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Desire of university students for esthetic treatment and tooth bleaching: a cross-sectional study

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Aim: The aim of this study was to investigate the prevalence of the desire of university students for esthetic treatment and tooth bleaching, and associated factors. **Methods:** A cross-sectional study was performed in 2016 with first-semester university students in Pelotas. Data was collected via a self-administered questionnaire including demographic, socioeconomic and psychosocial characteristics. Oral Impact on Daily Performance (OIDP) was assessed and Poisson regression models were used to evaluate the association between the following outcomes: prevalence of desire for esthetic treatment and the tooth bleaching. A p-value of ≤ 0.05 was considered significant. **Results:** A total of 2,058 students participated in the study. Refusals represented a mere 1.4% of the total sample. Of the individuals interviewed, 16.1% underwent tooth bleaching and 74.4% reported a desire for esthetic dental treatment. Models showed students with higher family income and with the intention to use private dental services had 65% and 47% higher prevalence of tooth bleaching, respectively. Individuals satisfied with dental color and appearance exhibited a higher prevalence of tooth bleaching, as did those who smoked. On the other hand, students satisfied with dental color (PR= 0.77, 95% CI: 0.73-0.80) and with their dental appearance (PR= 0.82, 95% CI 0.78-0.87) demonstrated less desire to undergo esthetic dental treatment. Moreover, individuals who suffered some impact in OIDP reported a greater desire for esthetic treatment (PR= 1.07, 95% CI: 1.02-1.13). **Conclusion:** General and psychosocial characteristics were associated with the desire for esthetic treatment and tooth bleaching in university students.

Keywords: Tooth bleaching. Quality of life. Esthetics, dental.

Introduction

Dental appearance is an important component of facial attractiveness. This characteristic is considered a complex, subjective perception influenced by cultural, contextual, individual and environmental factors[1,2]. Teeth that are perfectly aligned and whiter are often considered important requirements for satisfaction with dental appearance[1-5]. In recent years, the demand for esthetic procedures has increased significantly in dentistry, not only through orthodontic treatment, but also by means of tooth bleaching[5]. In view of this, a symmetrical, harmonious, white smile has become associated with a better quality of life[3,5]. Moreover, a significant level of social construction in respect of esthetics can be observed in Brazil, which attributes an important role to the smile and, consequently, dental color[6]. A recent study in Brazil showed that individuals with significant dental caries displayed a higher prevalence of desire for tooth bleaching compared with the low caries group[2]. The authors have explained these findings through the social construction of the Brazilian population that frequently reports esthetics as a proxy for dental health[2].

Change in tooth color may occur due to a natural process of dental aging or may be caused by oral diseases, dental trauma or by the use of dental material such as mineral trioxide aggregate[7-10]. Moreover, tooth discoloration may also be due to extrinsic pigmentation, which occurs with the consumption of highly pigmented foods and also tobacco use[11]. Tooth discoloration is highly prevalent and may affect self-esteem[5,7,8,12]. These conditions could increase the desire for bleaching treatments. Dissatisfaction with tooth color is one of the main reasons associated with dissatisfaction with dental appearance[5].

One possible impact of tooth bleaching on the oral health-related quality of life (OHRQoL) has been discussed, but is still not entirely clear and may vary according to the age of the individual, since younger people attribute greater value to white teeth. While clinical studies on young adults[3] show that individuals reported greater satisfaction with their smiles after tooth bleaching, different findings have been observed in a similar design study with older individuals[13] failing to show an improvement in OHRQoL after tooth-bleaching treatment. Other studies have demonstrated that tooth bleaching increases subjects' self-esteem, and it could improve social interaction[5,7,8,12].

Accordingly, dental esthetics has been associated with oral health-related quality of life in young university students[14]. Small alterations in dental esthetics significantly influenced the OHRQoL of these students[14]. The University is an environment composed mostly of young people, permeated by a high degree of social interaction and, in this context, facial attractiveness tends to play an important role in the acceptance of individuals by their colleagues and friends[15]. Considering that adverse dental appearance has a negative impact on facial attractiveness, a high demand by university students for esthetic dental procedures might be expected, but this issue has not yet been investigated. Therefore, this study aimed to investigate the prevalence of the desire of university students for esthetic treatment and tooth bleaching, and associated factors.

