

Dental Whitening: Self-Referred Needs *versus* Professional Indication

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ABSTRACT

Objective: To analyze the self-reported need of patients compared to professional indications for tooth whitening. **Material and Methods:** Initially, 58 undergraduate students responded to a form that highlighted the question: "Do you think you need to have your teeth whitened?" Among those who answered positively to the previous question, ten individuals were photographed with their smiles. In addition, they were asked to point out, on the Vita 3D-Master scale, which color they believed their teeth had, a value that was compared to the actual color obtained by a spectrophotometer. Finally, the photographs were presented to dentists, who were asked about the indication or not of the whitening treatment. **Results:** Most interviewees (63.8%) self-reported the need for whitening, as well as there was a greater incidence of a positive indication among professionals (53.9%). Pearson's Chi-square test revealed a relationship between patient gender and the training course on the desire to have teeth whitened. Among the professionals, the specialty, as well as time since graduation, interfered in the indication for whitening. **Conclusion:** Professionals and patients share the aesthetic ideal directly related to light teeth; most patients self-perceive the color of their teeth darker than it actually is; the opinion about the color of the teeth has an extremely subjective character and varies greatly from one professional to another.

Keywords: Self-Assessment; Tooth Bleaching; Esthetics.

Introduction

Aesthetic treatment is an important guide in improving social and human relationships, imposing changes in their well-being, self-esteem, and self-image. It is accepted that self-esteem is equivalent to loving oneself, but when diminished, it implies feelings of incapacity, apathy, discouragement, and indifference, which can affect anxiety, anguish, and fear [1].

Tooth whitening is inserted in this context and appears as an aesthetic tool for a harmonic smile, proving the need of the patient to feel accepted and helping in the meeting of well-being with self-esteem [2]. The idea that white teeth are healthier, as well as the variability of whitening products available to the general population, increases the desire to perform this procedure. Tin-Oo et al. [3] and Demarco et al. [4] demonstrated that tooth color generates greater concern in the individual than shape and dental alignment.

However, the desire to have white teeth has led people to perform tooth whitening many times with shorter repetition intervals without professional guidance [5,6]. Therefore, dental professionals must be aware of the limit between technique and ethics, remembering that patient dissatisfaction also creates professional frustration and that expectation greatly influences treatment satisfaction.

Previous studies indicated that nonprofessionals are more likely to prefer whiter teeth than dentists, although there are few studies available [7,8]. However, a recent study with dentistry undergraduate students showed that female students were more likely to want to bleach their teeth and B1 shade was the most desired shade among them. In addition, Fifth-year students were more satisfied with their teeth color as compared with 1st-year students [9].

The aesthetic self-perception of whitening is poorly explored in the literature [10]. Thus, this study aimed to list and discuss the importance of tooth whitening for people by analyzing the incidence of self-reported needs by patients compared to professional indications for whitening. It is also assessed whether there will be a discrepancy between the dental color indicated by the patients and the color registered with the spectrophotometer and observe if there will be differences in the incidence of professional indication depending on the dentist's specialty.

Material and Methods

Ethical Clearance

This study was submitted to and approved by the local Human Research Ethics Committee (Protocol nº 37756214.7.0000.5208). All volunteers agreed to participate in the present research and signed a consent form to participate in the study.

Study Design and Data Collection

In the first stage of this cross-sectional study, 58 individuals of both sexes, between 18 and 46 years old, were interviewed among students enrolled in courses in the area of health and biological sciences at the Federal University of Pernambuco, according to the following inclusion criteria: 1. Presence of all-natural and vital anterior superior teeth; absence of extensive restorations or prostheses involving the buccal surfaces of the anterior teeth; absence of carious lesions on the anterior teeth; absence of periodontal disease. In addition, patients under 18 years of age were excluded; dental students and smokers.

The individuals received a form from which the questions stand out: 1. Have you ever had underwent teeth whitening treatment? 2. If so, which type? 3. Do you think you need to have your teeth whitened? 4. In your opinion, who or what dictates the patterns related to the ideal color of a smile?

