

# Prevalence of Self-Reported Tooth Discoloration among the students of Gulf Medical University, Ajman, UAE

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## ABSTRACT

**Objectives:** To determine the prevalence of self-reported tooth discoloration amongst the study sample, to assess the relationship between tooth discoloration and selected risk factors

**Materials and methods:** A cross-sectional study was conducted between March-July, 2014 including 200 students studying in Gulf Medical University, Ajman. A stratified random sampling method was used to recruit the participants. A self-administered questionnaire was used as a tool, tooth discoloration (irrespective of being internal or external) was self-reported. Data was analyzed by SPSS version 20. Association between tooth discoloration and independent factors were tested by X<sup>2</sup> test with a significance level of 0.05.

**Results:** The frequency of tooth discoloration amongst the participants was 43.5%. Higher frequencies of tooth discoloration was found in age group 20-24 years (49.6%, p value= 0.054) and was found more in BPT students (75%, p value= 0.001), Smokers were more effected when compared to nonsmokers (62.7% vs 35.5%, p value= 0.001). Frequency of coffee consumption was also found to have an association with discoloration, as 60% of students who drank coffee more than twice a day reported tooth discoloration. Self-satisfaction displayed a divide in opinion amongst participants with discoloration, with only 48.3% of the 87 students professing dissatisfaction with the current esthetic appearance of their teeth. Finally, it was found that out of the entire sample only 33 students (37.9%) had previously sought for cosmetic improvements of their smile by undergoing tooth bleaching.

**Conclusion:** Tooth discoloration is common among college student with a prevalence of 43.5%. Significant associations were noticed between tooth discoloration and smoking, academic program. Only 33 students (37.9%) had previously sought for cosmetic improvements of their smile by undergoing tooth bleaching.

**Keywords:** tooth discoloration, university student, risk

## INTRODUCTION

Tooth discoloration is defined as any change in the color, hue or translucency of a tooth due to any cause<sup>1</sup>. It is the altered physical appearance of the tooth from its natural state. Through intricate chemical reactions, the natural substances of the tooth bond with specific compounds and selectively inhabit a certain degree of their characteristics, resulting in a change of color. Medically speaking, stains are taken up by enamel and dentine, these stains are the very same that lead to extrinsic tooth staining, including in particular dietary chromogens and the by-products of tobacco smoking<sup>2</sup>. Though the reaction is generally harmless, it can immensely affect the appearance of an individual.

In recent times esthetics has played a vital role in modern society. Through social and media outlets greater awareness has been spread on the ideal beauty of males and females alike, thus creating a consciousness of imperfection amongst the world. This has contributed to the proliferated demand and evolution of the field of Medical Cosmetics. Tooth discoloration is a frequent finding across general populations, it is considered an esthetically displeasing finding with psychologically traumatizing effects on the self-esteem of afflicted individuals<sup>3</sup>. Unfortunately, dental health, let alone esthetics are not given much attention in certain underwhelming economic climates, therefore the development of abnormal dental conditions usually goes undetected until prevention is out of the question and only therapeutic treatment is viable. A study conducted in North Jordan determined that 80% of children only visit the dentist for emergencies<sup>4</sup>. This fact supports that dental related conditions are only given importance once they have propagated to statuses that require emergency measures.

The topic of discoloration and staining is not foreign territory to the broad field of medical research; in Chakkar Ka Milak of Modrabad, India, 780 school children within the age group of 12-15 were examined for black marginal staining. Upon examination, 156 of the participants portrayed marginal staining [5]. In addition to this study, discoloration was further proved as a condition affecting children and adults. In the state of Parana, Brazil, 263 children ranging from the ages 6-12 were physically examined for black stains<sup>6</sup>. Of that population 39 were found to have black stains, 14.9% of the total study population<sup>6</sup>. Another study conducted in Udaipur, India concluded that 18% of schoolchildren in the city were found to have black stains [7]. This further supports that tooth discoloration is a common finding. Studies have shown that black stains are commonly diagnosed as pigmented dots, lines with incomplete coalesce of dots or continuous lines<sup>8</sup>. These lesions rarely go beyond the cervical third and contour the crown around the gingival third, not extending to the proximal areas<sup>9</sup>.

There are several causes of tooth discoloration proven and supported by the research of many great medical practitioners. The most common of these causes are [3]: Food and drinks (coffee, tea, colas, wines, and specific fruits), tobacco products (cigarettes, sheesha, dokha and snuff) Poor dental hygiene (inadequate removal of plaque which contains stain producing substances), Diseases (caries), medications (tetracycline, doxycycline, chlorhexidine, cetylpyridinium chloride, Benadryl), medical treatments (radiation therapy and chemotherapy), dental materials (amalgam, silver sulfide containing materials, endodontic sealers), advancing age, Genetics, environment (excessive fluoride), and trauma.

