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## Patients' general satisfaction with the appearance of anterior maxillary teeth

### Zadovoljstvo pacijenata izgledom prednjih gornjih zuba

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#### Abstract

**Background/Aim.** Dental appearance plays an important role in practically all personal social interactions. The main factors that define the dental appearance are tooth colour, shape and position, quality of restoration, and the general position of the teeth in arch, especially in the anterior region. The aim of this study was to evaluate the impact of dental status (tooth shape, fracture, dental and prosthetic restorations and presence of plaque) on patient's satisfaction with the dental appearance, controlling for the age and gender. **Methods.** A total of 700 Caucasian subjects (439 women) aged 18–86 (median 45 years) participated in the cross-sectional study. Study included clinical examination and self-administrated questionnaire based on self-perceived aesthetics and satisfaction with the appearance of their maxillary anterior teeth. **Results.** A regression analysis demonstrated that presence of dental plaque, tooth fracture, composite fillings and crowns had significant independent contribution and were negative predictors of satisfaction with teeth appearance. Participants with presence of plaque on upper teeth ( $p < 0.001$ ), fractures ( $p = 0.005$ ), composite fillings ( $p < 0.001$ ) and crowns ( $p = 0.032$ ) were less satisfied than those without it. Model explains 12% or variance of general satisfaction with the appearance of maxillary frontal teeth ( $p < 0.001$ ) and the major contributors are composite fillings (5.3%) and plaque (3.2%). Tooth shape, age and gender were not significant predictors of satisfaction. **Conclusion.** Satisfaction with the teeth appearance is under the influence of many factors with significant negative influence of presence of dental plaque, fractures, composite restorations, and crowns.

#### Key words:

esthetics, dental; patient satisfaction; surveys and questionnaires; age factors; dental plaque; dental restoration, permanent.

#### Apstrakt

**Uvod/Cilj.** Izgled zuba igra važnu ulogu u praktički svim kontaktima jedne osobe. Glavni faktori koji definišu izgled zuba su boja, oblik i pozicija zuba, kvalitet restauracije i položaj zuba u zubnom luku, posebno u prednjem delu. Cilj ovog rada bio je da se utvrdi uticaj životnog doba, pola, frakture zuba i plak indeksa na zadovoljstvo pacijenta izgledom zuba. **Metode.** U istraživanju je učestvovalo 700 ispitanika u životnom dobu 18–86 godina (medijana 45 godina). Istraživanje je bilo bazirano na kliničkom pregledu i ispunjavanju upitnika koji je uključivao pitanja bazirana na samoproceni zadovoljstva izgledom gornjih prednjih zuba. **Rezultati.** Regresijska analiza je pokazala da dentalni plak, frakture zuba, kompozitni ispuni i krunice imaju statistički značajan uticaj i da su negativni prediktori zadovoljstva izgledom zuba. Ispitanici s plakom na gornjim prednjim zubima ( $p < 0,001$ ), frakturom ( $p = 0,005$ ), kompozitnim ispunima ( $p < 0,001$ ) i krunicama ( $p = 0,032$ ) bili su manje zadovoljni od ispitanika bez njih. Model objašnjava 12% varijanse generalnog zadovoljstva izgledom gornjih prednjih zuba ( $p < 0,001$ ) kao i najveći učinak imaju kompozitni ispuni (5,3%) i plak (3,2%). Oblik zuba, životno doba i pol nisu bili značajni prediktori zadovoljstva. **Zaključak.** Zadovoljstvo izgledom zuba je pod uticajem mnogih faktora, a negativan uticaj imaju prisustvo zubnog plaka, fraktura, kompozitnih ispuna i krunica.

#### Ključne reči:

estetika, stomatološka; bolesnik, zadovoljstvo; ankete i upitnici; životno doba, faktor; zub, plak; zub, trajni ispuni.

## Introduction

In the past, restorative dentistry considered mostly functional demands, but with the decrease in caries prevalence, interest in dental aesthetics has increased rapidly among both patients and dentists<sup>1-4</sup>. Nowadays, public appearance plays an extremely important role in both advertising industry and media in general since it affects other people's perception in numerous daily situations<sup>1,5</sup>. Therefore in the last two decades esthetics in dental practice has become just as important as functional, structural and biological characteristics.