From this initial sample, 10 individuals were selected by lot; among those who responded positively regarding the need to have teeth whitened, however, only nine attended. After receiving dental prophylaxis with pumice paste and Robinson's brush, they photographed the frontal smile and smiling face with a digital camera (EOS Rebel T5i, Canon Medical Systems Corporation, Tokyo, Japan) coupled with a circular flash, under the same lighting conditions and with the same speed and aperture regulation.

Then, each individual received a dental color scale (Vita Toothguide 3D Master, VITA Zahnfabrik, Bad Säckingen, Germany), ordered according to the value of the lightest to the darkest color, and they were asked which value they believed to correspond to the color of their smile. The value indicated was then noted on the form and compared to the value, on the same scale, obtained by recording the color of the upper right central incisor with a portable digital spectrophotometer (Vita Easyshade, Vident, Brea, California, USA).

In a second step, the photographs of the 9 patients were presented to 20 dentists (convenience sample), who, after reading and signing the informed consent form, were asked if, from their point of view, the patients in question would have a clinical need to receive vital whitening treatment. The responses were noted on a form.

Data Analysis

Data were analyzed descriptively using absolute and percentage frequencies and statistical measures: mean, standard deviation, and median for the age variable and were inferentially analyzed using Pearson's Chi-square test or Fisher's exact test when the condition for using the Chi-square test was not verified. To verify the existence of a difference between the opinions of dentists, the Cochran test was applied and to observe the agreement index between them in relation to the nine patients, Kendall's concordance coefficient was obtained. The margin of error used in the decisions of the statistical tests was 5.0%. Statistical calculations were performed with SPSS (Statistical Package for the Social Sciences) in version 21.

Results

Table 1 corresponds to the general characteristics of the sample. The age of the 58 individuals interviewed ranged from 17 to 46 years, had a mean of 20.34 years, a standard deviation of 3.96 years, and a median of 19 years.

Table 1. Distribution of students according to the characterization data.

Variables	N	%
Age Range (Years)		
18 to 19	31	53.4
20 to 46	27	46.6
Sex		
Male	27	46.6
Female	31	53.4
Profession		
Student	56	96.6
Civil firefighter	1	1.7
Musician	1	1.7
Course		
Biological Sciences	7	12.1
Nutrition	20	34.5
Medicine	4	6.9
Physical Education	22	37.9
Biomedicine	5	8.6
Place of Birth		
Recife	22	37.9

Recife Metropolitan Region	4	6.9
Inland/ Another state	10	17.2
No information	22	37.9

Regarding questions related to teeth whitening, it is noteworthy that: only 15.5% (9) answered affirmatively to have already performed tooth whitening. Of these, 6.9% had undergone teeth whitening using the in-office technique, 5.2% had undergone supervised whitening, and one individual had used over-the-counter whitening stripes. The majority (63.8%) stated that they needed to have their teeth bleached. In the question about who or what dictates the standards related to the ideal color of a smile, more than half (56.9%) answered that it was "Media", followed by 19.0% was "Self-esteem" and 10.3% claimed to be the "Society" (Table 2).

Table 2. Distribution of students interviewed according to issues related to teeth whitening.

Questions	N	%
P1. Have you performed tooth whitening?		
Yes	9	15.5
No	49	84.5
P2. If you have done tooth whitening, what type?		
In-office	4	6.9
At Home	3	5.2
Whitening tapes	1	1.7
No answer	1	1.7
No performed tooth whitening	49	84.5
P3. Do you think you need to have your teeth whitened?		
Yes	37	63.8
No	21	36.2
P4. In your opinion, who or what rule the patterns related to the ideal color of a smile?		
Media	33	56.9
Oral Hygiene	2	3.4
Society	6	10.3
Self esteem	11	19.0
Family	1	1.7
Dentist	1	1.7
Labor market	3	5.2
Genetic	1	1.7
P5. Is there a missing "front" tooth with a crown, prosthesis or with major restoration?		
Yes	3	5.2
No	55	94.8

Table 3 shows the comparison between the frequency of students who have already had teeth whitening according to age and sex, where it is possible to observe that the percentage that had already undergone tooth whitening was higher in the 20 to 46 age group than between 18 and 19 years old (22.2% versus 9.7%) and this percentage was only 1.3% higher in females (16.1% versus 14.8%), however for an error margin of the statistical tests (5%) there is no significant association between the question with any of the two variables analyzed ($p > 0.05$).

