

## The Effects of Dental Implant Patients' Treatment Satisfaction on Oral Health-related Quality of Life (OHIP-14)

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### ABSTRACT

This study was conducted to identify the factors influencing the treatment satisfaction and oral health-related quality of life among dental implant patients. A survey, using a self-administered questionnaire based on the Oral Health Impact Profile-14 (OHIP-14), was conducted to gather data from adult patients aged 20 years or older who underwent dental implant treatment at various dental hospitals and clinics in Seoul and Gyeonggi-do. The results from analyzing 146 questionnaires collected are as follows.

Oral health-related quality of life among participants ( $p < 0.05$ ) was found to be increasing with age in terms of general characteristics. Additionally, married individuals demonstrated higher levels of oral health-related quality of life compared to unmarried individuals ( $p < 0.05$ ). Also, a positive correlation was observed between the number of implants and both treatment satisfaction and OHIP-14 scores. Furthermore, participants who received regular checkups reported higher OHIP-14 scores compared to their counterparts. Moreover, participants who pay more attention to pain, complications, and side effects from the procedure expressed lower satisfaction with implant treatment compared to those who put more weight on cost and daily activities ( $p < 0.01$ ). In fact, the study revealed that satisfaction with implant treatment significantly impacted oral health-related quality of life, in the order of cost satisfaction ( $p < 0.001$ ), aesthetic satisfaction ( $p < 0.001$ ), and functional satisfaction ( $p < 0.05$ ). These findings underscore the importance of enhancing patient satisfaction with treatment to improve the quality of life related to oral health. Consequently, the study emphasizes the necessity of providing accurate education and improving awareness to uphold and enhance patient satisfaction with their dental treatments.

## 1. Introduction

Recent economic growth and advancements in medicine have contributed to an improved standard of living and increased life expectancy, resulting in higher expectations regarding health and quality

of life. Teeth play a crucial role in various complex functions such as mastication, aesthetics, and speech; therefore, even losing a single tooth can significantly impact one's quality of life (Chung et al., 2011). Tooth loss can be attributed to various factors, including dental caries, periodontal disease, trauma, and congenital reasons. It not only diminishes the ability to chew effectively but also limits the variety of foods that can be consumed, consequently reducing the overall quality of meals. This, in turn, can lead to nutritional issues, making it even more challenging to maintain good health (Chung et al., 2011). Consequently, tooth loss can cause discomfort in daily activities, deprive individuals of the pleasure derived from eating, and directly influence their quality of life. Additionally, tooth loss affects speech and aesthetics, limiting social activities that rely on smooth interpersonal communication, potentially leading to feelings of social exclusion and isolation (Kim, 2017). Therefore, prosthetic treatments such as fixed or removable dentures, bridges, and implants can be considered as ways to enhance oral health by overcoming the obstacles caused by tooth loss. However, among the aforementioned prosthetic treatments, bridges, which involve removing adjacent healthy teeth to create artificial teeth, can lead to the removal of healthy dental tissues, ultimately increasing the risk of root canal treatment for those teeth and reducing oral hygiene effectiveness due to food accumulation around the restoration, and potentially causing dental caries and periodontal disease in the surrounding teeth. Furthermore, another prosthetic treatment, removable dentures, exhibits the lowest patient satisfaction owing to diminished masticatory efficiency, significant bone resorption, and psychological discontent (Yoo, 2006).

In recent years, dental implants have emerged as the most successful and satisfying treatment technique. This method involves placing a fixture to support the restoration of a missing tooth. Dental implants not only provide a solution to the challenges posed by tooth loss but also offer advantages such as an extended lifespan compared to conventional prosthetic treatments, superior masticatory function, and aesthetically pleasing results that closely resemble natural teeth. As a result, dental implants have become widely practiced as a preferred alternative to traditional prosthetic treatments (Choi et al., 2022).

In fact, because of their ability to replace lost tooth without causing harm to adjacent teeth and their capacity to function similarly to natural teeth, the preference for dental implants is increasing among patients (Chung et al., 2011).

