

## Original Article

### Factors affecting the willingness to pay for implants: A study of patients in Riyadh, Saudi Arabia

Bishi Al Garni<sup>1</sup>, Sharat Chandra Pani<sup>2</sup>, Adel AlMaaz<sup>3</sup>, Ehsan Al Qeshtaini<sup>3</sup>, Hamad Abu-Haimed<sup>3</sup>, Khalid Al Sharif<sup>3</sup>

<sup>1</sup>Department of Maxillofacial Surgery, Riyadh Dental Center, King Saud Medical City, <sup>2</sup>Department of Preventive Dentistry, Riyadh Colleges of Dentistry and Pharmacy, <sup>3</sup>Riyadh Colleges of Dentistry and Pharmacy, Riyadh, Kingdom of Saudi Arabia

#### ABSTRACT

**Background:** One of the factors that dissuade patients needing tooth replacement from choosing dental implants is the prohibitive cost. Willingness to pay (WTP) is a useful tool to determine the ideal cost of an expensive procedure.

**Aim:** The aim of this study was to study the factors that influence the willingness to pay (WTP) among patients attending a private clinic and compare them to those attending a government setup.

**Materials and Methods:** A total of 100 patients (38 male, 62 female) who had one or more missing teeth were presented with different cost-benefit scenarios and then asked if they were willing to pay the median cost of a single implant in Riyadh city. The mean WTP price was compared using the one way-ANOVA, factors which could possibly influence patients' WTP were grouped together in a Binomial logistic regression model.

**Results:** Of the 100 individuals surveyed 67% said they would be willing to pay the median price for the placement of an implant. A comparison of socio-demographic factors showed that significant differences were found between gender, income groups and setting of the clinic in the mean WTP price of the patients ( $P < 0.05$ ). We also found that there was a significant difference in the mean WTP price between groups with regard to the area of the missing tooth, the patients' perception of their oral health and the their desire to want an implant ( $P < 0.05$ ).

**Conclusion:** The majority of the patients surveyed were willing to pay the median price for an implant. Willingness to pay (WTP) is a multifactorial variable which is significantly influenced by the income of the patient, the setting of the clinic and the gender; the most significant factor being the acceptability of the implant to the patient.

**Key Words:** Dental implants, Saudi Arabia, willingness to pay

Received: June 2012

Accepted: September 2012

#### Address for correspondence:

Dr. Sharat Chandra Pani,  
Department of Preventive  
Dentistry Riyadh Colleges  
of Dentistry and Pharmacy,  
PO Box 84891, Riyadh,  
Kingdom of Saudi Arabia.  
E-mail: sharatpani@hotmail.  
com

## INTRODUCTION

Over the past decade the placement of implants has increased exponentially across the world.<sup>[1]</sup> While there have been many clinical limitations to the placement of implants cited in literature<sup>[2,3]</sup> one of the strongest arguments against the willingness of patients

towards the placement of dental implants has been the prohibitive cost of these implants.<sup>[4,5]</sup> In the past few years however there have been many reports in literature that as the cost of dental implants decrease and their rates of success improve, patients' reluctance towards the placement of implants may slowly be changing.<sup>[6-8]</sup>

Assessing a patient's willingness to pay (WTP) is one of the most accepted methods to evaluate the acceptability of new treatment modality for the clinician. It has been used to successfully measure patient's perception in not only in dentistry,<sup>[9-11]</sup> but in fields such as orthopedics,<sup>[12]</sup> cardiology<sup>[12,13]</sup> and health care service preferences.<sup>[14]</sup> Bidding is the oldest and most accepted tool to assess WTP

Access this article online



Website: [www.drj.ir](http://www.drj.ir)

of a patient and provides both clinicians and third party payment providers with a realistic estimate of how much a patient can spend on a new treatment modality.<sup>[15]</sup>

Despite this, it has been stated that data on how much a patient is willing to pay for implant care and how this may influence clinical decision making is scant.<sup>[16]</sup> Although, there is some data on the factors that affect clinicians' recommendation of dental implants in the Middle East,<sup>[17]</sup> the concept of WTP for implant treatment and how it influences clinical decisions remain a largely unexplored area.