Table 3. Percentage distribution of responses to the question: "Have you performed tooth whitening?" According to age group and sex.

Variables	Performed Tooth Whitening				Total		p-value
	Yes		No		N	%	
	N	%	N	%			
Total Group	9	15.5	49	84.5	58	100.0	
Age Range (Years)							
18 to 19	3	9.7	28	90.3	31	100.0	$p^{(1)} = 0.279$
20 to 46	6	22.2	21	77.8	27	100.0	

Sex							
Male	4	14.8	23	85.2	27	100.0	p ⁽¹⁾ = 1.000
Female	5	16.1	26	83.9	31	100.0	

⁽¹⁾Fisher's exact test.

In the study of the question "Do you think you need to have your teeth whitened?" Table 4 shows that the percentage that answered affirmatively was: much higher among female than male students ($p=0.001$). The response was affirmative for most students in all courses, except for those in medical courses, with an emphasis on nutrition students (70.0%) and physical education courses (63.6%). The association between the question was verified for both variables ($p < 0.05$). Eight (88.9%) of the nine photographed individuals indicated darker shades on the scale compared to the actual color indicated by the digital spectrophotometer. Only for one of them (11.1%), these values coincided (Table 4).

Table 4. Percentage distribution of answers to the question: "Do you think you need to have your teeth whitened" according to sex and course.

Variables	Do you think you need to have your teeth whitened?				Total Group		p-value
	Yes		No		N	%	
	N	%	N	%			
Total	37	63.8	21	36.2	58	100.0	
Sex							
Male	11	40.7	16	59.3	27	100.0	p ⁽¹⁾ =0.001*
Female	26	83.9	5	16.1	31	100.0	
Course							
Biological Sciences	4	57.1	3	42.9	7	100.0	p ⁽²⁾ =0.036*
Nutrition	14	70.0	6	30.0	20	100.0	
Medicine	-	-	4	100.0	4	100.0	
Physical Education	14	63.6	8	36.4	22	100.0	
Biomedicine	5	100.0	-	-	5	100.0	

*Significant association at 5.0%; ⁽¹⁾Pearson's Chi-square test; ⁽²⁾Fisher's exact test.

Table 5 shows the results of the 180 evaluations performed by the 20 dentists in the nine individuals who said they needed the whitening treatment, depending on the specialty, time of graduation and teaching institution where the teachers took the course. From this table, it is highlighted that: a little more than half (53.9%) of the answers were indicative of whitening; there was a significant association between the indication of whitening with specialty and time since graduation. The percentage of positive indications was higher among professionals in the specialties: Dentistry, Dentistry + Orthodontics and Dentistry + Implantology, and lower among specialists in Dentistry + Endodontics, Endodontics, Pediatric Dentistry and Periodontics. The highest percentage of responses with an indication for whitening occurred among those who had more than 20 years of graduation (65.3%) and the lowest among those who were 10 to 19 years of age (35.6%).

Table 5. Evaluation of the percentage of whitening indication by dental surgeons according to specialty, time of graduation and teaching institution.

Variables	Tooth Whitening Indication				Total Group		p-value
	Yes		No		N	%	
	N	%	N	%			
Total	97	53.9	83	46.1	180	100.0	
Specialty							p ⁽¹⁾ =0.018*
Dentistry	7	77.8	2	22.2	9	100.0	
Dentistry/ Orthodontics	7	77.8	2	22.2	9	100.0	
Dentistry / Implantology	7	77.8	2	22.2	9	100.0	
Implantology	12	66.7	6	33.3	18	100.0	
Maxillofacial Surgery	12	66.7	6	33.3	18	100.0	
Prosthesis	6	66.7	3	33.3	9	100.0	

