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Research Article**Evaluation of Patients' utility Values for Replacement Options of Lost Teeth****M. Frazadmoghadam¹, T. Malek Mohammadi^{1*},****M. Mohammadi² and R. Goudarzi³**

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ABSTRACT

Background and Aim: Impaired mastication, speaking and aesthetic due to tooth loss results in a lower quality of life in partially dentate individuals. The aim of this study was to determine the utility values of three possible replacement options for partially dentate individuals.

Methods: A convenience sampling method was used to recruit 156 partially dentate patients. Each participant was presented with three treatment options (Cobalt-Chromium removable partial denture, tooth supported fixed bridge and implant supported fixed prosthesis). The treatment process, advantages and disadvantages of each option was clearly explained. Participants were asked to mark their utility score of each treatment option on a 0-10 range Standard Visual Analogue Scale. Data was analyzed by SPSS-22 software.

Results: The mean utility score for Cobalt-Chromium removable partial denture, tooth supported fixed bridge and implant supported fixed prosthesis was 4.45 ± 2.46 , 7.14 ± 2.22 and 9.05 ± 1.72 respectively.

Conclusion: Among the three options for treating partially dentate patients, implant supported fixed prosthesis and Cobalt-Chromium removable partial denture, respectively gained the highest and lowest utility value. Age, gender, occupation and educational status were variables which affected utility score.

Keywords: Dental implant, Tooth loss, Utility, Dental prosthesis

BACKGROUNDS

Tooth loss is an important factor influencing oral health and quality of life (1). Periodontal destruction and dental caries finally result in tooth loss. Up to 45 years of age, dental caries is considered to be the main cause of tooth loss. In older aged patients, periodontal destruction and dental caries are equally important in losing tooth. Overall, 30-35% of tooth loss is related to periodontal problems and 50% happen as a result of dental caries (2).

Today, oral health promotion efforts has resulted in lower prevalence of edentulism in North America and European countries (3). In Iran,

70.7% of people above 65 years of age, are edentulous. This rate increases with age (4). Tooth replacement is one of the most complex treatments in dental practice (5).

Formerly, tooth loss was not a concern to most people and people were satisfied with conventional treatment methods (6). Today the attitude has changed and most people prefer dental implant based treatments. Implant based treatment methods increase the retention and stability of prosthesis and a conservative way to avoid the preparation of adjacent teeth (7,8). Likewise, it

avoids ridge atrophy and provide appropriate aesthetic appearance(9,10).

Oral problems including tooth loss influence ones quality of life by affecting chewing ability, speaking and aesthetics (11). Health economic or health utility studies seem to be necessary in order to determine the valid and utile treatment methods in different countries (12). Utility is an index of a group or an individual's preference of a given treatment method or clinical intervention (13).

There are different ways to assess patients' utility value of a treatment method. The simplest method is to use the time trade-off visual analogue scale(VAS) (14).

Nassani evaluated the utility values of mouth with lost teeth in Syrian population. The highest and lowest utility value were score for the loss of second maxillary molar and central maxillary respectively (15).

In another similar study, the loss of central maxillary achieved the least utility value in both English and Persian populations (16).Nassani compared the utility value for different tooth replacement methods in patients with shortened dental arch. In this study, patients scored implant supported fixed prosthesis less than tooth supported fixed prosthesis whereas implant supported fixed prosthesis received a higher score than removable prosthesis (17).

With all existing cultural differences, it will be advantageous to determine the best valued treatment regarding the replacement of teeth in partially dentate patients in Iran. Therefore this study was carried out to determine patients' utility value of three treatment options for replacement of teeth in partially dentate patients.

METHODS

In this cross sectional study, a non-random convenient sampling method was used to recruit eligible subjects among patients who referred to prosthesis department of Kerman Dental School. Due to the presence of only one study regarding utility values of prosthesis treatment options (17), sampling size was determined as 156. Inclusion criteria were set as having at least one or more lost

teeth and having the intention to replace them. The Ethic approval Cod was IR.KMU.REC.1395.408.After obtaining an informed consent, demographic characteristics such as age, gender, educational status and occupation were recorded. A paper containing the three treatment options for replacing teeth in written form, was given to each patient. The three treatment options were as below:

1. Cobalt-Chromium removable partial denture
2. Tooth supported fixed bridge
3. Implant supported fixed prosthesis

An explanation regarding the process, advantages and disadvantages of each treatment method was given to each patient. A model showing the actual treatment option was also shown to each patient for better understanding [PE-IMP002 model (Nissin,Kyoto,Japan), for implant and removable partial denture and PE-IMP003 model (Nissin,Kyoto,Japan), for implant and fixed bridge]. Each interview lasted 15-20 minutes.