Given this background it was decided to evaluate Saudi patients' WTP for implant treatment and attempt to define the clinical and socio-demographic factors influencing that decision.

### Methodology

Ethical clearance for the study was obtained from the research center of the Riyadh Colleges of Dentistry and Pharmacy (UGSRP/2011/021). The study was conducted between September 2011 and January 2012.

### Selection of the sample

The power of sample was calculated based on the minimum sample required for a regression analysis with a single dependent variable, with true  $r^2$  value of 0.1, with alpha set at 0.05; which was 50. A total of 100 patients (38 male, 62 female) who had one or more missing teeth were selected using convenience sampling. The sample comprised of 50 uninsured patients reporting to the outpatient dental departments of a private hospital and 50 patients reporting to a government hospital in Riyadh after obtaining an informed consent.

### Data collection

Data collection was done by four of the authors, (AM, EQ, HA, KS) who were trained in the bidding process and collection of demographic data. Given the subjective nature of WTP and differences among patients, the investigators were calibrated against the lead investigator (BG). Patients who consented to participate in the study were given a form in Arabic asking them to fill in their demographic data. The bidding process was administered to patients in two stage process. In the first stage, the patients were presented with different cost-benefit scenarios and then asked if they were willing to pay the median cost of a single implant in Riyadh city, which was 3000 SR (1 SR = 3.77 US\$).

In the second phase, patients were allowed to bid for the price they would be willing to pay. Patients who were unwilling to pay the median price had the price progressively reduced by 500 SR until they reached a price they would be willing to pay or the sum reached 0. Patients who were willing to pay the median price for an implant had the price progressively increased by 50 Riyals and asked if they would still be willing to pay for the dental implant. The price was progressively increased until the patient was no longer willing to pay for the implant or until they reached the maximum price charged for an implant in Riyadh city which was 8500 SR.

### Statistical analysis

The data was processed using the SPSS version 19 data processing software. The factors that could influence the patients' WTP were classified into socio-demographic factors and individual patient specific factors. The mean price the patient was willing to pay for an implant was compared between different demographic groups using the one way-ANOVA.

The socio-demographic and individual patient factors were then grouped into two Binomial logistic regression models, with WTP as the dependent variable.

## RESULTS

Of the 100 individuals surveyed 67% said they would be willing to pay (WTP) the median price for the placement of an implant. A comparison of socio-demographic factors [Table 1] showed that significant differences were found between gender, income groups and setting of the clinic in the mean WTP price of the patients. Females had a higher mean WTP price than males; however, the proportion of females WTP the median price was similar to that of the males surveyed. Patients in the government setting had a lower WTP price than those in the private setting; there were also fewer individuals in the government setting who were WTP the median price for the placement of an Implant. The WTP price and the number of individuals WTP the median price increased proportionately with the income of the family. Comparison of the income groups among the two centers showed that there was no significant difference in the income of patients attending either the government or private clinic. Although students had the highest WTP price, the employment status did not seem to have a significant impact on WTP [Table 1].

**Table 1: Socio-demographic factors and their impact on willingness to pay price for a dental implant**

Factor	WTP median price (%)	B <sup>a</sup>	Sig	Mean bid price in SR	F <sup>b</sup>	Sig
Gender						
Male	25 (37.3)	-0.319	0.634	3,473.68	4.639	0.034*
Female	42 (62.7)			4,040.32		
Total Monthly Income						
<5,000 SR	7 (10.4)	-1.105	0.002*	3,955.56	4.293	0.017*
5,001-10,000 SR	26 (38.8)			2,650.00		
10,001 SR and above	34 (50.7)			2,100.00		
Employment						
Employed	29 (43.3)	0.153	0.434	3,500.00	0.732	0.573
Retired	5 (7.5)			4,975.61		
Unemployed	0 (0.0)			3,937.50		
Student	14 (20.9)			3,928.57		
Housewife	19 (28.4)			2,000.00		
Education						
Did not go to school	38 (56.7)	0.091	0.784	4,210.53	0.862	0.464
Primary school	29 (43.3)			3,500.00		
Intermediate school	25 (37.3)			2,666.67		
High school and above	42 (62.7)			3,357.14		
Location						
Private	7 (10.4)	1.073	0.032*	3,566.67	10.552	0.002*
Government	26 (38.8)			3,966.67		