Dentistry/ Prosthesis	6	66.7	3	33.3	9	100.0	
Dentistry/ Maxillofacial Surgery/ Radiology	6	66.7	3	33.3	9	100.0	
Orthodontics	9	50.0	9	50	18	100.0	
Dentistry/ Endodontics	4	44.4	5	55.6	9	100.0	
Endodontics	7	38.9	11	61.1	18	100.0	
Pediatric Dentistry	6	33.3	12	66.7	18	100.0	
Periodontics	3	16.7	15	83.3	18	100.0	
No Specialty	5	55.6	4	44.4	9	100.0	
Graduation time							
Up to 9 years	34	54.0	29	46.0	63	100.0	p ⁽²⁾ = 0.007*
10 to 19 years	16	35.6	29	64.4	45	100.0	
20 or more	47	65.3	25	34.7	72	100.0	
Educational Institution							
Universidade Federal de Pernambuco	57	57.6	42	42.4	99	100.0	p ⁽²⁾ = 0.160
Universidade de Pernambuco	26	57.8	19	42.2	45	100.0	
Universidade de Campinas	2	22.2	7	77.8	9	100.0	
Universo, Rio de Janeiro	3	33.3	6	66.7	9	100.0	
Faculdade de Odontologia, USP	3	33.3	6	66.7	9	100.0	
Universidade Estadual de Londrina	6	66.7	3	33.3	9	100.0	

*Significant association at 5.0%; ⁽¹⁾Fisher's exact test; ⁽²⁾Pearson's Chi-square test.

Table 6 reveals the frequency of positive indications for whitening for each patient and the frequency of positive indications per professional. The data reaffirm the high number of positive indications among professionals. Through the Cochran test, a significant difference between professionals ($p < 0.05$) is proved and Kendall's coefficient of agreement between professionals was $W = 0.337$ ($W < 0.65$), a value considered low.

Table 6. Number of whitening indications for each patient and frequency of positive indications per professional.

Variables	N	%
Pacient⁽¹⁾		
1	11	55.0
2	15	75.0
3	14	70.0
4	16	80.0
5	3	15.0
6	4	20.0
7	17	85.0
8	16	80.0
9	1	5.00
Professional⁽²⁾		
1	-	-
2	9	100.0
3	6	66.7
4	7	77.8
5	5	55.6
6	4	44.4
7	7	77.8
8	7	77.8
9	6	66.7
10	5	55.6
11	2	22.2
12	6	66.7
13	2	22.2
14	3	33.3
15	3	33.3
16	6	66.7
17	6	66.7

18	4	44.4
19	5	55.6
20	4	44.4

⁽¹⁾Percentage based on 20 professionals; ⁽²⁾Percentage based on 9 patients.

Discussion

It is believed that white teeth are associated with health, youthfulness, dynamism, success, sympathy, expressiveness, and socioeconomic prestige. Currently, an aesthetically pleasing smile is one of the main wishes of most dental office patients, encouraged by the aesthetic standards imposed by society and the media [11]. However, a recent study by Bonafé et al. [12] concluded that subjects who undergo dental bleaching treatment could improve their confidence in dental appearance and reduce concerns about dental aesthetics and the social and psychological impact of dental alterations. In this study, it was assessed the self-reported need of patients compared to professional indications for tooth whitening. Although there was no difference between self-reported need of patients compared to professional indications, the opinion about the color of the teeth had an extremely subjective character and varied greatly between one professional and another [12].

This desire of having whiter teeth is well evidenced by the high incidence of a positive response (63.8%) to the key question: "Do you think you need to have teeth whitened?" (Table 2). This result shows that the color of the teeth and a harmonious smile are important components of facial aesthetics and that the search for this 'perfect' smile can have repercussions in dental practice due to the increased demand for aesthetic treatments that involve, for example, excessive tooth whitening. This can often lead to major problems due to a greater incentive to abuse domestic bleaches, such as bleaching tapes, so-called whitening toothpastes, which patients can have direct access to in supermarkets, pharmacies, and online stores [13].

Over-the-counter products can expose patients to allergic reactions to their components, extravasation or ingestion of the whitening substance, and the occurrence of sensitivity [14,15]. In addition, bleaching agents increase the surface porosity of the enamel, induce subclinical pulp reactions and dentin hypersensitivity. However, in addition to all these negative effects, dentists must be alert about the changes in the soft tissues caused by the caustic effect of hydrogen peroxide, which participates as a promoter or co-carcinogen in oral chemical carcinogenesis [16].