Dental appearance is a leading feature in determining the overall attractiveness of one's face, thus playing an important role in practically all personal social interactions. Principal factors which define the dental appearance are tooth colour, its shape and position, quality of restoration, and the general positioning of the teeth in arch (crowding, diastemas), which is especially important in the anterior region<sup>6,7</sup>. The overall appearance of the dentition may be influenced by gender, age and education level. Moreover, gender-related differences play quite a significant role in aesthetic dentistry, since it has been demonstrated that women and men seem to have different approaches and needs in their pursuit of a more favorable dental appearance<sup>8,9</sup>. Consequently, it is very difficult to address individual needs with specific guidelines or a unique systematic approach that will undoubtedly lead to consistent results<sup>10,11</sup>.

In general, patients want white Hollywood teeth. Thus, tooth colour is absolutely one of the most important factors determining patient satisfaction with their smile<sup>1,6,7,12,13</sup>. In fact, bright teeth have been related to high social skills, intelligence, prestige, ability to balance conflicting needs, and relationship status<sup>14</sup>. Alternatively, untreated dental caries, discoloured front teeth restorations and missing teeth in the anterior region are sources of displeasure and lack of satisfaction<sup>1,15-17</sup>.

Malocclusion is a common oral finding. Regardless of its high frequency, treatment needs and demands vary depending on cultural and personal differences. In some populations, tooth misalignments are not regarded as serious defects which would necessitate treatment, either orthodontic or prosthetic<sup>18</sup> while, in other populations, with high standards of dental appearance the need for orthodontic treatment may similarly be quite pronounced<sup>19</sup>. There is a general agreement in the literature that people who are motivated to seek orthodontic treatment of malocclusion do so prompted by its negative physical, psychological and social impacts. However, the studies focusing on the effects of malocclusion and consequences of its treatment on people's lives have offered inconsistent and confusing results<sup>20</sup>.

As mentioned before, the harmonious smile is defined not only by the dental esthetic elements – shape, position, and color of the teeth – but also by the gingival (soft) tissues. Gingival health defined by colour, margins and visibility is the essential component of an attractive smile<sup>21</sup>.

Since the aesthetics is an important dimension in dental practice, and it is a result of a pleasing composition of many elements modified by individual preferences, cultural influences, sociodemographic factors and self-perceived need for

dental treatments, the aim of this study was to determine the predictors of patients' satisfaction with esthetic appearance of their maxillary anterior teeth.

## Methods

A total of 700 Caucasian subjects from Rijeka region, Croatia, (aged 18-86; median 45 years) participated in the cross-sectional study (439 women). Sampling procedure included convenient sample – consecutive voluntary blood donors at the Department of Transfusion Medicine University Hospital Rijeka, subjects at regular annual check-ups at the Institute for Public Health Rijeka, and patients seeking treatment at the University Dental Clinic Rijeka. All the participants included in the study gave written informed consent to the survey procedures, which were approved by the Ethical Committee of the Rijeka University Faculty of Medicine.

The inclusion criteria were individuals with all six anterior teeth present in the upper jaw; while exclusion criteria were: evidence of gingival inflammation or hyperplasia, observable gingival recession, observable occlusal wear, active orthodontic therapy by edgewise appliances, temporary crowns in prosthetic rehabilitation, progressive endodontic therapy, usage of splints for the treatment of temporomandibular disorders and participants with craniofacial syndromes.

Study included clinical examination and Aesthetic Questionnaire. The Aesthetic Questionnaire was self-administrated and comprised five questions related to satisfaction with dental appearance in general (tooth colour, shape, position in a dental arch and appearance of gingiva of maxillary anterior teeth). Assessments were made using a three-point scale with possible answers 'dissatisfied' = 1, 'moderately satisfied' = 2, or 'completely satisfied' = 3.

To test psychometric properties of this five-item Aesthetic Questionnaire the preliminary investigation was conducted which included 70 individuals who answered the 5 questions from the Questionnaire. Plaque index was determined using the method described by O'Leary et al.<sup>22</sup> in 1972. Plaque levels were assessed on four tooth surfaces. Presence or absence of plaque was noted with „+“ and „-“.