Materials and methods

This study was reported in accordance with the STROBE guideline (Strengthening the Reporting of Observational Studies in Epidemiology). Full details concerning the methods of the present study have been published previously[16].

Design study and Participants

A cross-sectional study (baseline) nested within a prospective cohort study[16] was performed on a cohort of university students entering Federal University of Pelotas (UFPel) in the first semester of the 2016 academic year. All newcomers to the first semester of 2016 (baseline) were invited to participate and signed a consent form. In terms of eligibility criteria, we included only individuals able to self-answer the questionnaire. Individuals who were not able to self-answer the questionnaire (such as those with visual impairment or motor deficiency) and those who did not enter university in 2016, were excluded from the final sample.

Prior to the data collection, all academic units of the University were informed about the study, which consented to its performance.

Data collection

Data were collected using a self-administered questionnaire including 74 questions related to demographic and socioeconomic characteristics, psychosocial characteristics, habits and health-related behavior. Participants were addressed by trained graduates (n=5) and undergraduate students (n=20). Initially, four hours of theoretical training was carried out and the questions were discussed. A pilot study was carried out on 100 university students not eligible for the study, from five different academic units, randomly selected by lots.

Independent variables:

Age of participants in years was collected, being categorized as follows: a) less than 18 years of age; b) 18 to 24 years of age; c) 25 to 34 years of age; and d) over 34 years of age. Family income data were collected in the currency of Brazil (BRL) (1 dollar = 3.92 BRL) and classified into *a)* ≤ R$1,000; b) R$1,001 to R$5,000; and c) ≥ R$5,001. In relation to harmful habits, the habit of smoking and its frequency of use was investigated using a validated, Brazilian version of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) recommended by the World Health Organization (WHO). Individuals were considered smokers if they reported smoking at least once a month.

Satisfaction with dental color was assessed by way of the question: Are you satisfied with the color of your teeth? [17]. Answers were dichotomized into satisfied (very satisfied / satisfied) and dissatisfied (very dissatisfied / dissatisfied). Satisfaction with dental appearance was assessed using the statement: "I do not like to see my teeth when I look at myself in the mirror, in photographs or in videos"[6]. The individuals were instructed to choose one of the following options, a) I do not agree; b) I agree a little; c) I agree; d) I agree a lot; and e) I totally agree. Alternatives were dichotomized into satisfied (I do not agree) and dissatisfied (the other alternatives).

Self-perception of oral health was obtained via the following question: Compared to other people of your age, how do you consider the health of your teeth, mouth and gums? Response options were dichotomized into: a) good (very good / good) and b) poor (regular / bad / very bad). The oral healthcare system data were collected through the following question: "If you need to go to the dentist, which type of dental service would you choose?", dichotomized into public dental service (public service/ school of dentistry) and private dental service (private health insurance/ private dental office). Oral health-related quality of life was assessed using the Brazilian version of the Oral Impact on Daily Performance (OIDP)[18]. This tool comprises questions including three domains (physical, psychological and social), with the alternatives being presented on a six-point *Likert* scale (a) never; b) less than once a day; c) once or twice a month; d) once or twice a week; e) 3-4 times per week; and f) every or almost every day). A cut-off point was established using the median. Oral health status was assessed through self-reported dental caries experience. The participants answered (yes/no) if he/she had at least one decayed, filled or extracted tooth due to dental caries. Individuals that answer yes to this question were considered to have experience of caries.

Dependent variables (outcomes)

The desire for esthetic dental treatment was assessed using the question: "Would you like to have esthetic treatment to improve the appearance of your teeth?" Tooth bleaching was assessed via the question: "Have you ever had your teeth bleached using trays or in a dental environment?". Both questions had yes (reference categories) and no as the response alternatives.

Ethical aspects

This study was approved by the Ethics Committee of the Faculty of Medicine/UFPel under protocol number 49449415.2.0000.5317.