\*Differences significant at  $P < 0.05$ , <sup>a</sup>Calculated using binomial logistic regression with WTP as dependent variable, <sup>b</sup>Calculated using One-way ANOVA, WTP: Willingness to pay

When the patient's specific factors influencing the patient's acceptance of an implant were considered, we found that there was a significant difference in the mean WTP price between groups with regard to the area of the missing tooth, the patients' perception of their oral health and the their desire to want an implant. No significant difference was found between the time elapsed since extraction or the desire of the patient to replace the missing teeth.

Patient with an anterior missing tooth or with missing teeth in both anterior and posterior seemed to be willing to pay more for an implant than those with only a posterior tooth missing, however, the difference was not statistically significant.

The patients' perception of their own oral health had a significant influence on the patients' WTP for an implant, with patients who considered their oral hygiene to be good or excellent were willing to pay a significantly higher price than patients who considered their oral hygiene to be poor [Table 2].

In order to ascertain the relationship of the multiple variables to the WTP of the patients, the variables were subjected to a binomial logistic regression, with the WTP price as the dependent variable for both the socio-demographic and the patient specific variables. Among socio-demographic factors [Table 1], income

and hospital setting seemed to have a significant influence on whether a patient was willing to pay for an implant or not. Surprisingly gender was not a factor in whether a patient was willing to pay for an implant or not, even though females who were willing to pay for an implant had a significantly higher WTP price than their male counterparts.

Among the individual patient factors, whether a patient wanted an implant or not was the most important factor that would determine whether a patient would be willing to pay for an implant. The only other factor that seemed to significantly influence the patients' WTP seemed to be the patients' perception of their oral health [Table 2].

## DISCUSSION

The effectiveness of the bidding technique in the assessment of WTP has been documented in literature.<sup>[15]</sup> The ease of this method was evident in our study as none of the patients we approached refused to participate in the study.

Usually, bidding for an object starts from the lowest price; however, this method may result in what has been termed as the "starting point bias"; which states that a patient who is offered a low price will refuse to bid higher making it difficult to determine

**Table 2: Patient specific factors and their impact on willingness to pay price for a dental implant**

Factor	WTP median price (%)	B <sup>a</sup>	Sig	Mean bid price in SR	F <sup>b</sup>	Sig
Time since extraction						
0-3 months	11 (16.4)	0.178	0.500	4,923.08	0.697	0.556
4-6 months	3 (4.5)			2,500.00		
7-12 months	9 (13.4)			3,214.29		
More than a year	44 (65.7)			3,900.00		
Preferred prosthetic replacement						
Implant	47 (70.1)	-0.084	0.750	4,261.54	2.383	0.074
Fixed	6 (9.0)			2,428.57		
Removable	3 (4.5)			2,900.00		
Don't know	11 (16.4)			3,562.50		
Number of missing teeth						
1-3 teeth	39 (58.2)	0.538	0.153	3,894.74	0.338	0.714
4-7 teeth	20 (29.9)			3,962.96		
8 or more	8 (11.9)			3,343.75		
Area						
Anterior	11 (16.4)	-0.738	0.089	3,843.75	3.238	0.049*
Posterior	38 (56.7)			3,516.67		
Both anterior and posterior	18 (26.9)			4,583.33		
Wants to replace the tooth						
Yes	63 (94.0)			3,939.56	0.574	0.451
No	4 (6.0)			3,966.67		
Perception of self oral health						
Good	11 (16.4)	1.097	0.028*	4,964.29	4.757	0.011*
Fair	47 (70.1)			3,911.76		
Poor	9 (13.4)			2,611.11		
Wants an implant						
Yes	67 (100.0)	22.949	0.998	4,367.82	33.525	0.000*
No	0 (0.0)			192.31		