In univariate analyses subjects were divided into 3 age groups: young age < 35 years; middle aged, 35–54 and old, ≥ 55 years. To examine the differences in several aspects of dental satisfaction in respect to gender a series of  $\chi^2$ -tests were performed within each age group ( $p < 0.05$ ). The multiple linear regression analysis was made to evaluate influence of presence of plaque, tooth shape (1 = ovoid; 2 = triangle and 3 = quadratic), fracture (0 = absent; 1 = present), composite fillings and crowns on maxillary anterior teeth on satisfaction with dental appearance, while controlling for the gender and age. For this purpose the variable plaque was introduced as a dichotomous variable: 0 = subject with no plaque or 1 = subject with plaque present on at least one tooth. Similar was done for presence of fractures, fillings and crowns.

The data were analyzed using a statistical software package SPSS 10.0 (SPSS 10.0; SPSS Inc., Chicago, IL, USA).

## Results

In the young age group most of the participants were moderately satisfied with the appearance and most of them were completely satisfied with colour, shape, position and gingiva of their teeth. As presented in the Table 1, there were no significant differences in gender in observed variables of dental satisfaction.

Participants from the middle age group were mostly completely satisfied with the appearance, colour, shape, position and

gingiva. However, several gender differences in satisfaction were obtained. Men and women from middle age group had a significantly different appraisal of satisfaction with the shape ( $\chi^2 = 10.175, p = 0.006$ ) of their teeth with 61.4% of women being completely satisfied with the shape compared to 39.7% of men, and with 28.6% men dissatisfied with the shape compared to 12.6% of women (Table 2.) Also, there was a significant difference in satisfaction with the position of teeth between men and women in the middle age group ( $\chi^2 = 5.961, p = 0.05$ ).

**Table 1**

**Results of  $\chi^2$ -test for satisfaction with different dental aspects between men (n = 79) and women (n = 180) in the young group (<35 years)**

Variable	Dissatisfied	Moderately	Completely satisfied	$\chi^2$	df	p
	n (%)	n (%)	n (%)			
Appearance				0.963	2	0.618
male	17 (33.3)	31 (39.2)	31 (39.2)			
female	34 (19)	83 (45.8)	63 (35.2)			
total	51 (19.8)	114 (43.8)	94 (36.4)			
Colour				1.373	2	0.503
male	12 (15.2)	29 (36.7)	38 (48.1)			
female	37 (20.6)	68 (37.8)	75 (41.7)			
total	49 (18.9)	97 (37.5)	113 (43.6)			
Shape				1.552	2	0.460
male	11 (13.9)	24 (30.4)	38 (48.1)			
female	19 (10.6)	68 (37.8)	75 (41.7)			
total	30 (11.6)	92 (35.5)	113 (43.6)			
Position				2.247	2	0.325
male	16 (20.3)	19 (24.1)	44 (55.7)			
female	31 (17.2)	60 (33.3)	89 (49.4)			
total	47 (18.1)	79 (30.5)	133 (51.4)			
Gingiva				1.096	2	0.578
male	8 (10.1)	19 (24.1)	19 (24.1)			
female	26 (14.4)	37 (20.6)	3 (20.6)			
total	34 (13.1)	56 (21.6)	56 (21.6)			

Note: % within the gender.

**Table 2**

**Results of  $\chi^2$ -test for satisfaction with different dental aspects between men (n = 63) and women (n = 127) in the middle age group (36–54 years)**

Variable	Dissatisfied	Moderately	Completely satisfied	$\chi^2$	df	p
	n (%)	n (%)	n (%)			
Appearance				5.602	2	0.061
male	19 (30.2)	26 (41.3)	18 (28.6)			
female	28 (22)	40 (31.5)	59 (46.5)			
total	47 (24.7)	66 (34.7)	77 (40.5)			
Colour				5.543	2	0.063
male	15 (23.8)	28 (44.4)	20 (31.7)			
female	24 (18.9)	40 (31.5)	63 (49.6)			
total	68 (35.8)	68 (35.8)	83 (43.7)			
Shape				10.175	2	0.006
male	18 (28.6)	20 (31.7)	25 (39.7)			
female	16 (12.6)	33 (26)	78 (61.4)			
total	34 (17.9)	53 (27.9)	103 (54.2)			
Position				5.961	2	0.051
male	18 (28.6)	19 (30.2)	26 (41.3)			
female	23 (18.1)	28 (22)	76 (59.8)			
total	41 (21.6)	47 (24.7)	102 (53.7)			
Gingiva				3.564	2	0.168
male	14 (22.2)	15 (23.8)	34 (54)			
female	18 (14.2)	23 (18.1)	86 (67.7)			
total	32 (16.8)	38 (20)	120 (63.2)			

Note: % within the gender.

