	.003
habit	General dentist	25	28.4	57	64.8	5	5.7	0	0.0	
Smoking	Specialist	12	37.5	16	50.0	1	3.1	2	6.3	.267
	General dentist	40	45.5	43	48.9	5	5.7	0	0.0	
Tooth type	Specialist	16	50.0	11	34.4	5	15.6	0	0.0	.008
	General dentist	22	25.0	57	64.8	9	10.2	0	0.0	
Type of	Specialist	20	62.5	7	21.9	5	15.6	0	0.0	<.001
edentulism	General dentist	28	31.8	58	65.9	2	2.3	0	0.0	
Bone density in	Specialist	27	84.4	5	15.6	0	0.0	0	0.0	1.000
the edentulous	General dentist	72	81.8	14	15.9	2	2.3	0	0.0	
area										
Implant area	Specialist	16	50.0	10	31.3	4	12.5	2	6.3	<.001
	General dentist	23	26.1	61	69.3	4	4.5	0	0.0	
Prosthesis space	Specialist	23	71.9	6	18.8	2	6.3	1	3.1	.103
	General dentist	53	60.2	31	35.2	4	4.5	0	0.0	
Emergence profile	Specialist	9	28.1	17	53.1	5	15.6	1	3.1	.011
	General dentist	14	15.9	67	76.1	2	2.3	5	5.7	
Bone quality	Specialist	27	84.4	4	12.5	1	3.1	0	0.0	.650
	General dentist	78	88.6	8	9.1	1	1.1	1	1.1	
Bone volume	Specialist	21	65.5	8	25.0	2	6.3	1	3.1	.203
	General dentist	69	78.4	17	19.3	1	1.1	1	1.1	
Bone pattern	Specialist	19	59.4	11	34.4	2	6.3	0	0.0	.145
	General dentist	67	76.1	19	21.6	2	2.3	0	0.0	
Occlusal pattern	Specialist	9	28.1	14	43.8	2	6.3	7	21.9	<.001
	General dentist	17	19.3	69	78.4	0	0.0	2	2.3	

Discussion:

Today, there are about 1300 different implant systems with different shapes, dimensions, materials, designs, surface topography, surface chemistry, and the ability to moist and modify surface features.[34,35] In recent years, the number of implant manufacturers has increased, and dentists have a variety of implant systems to choose from.[19,36] This study aimed to investigate the effective factors in selecting an implant system among clinicians in Kerman city. One of the main advantages of this study was the ability to determine the criteria for selecting dental implants among dentists in Iran.

In terms of the number of implant systems present in the office, the highest frequency was observed for dentists who had two implant systems in their offices (52.5%). This may be related to the following factors; first, different companies produce implants with different characteristics that may be suitable for one case and not suitable for the other. Second, some dentists prefer using multiple implant systems to protect themselves from problems in the future that may arise due to the use of just one implant system. Also, clinicians might prefer to use more than one implant system because of market fluctuations and problems related to implant import. In a study by Al-Wahadni et al, the majority of dentists utilized two or more implant systems.[19]

For the majority of dentists (40.8%), the priority for choosing an implant system was post-sales services and support of the company. It seems that the availability of implant systems in Iran is very important to clinicians and dentists. The cost of each implant and the satisfaction of previous patients were the next major reasons, which suggest that implant systems should also be tested clinically. On the other hand, few implant system companies refer to scientific research in support of their implant systems

or provide brochures containing such information on their websites. Only a few of these websites give customers an idea of which product or company complies with international standards.[19,37]

The most important criterion in choosing a brand in the opinion of most dentists (52.5%) was the presence of official representation and post-sales services in the country. Therefore, the dentist must be sure of the implant manufacturer's support in the country. The implant quality was reported as an important factor for 73.3% of dentists.

In the present study, for the majority of dentists (59.2%), the least important reason for choosing an implant system was the manufacturing country. Recommendation from colleagues (24.2%) was of minor importance in the choice of an implant system. Contrary to our study, Hagiwara and Carr, in Japan, stated that dentists often choose an implant system because of its simplicity or their colleagues' suggestions.[25] This difference can be due to the difference in the type of assessment or to the lack of sufficient scientific evidence regarding different types of implant systems.

The success of dental implants is multifactorial and depends on several factors, such as the quality and quantity of bone, surgical and prosthetic techniques and construction, and the applied load.[24,38]

Early failure of the implant due to inadequate osseointegration occurs in 1-2% of patients in the first few months. Secondary failure of the implant happens several years after successful osseointegration in about 5% of patients and is usually due to peri-implantitis.[34] The primary index for the success of dental implants is osseointegration or direct bone-implant contact, which is the direct attachment between the bone tissue and the titanium implant surface. Successful osseointegration is an indication of favorable bone response to the insertion of a dental implant.[39] However, the long-term success-

ful osseointegration of dental implants in the jawbones is due to the precision of the biomechanics of implants and their superstructure. Implant surface topography and surface roughness, bone-implant interface, implant design, implant length and diameter, geometric features of the edentulous site, and supporting properties of bone have been reported as important factors in the load transfer mechanism and bone-implant response.[24]

Clinicians have reported some effective factors in the selection of an implant system, including single-stage implant system (49.2%), different implant surfaces (covered, textured, machined, and flat; 85.0%), bone density in the edentulous area (82.5%), bone quality (63.3%), residual bone volume (75.0%), and bone pattern (71.1%). Unlike the present study, Al-Wahadni et al demonstrated that the most important criterion for choosing an implant system is the implant-abutment connection, and the other noticed criterion is the available evidence and documentation related to each implant system's efficacy (82.8%).[19]

Therefore, it seems that the scientific groups and implant manufacturers are very influential in implant dentistry; this is a worldwide phenomenon. The results of this survey showed that there are different opinions about the selection of implant systems. Dentists often face different options based on non-scientific information or lack of accurate data.

Conclusion:
The results of this study showed that for the majority of dentists, the priority for choosing an implant system was post-sales services and support of the company, which shows that successful companies are the ones that provide better post-sales services. The cost of each implant and the satisfaction of previous patients were the next major reasons.

Also, for the majority of dentists, the most important reason for choosing an implant system was the system's manufacturer. Further studies with a larger sample size as well as comparative studies on the factors affecting the choice of implant system between maxillofacial surgeons and periodontitis are required to achieve the best outcomes.

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