\*Differences significant at  $P < 0.05$ , <sup>a</sup>Calculated using binomial logistic regression with WTP as dependent variable, <sup>b</sup>Calculated using One-way ANOVA  
WTP: Willingness to pay

the minimum WTP price.<sup>[18]</sup> The use of the median price is said to be one of the most effective ways to negate any effect of such bias.<sup>[19]</sup>

The fact that a majority of our patients were willing to pay the starting price for a dental implant is a positive sign and is contrary to the findings of Leung and McGrath,<sup>[9]</sup> who found that most of their subjects were not willing to meet the market price of a dental implant. One of the factors for this difference, however, could be that our study focused on patients who had actually undergone tooth loss rather than the hypothetical situations used by others. In this respect, our findings correspond to those of Esfandari, *et al.*<sup>[6]</sup> who in a similar study on overdenture patients suggested that a majority of patients would be willing to meet the price of a dental implant if it meant an increase in oral function and stability of their dentures.

The loss of function due to a missing posterior tooth is an important factor in motivating the patient to seek replacement.<sup>[20]</sup> While the loss of esthetics as a factor in patients seeking implants to replace a missing

anterior tooth or prosthesis has been discussed in literature.<sup>[21,22]</sup> The role of loss of function in influencing the patients choice of an implant is often overlooked. This was evident in our study when we saw that there was no significant difference in the WTP for an implant between patients who had lost an anterior or a posterior tooth. In fact the WTP price was seen in patients who had lost both anterior and posterior teeth, suggesting that a combination of loss of function and loss of esthetics can greatly influence a patient's decision to pay for a dental implant.

There are conflicting views in literature regarding the relationship between the period of time elapsed since tooth loss and patients' desire to replace missing teeth. While some have pointed out that a longer time frame elapsed since the extraction of the tooth indicates the lack of interest on the part of the patient to replace his/her teeth<sup>[23]</sup> others have stated that a prolonged loss of function could make the patient realize the value of replacing the tooth.<sup>[20]</sup> Interestingly, we found that the number of teeth lost and the time elapsed since

the time of extraction were not significant factors in influencing WTP of the patient. However, given the small size of our paper and the several possible confounding factors, this fact should be studied in greater detail.

In general, females have been found to be more willing to pay for healthcare services than men.<sup>[24,25]</sup> Our study found that women who said they were willing to pay for implant had higher mean WTP scores than the men, however, there was no significant difference in the number of men and women willing to pay the median price of a dental implant. This seems to suggest that, although gender is an issue in the WTP for dental implants, other factors perhaps play a greater role.

The influence of income on the ability to pay is a debated topic. While our findings agree with investigators who have indicated a positive association between the income group and the WTP,<sup>[26-28]</sup> others, including a recent study with methodology very similar to ours have found no such association.<sup>[9,29,30]</sup> A possible explanation for this could be that the studies were carried out in different countries and settings. Some of the studies also used hypothetical models<sup>[9]</sup> rather than real patients, suggesting that although such models may predict general trends, the actual loss of function that a patient who undergoes extraction experiences is difficult to replicate.

The fact that patients in a government setup are less likely to be WTP, for care is documented in literature.<sup>[31,32]</sup> The fact that there was no significant difference in the distribution of income groups between the private and the government hospital seems to reinforce the fact that while WTP is dependent on income, it is perhaps also influenced by the patients' perception of the cost of health care at a particular institution.

A positive correlation was found between the perception of oral health and the mean WTP price of the patients. While this is similar to a recent study on patients WTP for implants,<sup>[9]</sup> it is contrary to the findings of studies on implant overdentures<sup>[6]</sup> orthognathic surgery,<sup>[30]</sup> and dental caries<sup>[33]</sup> where the WTP is usually inversely proportionate to the perception of oral health. This seems to suggest that WTP for implants, especially single implants, may be driven by an understanding of needs rather than symptoms. This also perhaps, explains why the acceptability of the implant was the most significant factor in influencing whether a patient would pay for the implant or not.