Again, women were more frequently completely satisfied with the position of their teeth compared to men, while men were more frequently dissatisfied with the position compared to women (Table 2).

As presented in Table 3, participants from the old age group were mostly completely satisfied with the appearance, shape, position, and gingiva and moderately satisfied with colour of their teeth. There were no significant gender differences in dental satisfaction in this age group (Table 3).

der model. Multiple regression provide us this opportunity. This is demonstrated in present study. Although there is a different satisfaction with teeth appearance between genders in some age groups in univariate models, in general gender and age are not principal, significant or even highly influential factors of satisfaction in multiple model. Dental appearance is adversely affected by abnormalities and deviations in the oral region<sup>12</sup>. In this study we investigated satisfaction with dental appearance in relation to age, gender, pres-

**Table 3**  
**Results of  $\chi^2$ -test for satisfaction with different dental aspects between men (n = 119) and women (n = 132) in the old age group (> 55 years)**

Variable	Dissatisfied	Moderately	Completely	$\chi^2$	df	p
	n (%)	n (%)	satisfied n (%)			
Appearance				1.024	2	0.599
male	27 (22.7)	41 (34.5)	51 (42.9)			
female	25 (18.9)	53 (40.2)	54 (40.9)			
total	52 (20.7)	94 (37.5)	105 (41.8)			
Colour				.378	2	0.828
male	31 (26.1)	46 (38.7)	42 (35.3)			
female	30 (22.7)	53 (40.2)	49 (37.1)			
total	61 (24.3)	99 (39.4)	91 (36.3)			
Shape				4.076	2	0.130
male	12 (10.1)	48 (40.3)	59 (49.6)			
female	25 (18.9)	45 (34.1)	62 (47)			
total	37 (14.7)	93 (37.1)	121 (48.2)			
Position				3.800	2	0.150
male	15 (12.6)	44 (37)	60 (50.4)			
female	29 (22)	44 (33.3)	59 (44.7)			
total	44 (17.5)	88 (35.1)	119 (47.4)			
Gingiva				.136	2	0.934
male	21 (17.6)	29 (24.4)	69 (58)			
female	21 (15.9)	33 (25)	78 (59.1)			
total	42 (16.7)	62 (24.7)	147 (58.6)			

**Note: % within the gender**

In order to further examine dental satisfaction, a regression analyses were performed with dominant shape, dominant plaque, at least one fracture on upper incisors, at least one composite fillings on upper incisors, at least one crowns on upper incisors, age, and gender while dependent variable was satisfaction with dental appearance expressed as the average score on the Aesthetic Questionnaire (Table 4). The results showed that the model explains 12% of variance of dental satisfaction. Dental plaque, tooth fracture, composite fillings and crowns have significant independent contribution and are negative predictors. Participants with presence of plaque on upper teeth, fractures, composite fillings and crowns were less satisfied than those without it. The major contributors were composite fillings (5.3%) and plaque index on upper incisors (3.2%).

## Discussion

Numerous factors are influencing satisfaction with its own dental esthetics and this study may help dentists to pay increased attention to the factors of patients' concern. Some factors are to some extent interrelated, complemented, share the same variance, or reduce the effects of the other factor. Therefore they should be explored simultaneously in a broad-

ence/absence of composite fillings and crowns, plaque index and tooth fracture.

**Table 4**

Regression analyses for dental satisfaction		
Parameter	Beta	p
Dominant shape	0.046	0.197
Dominant plaque	-0.183	0.000
Fracture	-0.101	0.005
Composite filling	-0.247	0.000
Crowns	-0.083	0.032
Age	0.257	0.797
Gender	0.489	0.625
	R <sup>2</sup> = 0.122	
	F = 13.747	
	p = 0.000	

Limited number of documented literature was present on influence of different factors on satisfaction in Croatian population. This study would help subjects to show their satisfaction with dental appearance and it may help dentists to pay increased attention to the factors of patient concern.