Statistical methods

Statistical analyses were performed using the software Stata 12.0 (Stata Corporation, College Station, TX, USA). For the descriptive analysis, relative and absolute frequencies were estimated. Multivariate Poisson regression models have been proposed to estimate prevalence ratios of binary outcomes in cross-sectional studies[19]. Poisson regression models were used to assess the association between variables of interest (the desire for esthetic treatment and tooth bleaching) and exposure variables. This strategy permitted the estimate of the Prevalence Ratio (PR) as the measure of effect and a 95% confidence interval (CI) was adopted. Variables with P values of ≤ 0.20 in the crude analyses were included in the model fit. A forward-stepwise procedure was used to include or exclude explanatory variables in the model fit. For the final model, the variables were considered significant if they had a p-value of ≤ 0.05, after adjustment.

Results

A total of 3,237 students entered University in the first semester of 2016, of which 2,058 (63.6%) participated in this study. Twenty-nine students (1.4%) declined to participate. More than half of participants were women (52.3%), with ages ranging from

18 to 24 (66.1%) and with family income in the second tertile (61.6%). Desire for dental esthetic treatment was reported by 74.4% of the university students. Of the participants, 16.1% had already undergone tooth bleaching. Table 1 displays characteristics according to the desire for dental esthetic treatment and for tooth bleaching.

Table 1. Sample characteristics according to tooth bleaching and to desire for dental esthetic treatments. Federal University of Pelotas, Pelotas/Brazil (n=2,071 university students). 2016.

Variable/Category	Dental bleaching N (%)	Desire for dental esthetic treatments N (%)
Sex	**2,061**	**2,063**
Male	159 (16.16)	681 (69.21)
Female	172 (15.97)	858 (79.52)
Age (years)	**2,061**	**2,063**
16 - 17	53 (17.15)	209 (67.42)
18 - 24	214 (15.67)	1,032 (75.66)
25 - 34	36 (16.90)	162 (75.35)
35 or more	30 (17.34)	133 (76.44)
Family income	**1,702**	**1,704**
≤ R$1000	32 (11.68)	220 (79.42)
R$1001 to R$5000	152 (14.49)	796 (75.88)
≥ R$5001	85 (22.43)	271 (71.69)
Satisfaction with dental color	**2,068**	**2,070**
Dissatisfied	91 (10.92)	763 (91.60)
Satisfied	243 (19.68)	777 (62.81)
Satisfaction with dental appearance	**2,048**	**2,049**
Dissatisfied	129 (13.03)	864 (87.10)
Satisfied	204 (19.28)	660 (62.44)
Caries experience	**2,069**	**2,071**
No	97 (14.72)	476 (72.34)
Yes	237 (16.81)	1,065 (75.37)
Self-perception of oral health	**2,067**	**2,069**
Good	256 (17.32)	1,069 (72.38)
Bad	77 (13.07)	471 (79.56)
Dental service payment mode	**1,747**	**1,749**
Public	61 (11.87)	389 (75.24)
Private	225 (18.25)	903 (73.3)
Smoking	**2,009**	**2,010**
No	263 (15.26)	1,293 (74.96)
Yes	60 (21.05)	203 (71.23)
Oral health-related quality of life	**2,002**	**2,003**
No impact	202 (17.34)	791 (67.78)
With impact	119 (14.22)	698 (83.49)

A crude analysis showed that family income, satisfaction with dental color, satisfaction with dental appearance, self-perception about oral health, the oral healthcare system, smoking habits and oral health-related quality of life were associated with having undergone tooth bleaching. After adjustments, family income, satisfaction with dental color, satisfaction with dental appearance, the oral healthcare system and smoking habits remained associated with the outcome. University students with high family income and those with intention to use private dental services equated to 65.0% (PR= 1.65, 95% CI: 1.07–2.54) and 47.0% (PR= 1.47, 95% CI: 1.10–1.97), greater prevalence of tooth bleaching, respectively. Similarly, individuals who were satisfied with their dental color (PR= 1.44, 95% CI: 1.08-1.93) and their dental appearance (PR= 1.29, 95% CI: 1.00-1.68) also presented high prevalence of tooth bleaching. Student smokers (PR= 1.49, 95% CI: 1.11-2.01) reported a higher prevalence of having undergone tooth bleaching when compared to non-smokers (Table 2).