The acceptance rate of the implant (patients willing to place an implant after initial interview) was 87% which is higher than those reported in other countries<sup>[34,35]</sup> who reported acceptance rates between 27% and 58%. One of the reasons for this variation could be because our study was conducted in a hospital setting, where people were looking to replace their teeth rather than in the general population. Despite this finding, the high acceptance rate is a positive sign and indicates that patients in Riyadh City are not only aware of implants, but would also like to have them placed; and in most cases be willing to pay for them.

This study was designed to serve as an initial assessment of factors influencing WTP for dental implants in Saudi Arabia; however, the factors highlight trends that in all probability transcend borders. A larger sample using specific patient groups could provide us with greater insight into specific factors and serve as a useful guideline to establish payment modalities for dental implants, especially in countries where the field is relatively new.

## CONCLUSION

Within the limitations of this study, it can be concluded that despite the cost of treatment, dental implants seem to be an attractive treatment option for the replacement of missing teeth among patients in Riyadh city. The income and gender of the patient and the setting of the practice all seem to influence the WTP of the patients. The greatest factor influencing the patient's WTP is the acceptability of the implant to the patient.

## REFERENCES

1. Davarpanah M, Szmukler-Moncler S. Unconventional implant treatment: I. Implant placement in contact with ankylosed root fragments. A series of five case reports. *Clin Oral Implants Res* 2009;20:851-6.
2. Binon PP. Treatment planning complications and surgical miscues. *J Oral Maxillofac Surg* 2007;65:73-92.
3. Froum S, Casanova L, Byrne S, Cho SC. Risk assessment before extraction for immediate implant placement in the posterior mandible: A computerized tomographic scan study. *J Periodontol* 2011;82:395-402.
4. Kim SG, Solomon C. Cost-effectiveness of endodontic molar retreatment compared with fixed partial dentures and single-tooth implant alternatives. *J Endod* 2011;37:321-5.
5. LuBovich R Sr. Smile designing for the malcontent patient. *Compend Contin Educ Dent* 2010;31:412-6.