Participants were asked to mark their utility value score of each treatment method on a VAS line. A VAS line is a 10 cm line numbered 0-10, the right end indicated the most valued utility (10) and the left end indicated the least valued utility (zero).Among the following factors; quality, aesthetics, durability, treatment duration, pain, cost, precision and the health of adjacent teeth, participants were asked to determine their reasons for scores to each treatment option.Data were entered into SPSS-22 software and independent t-test, chi-square, one way ANOVA and Pearson correlation test were used for the analysis. Also a p-value under 0.05 was considered as significant level.

RESULTS

Overall 156 subjects who were 16-70 years old participated in the study. Among them, 100 subjects were women and 56 were men. Mean utility value score regarding the replacement of lost teeth for the three treatment options (Cobalt-Chromium removable partial denture, tooth supported fixed bridge and implant supported fixed prosthesis) were 4.54 ± 2.46 , 7.14 ± 2.22 and

9.05±1.72 respectively. ANOVA test showed that the three treatment options was statistically significant (f=167.77, p=0.001) (table 1).

Table 1.Participants' mean utility value for the results of treatment options and comparison of these three options.

Treatment options	Mean utility value	Standard deviation	p-value
Chrome-Cobalt Removable Partial Prosthesis	4.54	2.46	<0.001
Fixed bridge	7.14	2.22	
Implant treatment	9.05	1.72	

Post hoc Scheafer analysis revealed that implant supported fixed prosthesis was significantly more valued than the other two options. Also Cobalt-Chromium removable partial denture, was significantly less valued compared to the other treatment options. Considering quality, aesthetics, efficiency, durability, precision and the health of adjacent teeth, implant supported fixed prosthesis was the first choice. On the other hand, cost, treatment duration and pain were factors which influenced the choice of Cobalt-Chromium removable partial denture (table 2).

Table 2. The percent of positive response of participants to the Selection criteria of each treatment and comparison of the treatment options based on selected criteria.

Selection criteria	Chrome-Cobalt RPD(%)	Fixed bridge(%)	Implant treatment(%)	p-value
Quality	13.6	35.7	66.9	0.001
Esthetic	14.9	59.1	66.2	0.001
Durability	19.5	42.2	64.9	0.001
Treatment time	13.6	5.8	9.1	0.06
Pain	4.5	2.6	0.6	0.09
Cost	49.4	9.1	3.2	0.001
Accuracy	0.6	4.5	6.5	0.02
Health of the other teeth	7.8	8.4	22.7	0.001
The other reasons	2.6	0.6	0	0.07

Regarding demographic variables, gender influenced the choice of treatment options. Men preferred to use Cobalt-Chromium removable partial denture, more than women (p=0.01). Also ones occupation affected the choice of a treatment option (table3).

Table 2.Patients' utility values for each treatment option based on sex, occupation, and education level, and comparison of them.

Variables		Chrome-Cobalt RPD (Mean±SD)	Fixed bridge (Mean±SD)	Implant treatment (Mean±SD)
sex	Male	5.00±2.44	7.26±2.20	9.17±1.26
	Female	4.36±2.44	7.09±2.22	9.00±1.88
	p-value	0.01	0.44	0.34
Occupation	Free	4.11±2.87	7.47±1.71	9.36±1.23
	employee	4.52±2.30	6.69±2.60	9.09±1.68
	Without job	4.33±2.27	6.33±1.74	8.00±1.97
	Student	3.54±1.64	6.81±1.04	9.18±0.84
	Retired	5.83±2.61	8.00±2.17	9.16±0.92
	Housekeeper	4.90±2.74	7.71±2.17	9.46±1.93
	p-value	0.01	0.002	0.01
Education level	Without literacy	8.66±2.00	10.00±0.00	10.00±0.00
	Primary literacy	5.0±2.58	8.40±1.47	9.23±1.52
	Under diploma	5.33±2.17	6.67±1.32	10.00±0.00
	Diploma	4.78±2.62	7.50±2.26	9.00±2.20
	Associate diploma	3.20±2.28	5.13±2.60	9.07±1.11
	Licentiates degree	4.77±1.80	7.00±1.87	9.13±1.23
	Master's degree	3.14±2.15	6.00±1.66	8.57±1.74
	Doctorate degree/PhD	3.33±1.32	6.66±0.50	9.33±0.50
	p-value	<0.001	<0.001	0.17

Retired subjects assigned more utility value score to Cobalt-Chromium removable partial denture and tooth supported fixed bridge (Utility=5.83, Utility=8.00) respectively. Also Implant treatment received the highest utility score from housekeepers (utility=9.46).

The other factor affecting the utility score was educational status which influenced the choice of Cobalt-Chromium removable partial denture and tooth supported fixed bridge ($p=0.001$). Also the mean utility score of Cobalt-Chromium removable partial denture was positively associated with age ($r=0.0161$) (table 4). Furthermore, Compared to other treatment options, the number of missing teeth was mostly associated with the tooth supported fixed bridge treatment (table 4).