Furthermore, the demand for dental implants in Korea has been steadily rising, driven by the rapid aging of the population and the recent expansion of insurance benefits. A study conducted by Kim et al. (2009) analyzed the impact of implant surgery on the quality of life and showed significantly improved satisfaction levels - the procedure was highly regarded as beneficial for enhancing the quality of life among individuals with missing teeth, with reports indicating improvements in chewing ability and high masticatory ability scores contributing to the overall enhancement of their quality of life.

The Oral Health Impact Profile (OHIP-49), created by Locker in 1988, serves as a significant tool for assessing the quality of life related to oral health. This survey-based tool comprises 49 items that evaluate perceptions related to oral health-related quality of life and measures the social impact of oral diseases. Later, Slade (1994) developed the Oral Health Impact Profile (OHIP-14), which encompasses seven domains reflecting functional limitations, physical discomfort, psychological

discomfort, physical disability, psychological disability, social disability, and handicap. OHIP-14 is a well-established and valid instrument for assessing the impact of oral health on individuals' quality of life. At present, the Oral Health Impact Index (OHIP-14) stands as the most extensively utilized measure for assessing oral health-related quality of life and is widely recognized as the most excellent measurement tool (Strassburger et al., 2004).

Domestic demand for dental implants has been on the rise. However, the majority of existing research has primarily centered on comparing satisfaction levels of various functions before and after implant treatments, based on general characteristics – there remains a scarcity of studies that analyze the factors associated with implant treatment satisfaction and its impact on the quality of life of dental implant patients. Hence, this study was undertaken to enhance the quality of life for implant patients by identifying the characteristics of implant treatment among adults who underwent the procedure and understanding the correlation between satisfaction with implant treatment and oral health-related quality of life.

## **2. Methods**

### *2.1 Participants*

The study was carried out between July 4th and July 29th, 2022, focusing on adults aged 20 years and above who had received dental implant treatments at dental clinics and hospitals in Seoul and Gyeonggi area. Convenience sampling was used to select participants. After explaining the study's purpose and methodology and obtaining informed consent, a survey was conducted. Initially, 160 participants were surveyed, but 14 individuals were excluded due to incomplete or unsuitable responses, resulting in a final analysis of 146 participants.

### *2.2 Research tools*

The research tool used in this study consisted of 6 questions about general characteristics, 6 questions about implant procedure characteristics, 12 questions about treatment satisfaction with implants, and 14 questions about quality of life related to oral health. For assessing implant treatment satisfaction, the tool used by Kang (2020) was adapted and supplemented. Similarly, satisfaction factors were constructed of 12 questions of functional satisfaction (3 questions), aesthetic satisfaction (3 questions), cost satisfaction (questions), and maintenance satisfaction (3 questions). The score for each factor was measured as '1 = Highly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Highly Agree' using a 5-point Likert scale, with higher scores meaning higher levels of satisfaction.

Oral health-related quality of life was measured using OHIP-14 (Slade, 1994; Kang, 2020). OHIP-14 consists of 14 items in 7 areas, including 2 functional limitation items, 2 physical pain items, 2 mental discomfort items, 2 physical capacity reduction items, 2 mental capacity reduction items, 2 social capacity reduction items, and 2 social disadvantage items. The score for each item was measured as '1 = Highly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Highly Agree'

using a 5-point Likert scale, with higher scores meaning higher levels of quality of life related to oral health. The Cronbach's  $\alpha$  coefficients for treatment satisfaction and OHIP-14 were found to be 0.889 and 0.902, respectively, demonstrating a significant level of measurement reliability.

### 2.3 Statistical analysis

The collected data was subjected to statistical analysis using the SPSS 21.0 program (IBM SPSS Statistics, New York, USA), with a significance level of  $\alpha = 0.05$ . To gain insight into the general characteristics of the study subjects, frequency and percentage calculations were also performed. To explore potential differences between satisfaction levels of implant patients and OHIP-14 scores concerning implant characteristics, independent sample T-tests and one-way ANOVA were employed. Additionally, Scheffe's post hoc test was used for the statistically significant groups.

In order to examine the relationship between treatment satisfaction and OHIP-14 scores in implant patients, Pearson's correlation analysis was conducted. Moreover, multiple regression analysis was performed to identify the factors influencing OHIP-14 scores in implant patients.