6. Esfandiari S, Lund JP, Penrod JR, Savard A, Thomason JM, Feine JS. Implant overdentures for edentulous elders: Study of patient preference. *Gerodontology* 2009;26:3-10.
7. Pommer B, Zechner W, Watzak G, Ulm C, Watzek G, Tepper G. Progress and trends in patients' mindset on dental implants. II: Implant acceptance, patient-perceived costs and patient satisfaction. *Clin Oral Implants Res* 2011;22:106-12.
8. Zitzmann NU, Marinello CP, Sendi P. A cost-effectiveness analysis of implant overdentures. *J Dent Res* 2006;85:717-21.
9. Leung KC, McGrath CP. Willingness to pay for implant therapy: A study of patient preference. *Clin Oral Implants Res* 2010;21:789-93.
10. Tamaki Y, Nomura Y, Teraoka K, Nishikahara F, Motegi M, Tsurumoto A, *et al.* Characteristics and willingness of patients to pay for regular dental check-ups in Japan. *J Oral Sci* 2004;46:127-33.
11. Koberlein J, Klingenberg D. Foreign dentures and dental tourism-willingness-to-pay and factors influencing the demand for foreign dental prosthesis in Germany. *Gesundheitswesen* 2011;73:e111-8.
12. Cross MJ, March LM, Lapsley HM, Tribe KL, Brnabic AJ, Courtenay BG, *et al.* Determinants of willingness to pay for hip and knee joint replacement surgery for osteoarthritis. *Rheumatology (Oxford)* 2000;39:1242-8.
13. Nowakowska D, Guertin JR, Liu A, Abrahamowicz M, Leloir J, Lespérance F, *et al.* Analysis of willingness to pay for implantable cardioverter-defibrillator therapy. *Am J Cardiol* 2011;107:423-7.
14. Byrne MM, O'Malley KJ, Suarez-Almazor ME. Ethnic differences in health preferences: Analysis using willingness-to-pay. *J Rheumatol* 2004;31:1811-8.
15. O'Brien B, Gafni A. When do the "dollars" make sense? Toward a conceptual framework for contingent valuation studies in health care. *Med Decis Making* 1996;16:288-99.
16. Exley CE, Rousseau NS, Steele J, Finch T, Field J, Donaldson C, *et al.* Paying for treatments? Influences on negotiating clinical need and decision-making for dental implant treatment. *BMC Health Serv Res* 2009;9:7.
17. Al-Shammari KF, Al-Khabbaz AK, Akar MH, Al-Ansari JM, Wang HL. Implant recommendation as a replacement option after tooth loss for periodontal reasons. *Implant Dent* 2006;15:104-10.
18. McNamee P, Ternent L, Gbangou A, Newlands D. A game of two halves? Incentive incompatibility, starting point bias and the bidding game contingent valuation method. *Health Econ* 2010;19:75-87.
19. Onwujekwe O, Nwagbo D. Investigating starting-point bias: A survey of willingness to pay for insecticide-treated nets. *Soc Sci Med* 2002;55:2121-30.
20. Mukatash GN, Al-Rousan M, Al-Sakarna B. Needs and demands of prosthetic treatment among two groups of individuals. *Indian J Dent Res* 2010;21:564-7.
21. Al-Sabbagh M. Implants in the esthetic zone. *Dent Clin North Am* 2006;50:391-407, vi.
22. Amet EM. Management of unscheduled anterior tooth or prosthesis loss with extraction and immediate implant placement: A clinical report. *J Oral Implantol* 2010;36:209-17.
23. Shigli K, Hebbal M, Angadi GS. Prosthetic status and treatment needs among patients attending the prosthodontic department in a dental institute in India. *Eur J Prosthodont Restor Dent* 2009;17:85-9.
24. Fu TT, Lin YM, Huang CL. Willingness to pay for obesity prevention. *Econ Hum Biol* 2011;9:316-24.
25. Schuh MJ, Droege M. Cognitive services provided by pharmacists: Is the public willing to pay for them? *Consult Pharm* 2008;23:223-30.
26. Birch S, Sohn W, Ismail AI, Lepkowski JM, Belli RF. Willingness to pay for dentin regeneration in a sample of dentate adults. *Community Dent Oral Epidemiol* 2004;32:210-6.
27. Dixon S, Shackley P. Estimating the benefits of community water fluoridation using the willingness-to-pay technique: Results of a pilot study. *Community Dent Oral Epidemiol* 1999;27:124-9.
28. Matthews DC, Birch S, Gafni A, DiCenso A. Willingness to pay for periodontal therapy: Development and testing of an instrument. *J Public Health Dent* 1999;59:44-51.
29. Cunningham SJ, Hunt NP. Relationship between utility values and willingness to pay in patients undergoing orthognathic treatment. *Community Dent Health* 2000;17:92-6.
30. Smith AS, Cunningham SJ. Which factors influence willingness-to-pay for orthognathic treatment? *Eur J Orthod* 2004;26:499-506.
31. Mor V, Miller EA, Clark M. The taste for regulation in long-term care. *Med Care Res Rev* 2010;67:38 S-64 S1
32. Pannarunothai S, Mills A. The poor pay more: Health-related inequality in Thailand. *Soc Sci Med* 1997;44:1781-90.
33. Oscarson N, Lindholm L, Kallestål C. The value of caries preventive care among 19-year olds using the contingent valuation method within a cost-benefit approach. *Community Dent Oral Epidemiol* 2007;35:109-17.
34. Pommer B, Zechner W, Watzak G, Ulm C, Watzek G, Tepper G. Progress and trends in patients' mindset on dental implants. I: Level of information, sources of information and need for patient information. *Clin Oral Implants Res* 2011;22:223-9.
35. Zitzmann NU, Sendi P, Marinello CP. An economic evaluation of implant treatment in edentulous patients-preliminary results. *Int J Prosthodont* 2005;18:20-7.

**How to cite this article:** Al Garni B, Pani SC, AlMaaz A, Al Qeshtaini E, Abu-Haimed H, Al Sharif K. Factors affecting the willingness to pay for implants: A study of patients in Riyadh, Saudi Arabia. *Dent Res J* 2012;9:719-24.

**Source of Support:** Nil. **Conflict of Interest:** None declared.