### Gender and age

Contrary to our findings some evidence exist that apart from visible dental features, perception of dental appearance

is modified by cultural factors and individual preferences, varying between individuals and cultures and changing over time and with age<sup>5, 6, 23-25</sup>. It appears that men regard dental appearance as more important than women<sup>24</sup>, but females tend to be more satisfied with the general appearance of their teeth<sup>1</sup>. Results of our study showed that in the age group between 36 and 54 years, men are significantly less satisfied with the dental appearance, tooth shape and tooth position and achieved a significantly lower score on the average satisfaction of teeth in relation to women. This is likely due to strong impact of the media which portray men and women of all ages as needing to look younger and more attractive. Indeed, a study of 160 people of six different age strata ranging from 13 to 64 years showed that personal satisfaction with tooth colour was age-independent<sup>12</sup>. Although younger usually have healthier teeth, and less frontal restoration and discolorations they may be more concerned with slight imperfections. On contrary older people, in general, are more likely to be satisfied with their dental appearance<sup>12, 15</sup>, suggesting that the appearance of their teeth is not as important to older than to younger individuals<sup>5</sup>.

#### *Visible dental features*

Dental appearance is adversely affected by abnormalities and deviations in the oral region<sup>12</sup> so those visible traits must be primarily sources of dissatisfaction. Our model included and investigated several dominant dental traits – presence/absence of composite fillings and crowns, tooth shape, presence of plaque and tooth fracture. As it is demonstrated the presence of composite fillings and plaque on maxillary anterior teeth are major factors influencing dissatisfaction with dental aesthetics, but also not to a large extent.

#### *Restorations – fillings and crowns*

Composite fillings are the most common restorations in maxillary anterior teeth because of their low price in comparison to the prosthetic restorations. Although composite restorations can be completed in a single treatment session with no added laboratory cost, this material is presently limited by several restrictions – inability to completely replicate natural tooth in colour and changes induced during time due to polymerization-induced shrinkage, low wear resistance and surface porosity, which may influence the patient's level of satisfaction<sup>26</sup>. Those limitations of composite materials may contribute to poorer aesthetics in time and induce decrease of satisfaction with dental appearance. Therefore these materials need to improve their performances.

Younger people and women tend to expose more maxillary teeth than older and men<sup>24, 25</sup>. The shortcoming of

present study was that it did not assess the quality of restorations as an element that could influence satisfaction. Still, probably people sometimes think that when they have some dental restoration their dental appearance is altered or less natural and they are to some extent dissatisfied. Dental appearance may influence social interactions and contribute to social selection<sup>25</sup>. It also may reflect economic status<sup>27</sup>. Wealthier people, even with worse oral health, are likely to have better frontal restoration, brighter and straighter teeth and a higher red-white esthetics. Perhaps that is why the presence of composite restorations, even well-made, may be a higher source of dissatisfaction than presence of fixed prosthetic restorations.

#### *Plaque*

Satisfaction with teeth appearance may reflect general attitude on health, particularly oral health. That explains why presence of plaque is regarded second-order factor in dissatisfaction. The presence of gingivitis was not assessed in this study, but plaque index highly positively correlates with gingivitis<sup>28</sup>. Therefore it can be an indicator of periodontal health and oral health care. Quite expectedly, the increase of the degree of plaque index reduces the assessment of satisfaction with dental appearance. The participants who had a higher degree of plaque index reported a lower level of satisfaction with dental appearance. The plaque index was a statistically significant negative predictor of general satisfaction with their teeth ( $p < 0.001$ ).

#### *Shape*

Tooth shape does not significantly influence satisfaction with teeth appearance. Still, it appears that incisor shape may be the key determinant of their esthetic preferences with round incisors perceived as the most esthetic<sup>29</sup>. So to improve smile esthetics some mildly rounding the mesial and distal corners of square incisors can be done<sup>30, 31</sup>.

Many authors agree that the upper central incisors in particular are the key determinants in evaluating anterior dental aesthetics<sup>24, 26, 27, 31</sup>. This can be taken as implying that these teeth probably play the subconsciously important role in people's judgements concerning dental aesthetics. Maxillary teeth are often the most visible during smile, although this feature is age- and gender related.

#### **Conclusion**

This study revealed that composite fillings and a presence of dental plaque in the anterior maxillary teeth are negative predictors to a self-perceived dental appearance.

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