## 3. Results

### 3.1 Participants' satisfaction with implant treatment and quality of life related to oral health (OHIP-14)

The overall average of implant treatment satisfaction was  $3.44 \pm 0.71$  points, with maintenance satisfaction being the highest at  $3.68 \pm 1.09$  points, followed by cost satisfaction at  $3.53 \pm 0.95$  points, functional satisfaction at  $3.49 \pm 0.85$  points, and aesthetic satisfaction at  $3.08 \pm 0.67$  points. The mean score for OHIP-14 was  $3.27 \pm 0.86$  (Table 1).

**Table 1.** Research subjects' satisfaction with implant treatment and OHIP-14

Variables	Mean	Standard Deviation
Satisfaction with implant treatment	3.44	0.71
Functional satisfaction	3.49	0.85
Aesthetic satisfaction	3.08	0.67
Cost satisfaction	3.53	0.98
Maintenance satisfaction	3.68	1.09
OHIP-14	3.27	0.86

### 3.2 Satisfaction with implant treatment and quality of life related to oral health according to general characteristics (OHIP-14)

Treatment satisfaction and oral health-related quality of life (OHIP-14) according to the general

characteristics of the study subjects are shown in Table 2. In relation to OHIP-14 scores, it was found that those aged 49 or younger scored an average of  $2.99 \pm 0.93$  points, individuals aged 50 to 59 scored an average of  $3.34 \pm 0.73$  points, and those aged 60 or older scored an average of  $3.48 \pm 0.93$  points ( $p < 0.05$ ). As for marital status, married individuals obtained a higher score of  $3.38 \pm 0.84$  points, compared to unmarried individuals who scored  $2.83 \pm 0.80$  points ( $p < 0.05$ ). However, no statistically significant difference was found in treatment satisfaction between the groups (Table 2).

**Table 2.** Satisfaction with implant treatment and OHIP-14 according to general characteristics

Characteristics	Item	N(%)	Treatment satisfaction			OHIP-14		
			Mean±SD	t/F	p*	Mean±SD	t/F	p*
Gender	Male	61(41.8)	3.50±0.74	0.870	0.386	3.34±0.85	0.822	0.412
	Female	85(58.2)	3.40±0.68			3.21±0.87		
Age(year)	≤ 49	45(30.8)	3.41±0.70	0.097	0.907	2.99±0.93 <sup>a</sup>	3.770	0.025
	50-59	64(43.8)	3.47±0.73			3.34±0.73 <sup>ab</sup>		
	≥ 60	37(25.3)	3.43±0.69			3.48±0.93 <sup>b</sup>		
Education level	≤ High school	86(58.9)	3.44±0.66	0.148	0.882	3.27±0.86	0.48	0.962
	≥ College	60(41.1)	3.46±0.78			3.27±0.87		
Marital Status	Unmarried	24(19.9)	3.27±0.61	-1.409	0.161	2.83±0.80	-2.882	0.005
	Married	117(80.1)	3.50±0.73			3.38±0.84		
Monthly Income	≤ 200	48(32.9)	3.52±0.63	1.721	0.284	3.30±0.87	0.970	0.382
	201-300	35(24.0)	3.53±0.86			3.41±0.99		
	≥ 301	63(43.2)	3.34±0.66			3.16±0.77		
Vocation	Office Worker	46(31.5)	3.47±0.77	0.084	0.969	3.32±0.87	0.693	0.558
	Business owners	30(20.5)	3.45±0.67			3.20±0.82		
	Student, Unemployed	28(19.2)	3.46±0.61			3.09±0.74		
	Housewives, etc.	42(28.8)	3.39±0.74			3.37±0.94		
Total		146(100.0)	3.44±0.71			3.27±0.86		

\* by t-test for two groups and one-way ANOVA(post-test Scheffe) for three or more groups

<sup>a,b</sup> The same letter indicates no significant difference by Scheffe test at  $\alpha=0.05$

### *3.3 Treatment satisfaction and oral health-related quality of life according to implant procedure characteristics (OHIP-14)*

Treatment satisfaction and oral health-related quality of life (OHIP-14) according to the characteristics of the implant procedure of the study subjects are shown in Table 3. Both treatment satisfaction and OHIP-14 scores were the highest when the number of implants is 4 or greater, with a respective score of  $3.67 \pm 0.65$  and  $3.59 \pm 0.83$ . Satisfaction and OHIP-14 scores were found to have a positive relationship with the number of implants ( $p < 0.05$ ). In terms of regular checkups, participants who

received regular checkups had a significantly higher OHIP-14 score of  $3.39 \pm 0.78$  points, compared to their counterparts who scored  $2.96 \pm 0.96$  points ( $p < 0.01$ ).