Freitas et al. [17] reaffirm that with the improvement of the internet, one of the most revolutionary means of mass communication, information and entertainment, body images reach more people, contributing to the standardization of beauty. In fact, most of the respondents to the survey pointed to the media (56.9%) as the one that dictates the standards related to the ideal color of a smile.

In this study, Table 4 also points to this interesting relationship: most of the self-indication for whitening came from female students (83.9%). This finding corroborates a previous study with dental students, in which female students (52%) showed a significantly higher preference for changing their tooth color [9]. Among the standards of aesthetics, women, in fact, are more presupposed to the social standard of the search for perfection. Other studies reinforce that most men tend to neglect their own health and that there may also be a relationship with aesthetic concerns [18].

Among the answers obtained to the question "Do you think you need to have teeth whitened?", the Nutrition and Physical Education courses - courses that are more integrated with body, facial, and oral aesthetics - showed a high percentage of affirmative responses. However, the small sample size of this study makes inferences difficult for the general population.

Another important point is the patients' self-perception regarding their smiles. According to results obtained in the present study, eight of nine patients indicated a darker color on the color scale than their smile showed, a fact confirmed using Easy Shade. This data demonstrates that patients are always looking for an increasingly clear smile even though they have already undergone whitening treatment. A previous study by Samorodnitzky-Naveh et al. [19] compared patients' self-assessment of teeth shade with professional assessment and it was demonstrated that participants assessed their shade darker when compared to clinician analysis. Although in the present study the opinion about the color of the teeth had an extremely subjective character varying between one professional and another, most patients also self-perceive the coloring of their teeth as darker than it actually is [19].

According to Table 5, the indication for whitening treatment had a higher rate in dentists specialized in Dentistry, Orthodontics, and Implantology. Bearing in mind that these areas are the ones that are most related to dental aesthetics. Interestingly, professionals specialized in oral maxillofacial surgery also had a high number of indications for tooth whitening. Another result that surprised was related to the relationship with time since graduation. Most of the experienced professionals (65.3%) were in favor of this aesthetic procedure. On the contrary, surprisingly, professionals with less time since graduation had less indication for this procedure.

Analyzing Table 6, we found that for most patients, there was a higher incidence of positive professional indications. However, the agreement test between professional evaluations showed low values, indicating the subjectivity of the professional indication for tooth whitening, emphasizing that one of the dentists indicated the procedure to all patients while the other did not.

Indication of dental whitening in the office requires, primarily, prior knowledge of the etiology of the color change to be successful in the treatment. The determination of the reasons why the tooth presents the staining can reduce the number of failures and avoid frustrations based on unrealistic expectations [15].






In Brazil, the Federal Council of Dentistry collaborated and supported the resolution of the National Health Surveillance Agency (ANVISA) that regulates the sale of whitening agents. This can only be done by prescription from dentists, and the packaging and campaigns of the products must follow the terms of this resolution. The concern of professionals with the proposal for public consultation with ANVISA is to avoid the wrong use by the citizens of bleaching agents without professional guidance. The resolution determines the dispensing of dental bleaching agents containing hydrogen peroxide and carbamide peroxide, at concentrations greater than 3%, subject to dental prescription, among other requirements [20].

All the results presented in this study reaffirm the importance of common sense and responsibility, not only for professionals, but also for patients, in controlling anxiety and the excessive search for tooth whitening. Furthermore, this procedure contributes to the beauty and harmony of the smile, which, has positive repercussions on the individual's general health. Meanwhile, it is always necessary to consider the safety of use and the presence of a qualified professional to conduct the treatment.

Conclusion

Currently, professionals and patients share the aesthetic ideal directly related to light teeth. The perception of what is or is not aesthetic, in relation to the color of the teeth, varies depending on the context of the performance of each one, patients and professionals. The opinion about the color of the teeth has an extremely subjective character and varies greatly between one professional and another. Most patients self-perceive the coloring of their teeth darker than it actually is. Female patients are more often looking to have lighter teeth. Finally, the media has a decisive role in defining the aesthetic standard of the smile.

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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