When the desire for dental esthetic treatment was considered, a crude analysis showed a positive association with sex, age, family income, satisfaction with dental color, satisfaction with dental appearance, self-perception about oral health, tooth bleaching and oral health-related quality of life. After adjustments, women students (PR= 1.09, 95% CI: 1.09-1.21) aged between 18 and 24 (PR= 1.11, 95% CI: 1.02-1.19) and those aged between 25 and 34 (PR= 1.11, 95% CI: 1.00-1.23) were more likely to crave dental esthetic treatment. Students satisfied with their dental color (PR= 0.77, 95% CI: 0.73-0.80) and with their dental appearance (PR= 0.82, 95% CI: 0.78-0.87) were less likely to desire dental esthetic treatment. It was observed that students who suffered an impact on oral health-related quality of life reported a greater desire for esthetic treatment (PR= 1.07, 95% CI: 1.02-1.13) (Table 3).

Discussion

This study showed that general and psychosocial characteristics are associated with the desire of university students in Southern Brazil to undergo esthetic treatment and tooth bleaching. We observed that students that reported a negative impact on OHRQoL were associated with a greater desire for esthetic treatment. Moreover, students who reported being smokers presented an almost 50% higher prevalence of tooth bleaching.

Esthetics is a very important concept to the general population and has been considered a key component of social interaction. This media pressure for a better look has increased the demand for esthetic procedures, especially in women and young people[5,20-23]. Women are more concerned about health and more dissatisfied with their appearance[5] and are more likely to turn to esthetic procedures[20,21], such as plastic surgery[23]. In dentistry, people are concerned about tooth alignment and color[2]. An analysis of the printed media in the state of Espírito Santo showed an excessive appeal to esthetic issues linked to the capitalist philosophy of treating oral health as a commodity rather than as a health issue[24]. Thus, the overt publication of esthetic issues in the media reflects social values related to desire and vanity, which contribute to the production of a utopian-style esthetic benchmark[24].

Table 2. Crude (c) and adjusted (a) prevalence ratio (PR) for independent variables for tooth bleaching. Poisson regression model. Federal University of Pelotas, Pelotas/Brazil (n=1,422 universities students). 2016.

Variable/Category	PR[c] (CI95%)	p-Value	PR[a](CI95%)	p-Value
Sex		0.907	-	-
Male	1			
Female	0.99 (0.81 – 1.20)			
Age (years)		0.840		-
16 and 17	1		-	
18 to 24	0.91 (0.69 – 1.20)			
25 to 34	0.99 (0.67 – 1.45)			
35 or more	1.01 (0.67 – 1.52)			
Family income		< 0.001		0.005
≤ R$1000	1		1	
R$1001 to R$5000	1.24 (0.87 – 1.77)		1.16 (0.77 – 1.75)	
≥ R$5001	1.92 (1.32 – 2.80)		1.65 (1.07 – 2.54)	
Satisfaction with dental color		< 0.001		0.012
Dissatisfied	1		1	
Satisfied	1.80 (1.44 – 2.25)		1.44 (1.08 – 1.93)	
Satisfaction with dental appearance		< 0.001		0.050
Dissatisfied	1		1	
Satisfied	1.48 (1.21 – 1.81)		1.29 (1.00 – 1.68)	
Caries experience		0.232		-
No	1		-	
Yes	1.14 (0.92 – 1.42)			
Self-perception of oral health		0.020	-	-
Good	1			
Bad	0.76 (0.60 – 0.96)			
Dental service payment mode		0.001		0.010
Public	1		1	
Private	1.54 (1.18 – 2.00)		1.47 (1.10 – 1.97)	
Smoking		0.012		
No	1		1	0.008
Yes	1.38 (1.07 – 1.77)		1.49 (1.11 – 2.01)	
Oral health-related quality of life		0.062		-
No impact	1		-	
With impact	0.82 (0.67 – 1.01)			
-2 log likelihood (Empty model) = 1,886.5		-2 log likelihood (Final model) = 1,253.6		

Beyond the influence of the media, satisfaction with appearance is intimately related to the social interaction that this subjective condition provides, especially in young individuals who want to be accepted into a social group[25]. Our results corroborate the findings of previous studies, in which women and younger subjects show greater

Table 3. Crude (c) and adjusted (a) prevalence ratio (PR) for independent variables for the desire for esthetic treatments. Poisson regression model. Federal University of Pelotas, Pelotas/Brazil (n=1,422 universities students). 2016.