**Table 3.** Treatment satisfaction and OHIP-14 scores according to implant procedure characteristics

Characteristics	N(%)	Treatment satisfaction			OHIP-14		
		Mean±SD	t/F	p*	Mean±SD	t/F	p*
Decision motivation							
Recommendation by others	55(37.7)	3.53±0.63	2.633	0.075	3.32±0.87	0.313	0.732
Personal needs	79(54.1)	3.33±0.75			3.21±0.83		
Mass media	12(8.2)	3.75±0.66			3.34±1.02		
Costs							
≤ 100	20(13.7)	3.45±0.85	0.339	0.797	3.08±0.92	0.510	0.676
101-150	56(38.4)	3.51±0.63			3.24±0.82		
151-300	38(26.0)	3.40±0.73			3.32±0.68		
≥ 301	32(21.9)	3.36±0.72			3.36±0.89		
Duration of treatment(months)							
≤ 12	55(37.7)	3.55±0.71	1.659	0.194	3.31±0.92	3.039	0.051
13-36	45(30.8)	3.47±0.57			3.46±0.76		
≥ 37	46(31.5)	3.29±0.80			3.03±0.83		
Number of implants							
1	44(30.1)	3.29±0.73 <sup>a</sup>	2.964	0.049	3.00±0.85 <sup>a</sup>	4.663	0.011
2-3	68(46.6)	3.43±0.69 <sup>ab</sup>			3.28±0.83 <sup>ab</sup>		
≥ 4	34(23.3)	3.67±0.65 <sup>b</sup>			3.59±0.83 <sup>b</sup>		
Receive regular checkups							
Yes	103(70.5)	3.51±0.64	1.729	0.086	3.39±0.78	2.845	0.005
No	43(29.5)	3.28±0.83			2.96±0.96		
Consideration for treatment							
Pain	33(22.6)	3.29±0.60 <sup>a</sup>	3.970	0.009	3.16±0.83	0.519	0.670
Complications and side effects	61(41.8)	3.30±0.73 <sup>a</sup>			3.25±0.86		
Cost	30(20.5)	3.69±0.61 <sup>b</sup>			3.27±0.86		
Daily activities	22(15.1)	3.72±0.77 <sup>b</sup>			3.46±0.91		

\* by t-test for two groups and one-way ANOVA(post-test Scheffe) for three or more groups

<sup>a,b</sup> The same letter indicates no significant difference by Scheffe test at  $\alpha=0.05$

### 3.4 Correlation between satisfaction with implant treatment and oral health-related quality of life (OHIP-14)

The correlation between the participants' satisfaction with implant treatment and oral health-related quality of life (OHIP-14) is shown in Table 4. There observed a positive correlation between the

sub-variables of treatment satisfaction and OHIP-14: functional satisfaction ( $r = 0.492$ ,  $p < 0.001$ ), aesthetic satisfaction ( $r = 0.467$ ,  $p < 0.001$ ), cost satisfaction ( $r = 0.518$ ,  $p < 0.001$ ), maintenance satisfaction ( $r = 0.321$ ,  $p < 0.001$ ). In essence, the satisfaction of implant patients with their treatment tends to proportionally increase their overall quality of life related to oral health.