Table 3. Correlation between age and number of lost teeth with utility values given to treatment options

Variables		Chrome-Cobalt RPD	Fixed bridge	Implant treatment
Age	Correlation coefficient	0.161	0.071	-0.007
	p-value	0.002	0.171	0.892
Number of lost teeth	Correlation coefficient	0.139	0.324	0.116
	p-value	0.007	0.001	0.026

DISCUSSION

The aim of this study was to determine the utility value of three treatment options for replacing missing teeth in partially dentate people. The use of utility concepts is widely accepted in different fields of medicine although it has had limited use in dentistry. The aim of such techniques is to improve the quality of life and not to directly eliminate disease or pathology (17).

Evidences show that most people are willing to replace their teeth with prosthesis (18-20). Regarding utility value of methods for replacing teeth, Nassani has performed the only study which was carried out on a population with a different cultural basis (17). When utility values is considered, it is ideal that sampled people who determine their utility value are consistent with the study aim (14,21). Therefore in this study, people who had missed teeth and had sought treatment for replacing them, were used as samples.

Among the three treatment options, implant supported fixed prosthesis was valued more. This was due to its quality, aesthetic, durability, precision and health of adjacent teeth. Higher cost of this treatment was stated as the reason for not being valued. Regarding function and aesthetics, implant attracted the most utility value (Utility=9.05). After that tooth supported fixed bridge (utility=7.14) and Cobalt-Chromium

removable partial denture (utility=4.45) were valued respectively.

In Nassani's study, the highest utility value was given to cantilever fixed bridge (utility=0.64) and cantilevered resin-bonded bridge (utility=0.63). Implant supported prosthesis did not obtain the highest utility value. This variation in results could be due to differences between factors such as pain, duration of treatment and treatment costs in different populations (17).

In utility- analysis studies, implant supported prosthesis are not usually considered as the optimal treatment options. Similar to Nassani's study, in this study patients placed the least value on Cobalt-Chromium removable partial denture (17). Women considered tooth loss as a more influencing factor in the utility of mouth than men. This difference was not significant in the case of Shortened dental arches. In women, aesthetics was a more important factor in the utility of mouth. However function was equally important in both genders. Regarding treatment options, men placed a higher value on Cobalt-Chromium removable partial denture, whereas the utility placed upon implant and tooth supported fixed bridge did not differ significantly between men and women.

Nassani's study showed a lower utility of "no treatment" in women than men (17).

Age has a binary effect on the utility of mouth. Due to poor oral health, tooth loss might be a usual phenomenon in older people (22). However

younger people tend to have a healthier mouth and wish to keep their teeth, therefore tooth loss is unusual and each tooth loss in a young person has a higher impact on the utility of mouth compared to older people (16).

Results showed that as age increased, Cobalt-Chromium removable partial denture was valued more. Similarly, In Nassani's study, patients older than 65 valued Cobalt-Chromium removable partial denture more than younger patients (17). Lower ability for tolerating difficult, painful and long-lasting treatments might explain such results. Retired patients tended to value Cobalt-Chromium removable partial denture more. Lower salary after being retired from work and their older age could be stated as probable reasons. Uneducated people signed the highest score to all treatment options, this could be due to some misconception of advantages and disadvantages of the three treatment options. Cobalt-Chromium removable partial denture was less valued among higher educated people while implant supported fixed prosthesis utility score was not different among people with different educational levels.

The number of missed teeth was associated with utility value of treatment options. Obviously in people who have more lost teeth, the cost of replacing them with more optimal treatment options increase, leading to the choice of more intermediated treatment options.

Evaluation of treatment outcomes differ between clinicians and patients. Clinicians consider high utility value on the basis of treatment advantages, whereas patients determine low utility according to the process and complications of treatment. This difference in evaluation, leads to a poor treatment planning.

Regarding the choice of treatment options, some patients give complete responsibility to clinicians and some tend to express their opinions about treatment options.

For this group of patients, clinicians should consider patients opinion even if it is not the desired treatment option (17,23). Due to the convenient sampling method, the number of men

and women who were included in the study, was not proportional to its levels in the real population which could be considered in future studies.

Also it should be noted that utility valuation is subjective and could be influenced by different cultures.

CONCLUSION

According to the results of this study, partially dentate patients preferred to replace teeth with implant supported fixed prosthesis most and Cobalt-Chromium removable partial denture least. Gender, age and educational status influenced their value of different treatment options. Therefore health politicians in Iran should consider the costs of preferred methods for replacing teeth and present strategies to make these treatments available to a higher number of people.

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Conflict of interest

The authors report no conflicts of interest related to this study.

Disclosure

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