Variable/Category	PR[c] (CI95%)	p-Value	PR[a](CI95%)	p-Value
Sex		< 0.001		< 0.001
Male	1		1	
Female	1.15 (1.09 – 1.21)		1.15 (1.09 – 1.21)	
Age (years)		0.042		0.423
16 and 17	1		1	
18 to 24	1.12 (1.03 – 1.22)		1.11 (1.02 – 1.19)	
25 to 34	1.12 (1.00 – 1.25)		1.11 (1.00 – 1.23)	
35 or more	1.13 (1.01 – 1.27)		1.04 (0.94 – 1.15)	
Family income		0.021		-
≤ R$1000	1		-	
R$1001 to R$5000	0.96 (0.89 – 1.02)			
≥ R$5001	0.90 (0.83 – 0.98)			
Satisfaction with dental color		< 0.001		< 0.001
Dissatisfied	1		1	
Satisfied	0.69 (0.65 – 0.72)		0.77 (0.73 – 0.80)	
Satisfaction with dental appearance		< 0.001		< 0.001
Dissatisfied	1		1	
Satisfied	0.72 (0.68 – 0.76)		0.82 (0.78 – 0.87)	
Caries experience		0.150		-
No	1		-	
Yes	1.04 (0.99 – 1.10)			
Self-perception of oral health		< 0.001	-	-
Good	1			
Bad	1.09 (1.04 – 1.16)			
Dental service payment mode		0.391		-
Public	1		-	
Private	0.97 (0.91 – 1.03)			
Smoking		0.204		
No	1		-	-
Yes	0.95 (0.87 – 1.03)			
Tooth bleaching		0.001		0.110
No	1		1	
Yes	0.87 (0.80 – 0.94)		0.94 (0.87 – 1.01)	
Oral health-related quality of life		< 0.001		0.007
No impact	1		1	
With impact	1.23 (1.17 – 1.30)		1.07 (1.02 – 1.13)	
-2 log likelihood (Empty model) = 3,995.1			-2 log likelihood (Final model) = 3,702.0	

desire for esthetic treatment in plastic surgery[23] and dentistry[5,20-22]. Similarly, our study demonstrated that individuals satisfied with their dental color and dental appearance reported less desire for dental esthetic treatment. However, those individuals who did report some impact on their oral health-related quality of life tend to be more desirous of dental esthetic treatment, probably because they believe that undergoing esthetic dental procedures improves their oral health. In fact, similar observations were found in a birth cohort in southern Brazil[2]. Individuals with a history of dental caries over the course of their lives had 9% greater desire for tooth bleaching[2], highlighting the narrow relationship between the perception of esthetics and health in this population. So, social construction of esthetics and the excessive pressure of these parameters in the media can affect individuals' behavior concerning the demand for dental treatment, such as tooth bleaching[6] and replacement with non-white dental restoration[26], thus causing possible overtreatment. This desire for highly esthetic standards can be observed both in patients and in dentists. In fact, in Brazil, which has twice as many dentists than recommended by the World Health Organization, largely confined to the larger cities[27] - recommends the total substitution of amalgam restorations for esthetic reasons, mainly in Caucasian patients.