**Table 4.** Correlation between implant treatment satisfaction and OHIP-14

Variables	Functional satisfaction	Aesthetic satisfaction	Cost satisfaction	Maintenance satisfaction	OHIP-14
Functional satisfaction	1				
Aesthetic satisfaction	0.509**	1			
Cost satisfaction	0.521**	0.388**	1		
Maintenance satisfaction	0.347**	0.289**	0.776**	1	
OHIP-14	0.492**	0.467**	0.518**	0.321**	1

\*\* $p < 0.01$ , by Pearson's correlation analysis

### 3.5 Factors influencing oral health-related quality of life (OHIP-14)

To identify the factors affecting the subjects' satisfaction with implant treatment, multiple regression analysis was conducted with the sub-variables of satisfaction, - functional satisfaction, aesthetic satisfaction, cost satisfaction, and maintenance satisfaction - as the independent variables and OHIP-14 as the dependent variable. The results of this analysis are presented in Table 5.

The regression model was found to be significant ( $F=22.375$ ,  $p < 0.001$ ), and the model's explanatory power was 37.1%. The factors affecting OHIP-14 scores of implant patients were found to be cost satisfaction ( $p < 0.001$ ), aesthetic satisfaction ( $p < 0.001$ ), and functional satisfaction ( $p < 0.05$ ) in the given order.

**Table 5.** Factors influencing oral health-related quality of life (OHIP-14)

Variables	B	SE	$\beta$	t	$p^*$
(Constant)	0.720	0.307		2.348	0.020
Functional satisfaction	0.192	0.085	0.190	2.257	0.026
Aesthetic satisfaction	0.313	0.100	0.243	3.125	0.002
Cost satisfaction	0.397	0.101	0.454	3.922	<0.001
Maintenance satisfaction	0.132	0.083	0.167	1.595	0.113

$R^2=0.388$ , adj  $R^2=0.371$ ,  $F=22.375$ ,  $p < 0.001$

\* by multiple regression analysis

## 4. Discussion

Advancements in medicine and science have led to significant changes in the perception of oral health. These improvements have not only elevated the overall standard of living but also extended the average life expectancy. As a result, the understanding of health has transcended mere disease management, leading to higher expectations for overall well-being and quality of life (Park et al., 2011). The significance of teeth extends beyond mere aesthetics, as they serve crucial functions like chewing, pronunciation, and more. Since the loss of teeth can substantially impact one's quality of life, implant treatment is used to restore lost teeth, underscoring its importance.

The study was carried out to analyze the characteristics of dental implants and the treatment satisfaction of implant patients and identify the factors influencing treatment satisfaction in relation to oral health-related quality of life in order to maintain and improve patients' treatment satisfaction, and thereby providing essential data for developing education and management programs to enhance overall oral health-related quality of life.

In this study, the oral health-related quality of life of implant patients was found to vary based on their general characteristics. In terms of age, patients who are 49 or younger scored an average of 2.99 points, those in their 50s scored 3.34 points, and individuals over 60 years of age scored 3.48 points, showing increasing oral health-related quality of life with age. Notably, it is consistent with previous studies conducted by Kang (2020), which also reported the highest scores among participants aged 65 or older and the study by Park et al. (2011), who demonstrated an increase in the quality of life with advancing age. Regarding marital status, married individuals exhibited higher scores than unmarried individuals, which mirrors the findings of Park et al.'s (2011) study, where married participants also showed a higher score compared to unmarried individuals.

Examining the treatment satisfaction and oral health-related quality of life according to the characteristics of implant treatment, treatment satisfaction and oral health-related quality of life were the highest when the number of implants was 4 or more, and both treatment satisfaction and oral health-related quality of life increased as the number of implants increased. In the past, dentures were the preferred treatment method for multiple teeth loss. However, in recent times, implants have gained popularity as they offer a replacement for individual teeth akin to natural teeth. Consequently, implants are now favored over dentures more frequently, as they significantly reduce the discomfort associated with denture usage and lead to improved satisfaction and overall quality of life. Furthermore, the oral health-related quality of life showed notable differences based on the presence or absence of regular examinations. Participants who received regular examinations demonstrated higher quality of life scores compared to those who did not, a finding consistent with Kim's (2020) study. This serves as a crucial indicator, emphasizing the significance of regular checkups for implant patients above all else. It suggests the need to devise appropriate measures to encourage implant patients to prioritize and engage in regular checkups for their oral health.