Facial and dental attraction represents an important element in the quality of life. Individuals who perceive themselves to be "less attractive" tend to have lower self-esteem than those who consider themselves esthetically attractive. Similarly, individuals who find themselves more attractive and have a better health-related quality of life tended to perform orthodontic treatment and tooth bleaching. Tooth color is one of the most common components of the smile that causes dissatisfaction amongst people[6], and studies have demonstrated that individuals who underwent tooth bleaching state they are more satisfied with their dental color[5,28]. Similarly, we found an association between tooth bleaching and both satisfaction with dental color and satisfaction with dental appearance. This relationship highlights the significant contribution of tooth bleaching in the self-perception of dental appearance, explaining the increasing desire for tooth bleaching[5,28]. Conversely, as previously mentioned, our study showed that students satisfied with their dental appearance and their dental color exhibited less desire for esthetic treatment.

Tooth bleaching is the most craved after esthetic procedure[5] and the cost is lower when compared with composite or ceramic veneers. However, tooth bleaching is still very costly and available only through private dental services. Brazil's Unified Health System (SUS) provides free dental services to the population, focusing mainly on a preventive approach and on treatment of dental diseases[29]. Thus, the costs of esthetic procedures, including tooth bleaching, are not covered by the public system. This fact may partly explain the higher prevalence of tooth bleaching among those subjects with higher family income. It should be noted that Brazil has a large number of dentists[27] and the prevalence of dental caries is in decline, in all age groups. The market has become very competitive and there is increased demand for esthetic and cosmetic training in continuing education courses for dentists and, as a consequence, an increase in the prevalence of esthetic dental treatment provided by private dental offices. It indicates that the use of private services can be a decisive factor for performing tooth bleaching. On the other hand, a birth

cohort study only observed an association between prevalence of tooth bleaching and type of dental service used in crude models. Individuals that paid for their own treatment using private services, exhibited a greater prevalence of tooth bleaching, despite the association being discarded in the final model[2]. Moreover, the marketing industry has encouraged individuals to desire esthetic treatment and also constructed a utopian, esthetic demand in Brazilian society without fully appreciating the value of health[24].

Our findings also showed a higher prevalence of tooth bleaching among student smokers. Changes in tooth color can also occur due to extrinsic pigmentations provided by food and tobacco[11]. Previous studies reported a higher dissatisfaction with dental appearance in smokers[12,30]. Therefore, these individuals tend to undergo more tooth bleaching than non-smokers. A recent clinical trial concerning the effectiveness of at-home bleaching by smokers and non-smokers observed darker teeth in smokers after a year[11]. However, after dental prophylaxis, the authors observed that this darkening would disappear. This emphasizes, therefore, that the darker tooth color of smokers, even if these pigmentations are only extrinsic in nature, could lead these individuals to be more dissatisfied with dental color[12,30], and seek to carry out tooth bleaching to improve their dental appearance.

However, a number of limitations should be mentioned. Studies that use a cross-sectional design conceal the causal inferences. Thus, it is impossible to infer if students that reported a negative impact on OHRQoL had a greater desire for esthetic treatment or if this esthetic desire manifested itself prior to the impact on the quality of life (OHRQoL). In addition, the use of self-reported measures could be overestimated, as this is a subjective measurement. However, studies have shown individuals perceive the need for treatment in a similar way to the normative question, demonstrating that there is a similarity in these two evaluations and that, in most cases, there is no overestimation of the need for treatment based on self-perception[31]. Moreover, self-reported measurements have been considered as reliable, valid tools, being widely used in epidemiologic studies[4,5,32]. Lastly, the participant may have answered "yes", interpreting this option as a possible offer to perform some dental esthetic procedure. However, the prevalence was similar to that reported in other studies[5].

Furthermore, some points should be highlighted from the present study. To the best of our knowledge, this is the first study to investigate the desire for dental esthetic procedures and tooth bleaching in a large sample of university students. A tiny minority of losses and refusals render our results consistent, which can be extrapolated to populations with similar characteristics. Moreover, few studies have evaluated the association between quality of life and tooth bleaching, usually in studies with small sample sizes[3,13].

Thus, the present findings show that general and psychosocial characteristics are associated with the desire for esthetic treatment and tooth bleaching in university students, including satisfaction with dental color and satisfaction with dental appearance.

Compliance with Ethical Standards

Conflict of interest: The authors declare that there is no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its subsequent amendments, or comparable ethical standards.

Informed consent: Informed consent was obtained from all individuals participating in the study.

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