Furthermore, when pain, complications, and side effects were chosen as primary considerations during implant surgery, satisfaction with the treatment was lower compared to when cost and restrictions on daily activities were selected as primary concerns. Such findings highlight the importance of considering concerns related to pain and side effects as a priority in implant treatment. Despite



the potential expense of the implant procedure, it becomes evident that the treatment's benefits outweigh the higher cost, leading to an overall improvement in patients' standard of living. Therefore, it is necessary to educate patients about pain and side effects prior to starting implant treatment.

Among the study subjects, the factors of satisfaction with implant treatment influencing their oral health-related quality of life were observed to be cost satisfaction, aesthetic satisfaction, and functional satisfaction, in the given order. The results of a study by Chung et al. (2011) showed that functional factors and post-implantation maintenance and management aspects have a positive (+) effect on oral health-related quality of life, which is somewhat consistent with the findings. In general, previous research has suggested a positive relationship between high satisfaction with implants and improved quality of life after implant surgery (Kim et al., 2018) as well as between satisfaction of dental-related functions among implant patients and their oral health-related quality of life (Kim & Kim, 2010). In this study, the impact on oral health-related quality of life increased when the satisfaction with implant treatment was high, and treatment satisfaction after implant surgery was related to oral health-related quality of life. This study also found that a high level of satisfaction with implant treatment is significantly correlated with an increased impact on oral health-related quality of life, indicating a close relationship between the satisfaction following implant surgery and overall oral health-related quality of life. The enhancement of masticatory and aesthetic functions through implants after tooth loss can be regarded as an improvement in oral health-related quality of life. As a result, it is crucial for dental medical institutions to offer optimal treatment approaches and consistent oral health management to enhance implant satisfaction.

The limitations of this study lie in its geographic restriction to the Seoul and Gyeonggi regions and the limited representativeness of the sample; as the study subjects were selected from dental hospitals and clinics using random sampling, it may have affected the generalizability of the results. Furthermore, since this study lacked the ability to compare the quality of life before, during, and after the procedure for patients who underwent implant surgery, it becomes challenging to ascertain the extent of improvement in quality of life following the surgery. To address the limitations, continuous follow-up studies should be conducted.

## 5. Conclusions

This study examined the characteristics of implant treatment, treatment satisfaction, oral health-related quality of life, and the factors influencing treatment satisfaction concerning oral health-related quality of life by surveying patients who underwent implant treatment at dental hospitals and clinics in Seoul and Gyeonggi Province using the Oral Health Impact Profile (OHIP-14). A total of 146 samples were analyzed, and the results are presented below.

1. Overall average satisfaction with implant treatment was  $3.44 \pm 0.71$  points with maintenance satisfaction  $3.68 \pm 1.09$  points, cost satisfaction  $3.53 \pm 0.95$  points, functional satisfaction  $3.49 \pm 0.85$  points, and aesthetic satisfaction  $3.08 \pm 0.67$  points. The average oral health-related quality of life was  $3.27 \pm 0.86$  points.

2. The oral health-related quality of life showed a positive correlation with increasing age based

on general characteristics ( $p < 0.05$ ). Additionally, from the perspective of marital status, married individuals had higher oral health-related quality of life scores compared to unmarried individuals ( $p < 0.05$ ).

3. Treatment satisfaction and oral health-related quality of life according to implant procedure characteristics were found to be positively associated with the number of implants ( $p < 0.05$ ). Also, participants who underwent regular check-ups reported higher OHIP-14 scores compared to those who did not. Furthermore, individuals who prioritized pain, complications, and side effects during the procedure had lower satisfaction with implant treatment, whereas those who prioritized cost and routine activities showed higher satisfaction ( $p < 0.01$ ).

4. The level of satisfaction with implant treatment among participants significantly impacted their oral health-related quality of life. In descending order of influence, cost satisfaction ( $p < 0.001$ ), aesthetic satisfaction ( $p < 0.001$ ), and functional satisfaction ( $p < 0.05$ ) were identified as the key factors affecting their overall quality of life concerning oral health.

Based on the aforementioned study results, it can be affirmed that as the treatment satisfaction of implant patients increases, so does the quality of life related to oral health. Consequently, there is a need to prioritize correct education and awareness initiatives to effectively maintain and enhance patient satisfaction with their treatment.

## Conflicts of Interest

The authors declare no conflict of interest.

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