Though all the causes of staining listed above can be considered pathologic processes, there is one exception which can be classified as a physiologic process, which is discoloration due to the advancement of age. Teeth become darker as a physiological age change, this may be partly caused by the laying down of secondary dentine, incorporation of extrinsic stains and gradual wear of enamel allowing a greater influence on color of the underlying dentine<sup>2</sup>. A cross sectional study conducted in female high-schools of Isfahan, Iran, found that out of a study populace of 384 students, 335 had tooth discoloration. Out of the 335 students, 71.1% had discoloration due to caries, 24.7% due to extrinsic stains, 19.8% due to hypoplasia, 19.8% due to root and crown filling materials, 0.8% due to trauma, 0.3% due to Chlorhexidine mouthwash and 0.3% due to fluorosis<sup>10</sup>. Tooth discoloration is one of the most common reasons patients seek dental care<sup>11</sup>. Though the process of tooth discoloration is not always reversible, there are several treatment options available to either nullify or conceal the effect. They include<sup>11</sup>: Using proper flossing and tooth brushing techniques , avoiding food and beverages that cause stains Bondings, Veneer, Over the counter whitening agents In home whitening agents prescribed by dentists, In office whitening procedures. Limited information is available related to the frequency of this problem among young adults in the UAE. This is very important topic because it affects physical, emotional and social wellbeing of those who may be affected by this problem. The objectives of this study are to determine the prevalence of self-reported tooth discoloration amongst the study sample, to assess the relationship between tooth discoloration and selected risk factors.

## **MATERIALS AND METHODS**

A cross-sectional study was conducted between March-July, 2014 including 200 students, aged  $\geq 18$  year GMU students, who are available at time of data collection and give informed consent. A stratified random sampling method was used to recruit the participants. The sample size was determined on convenience base The data collection was done in 6 months. A self-administered questionnaire was used as a tool, which include; demography data, Lifestyle habits: Diet, Oral Hygiene Practices Psychological factors: Self-esteem, confidence. Tooth discoloration (irrespective of being internal or external) was self-reported. The GMU Ethics Committee approved the study

## **METHODOLOGY**

After getting approval from Ethics Committee, the researchers got approval from different colleges in the GMU for data collection. Time was assigned by secretary in each college to do data collection. During that time the research team distributed the questionnaires personally and collected back. Informed consent was taken before giving out the questionnaires and doubts were clarified. Data was analyzed by SPSS vesion20. Data was presented as frequency, percentages, charts and tables. Association between tooth discoloration and independent factors were tested by X<sup>2</sup> test with a significance level of 0.05

## **RESULTS**

The study included 200 students. Fig.1 shows that 43.5% of participants perceived to have discolorations. 43.5% of the study group perceived themselves to have tooth discoloration.

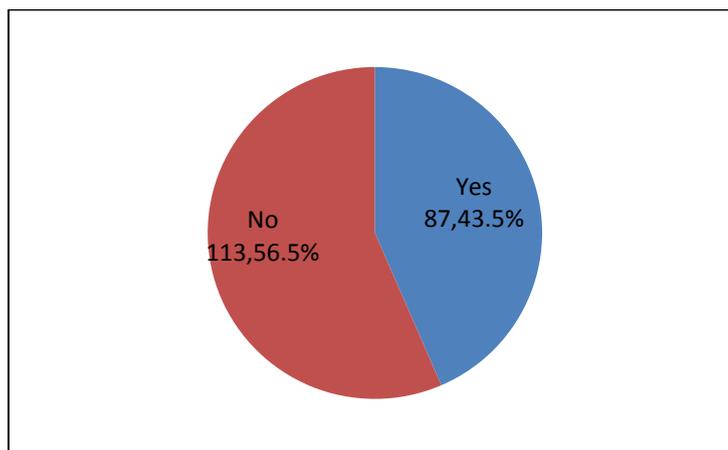


Figure 1. Distribution of participants based on tooth discoloration

Table 1. Association of Socio-demographic characteristics with tooth discoloration

Socio-demographic Characteristics	Groups	Discoloration in Teeth				P value
		Yes		No		
		No.	%	No.	%	
Gender	Male	32	43.2	42	56.8	0.955
	Female	55	43.7	71	56.3	
Age in years	<20 years	16	30.2	37	69.8	0.054
	20-24 years	63	49.6	64	50.4	
	>=25 years	8	40.0	12	60	
College	MBBS	30	32.3	63	67.7	0.001
	DMD	24	42.1	33	57.9	
	Pharm.D	18	60.0	12	40.0	
	BPT	15	75.0	5	25.0	
Ethnicity	Asia	60	43.5	78	56.5	0.337
	Africa	15	39.5	23	60.5	
	Europe	4	33.3	8	66.7	
	Others*	8	66.7	4	33.3	

Note: Others include Oceania and Americas

The association between Socio-demographic characteristics and tooth discoloration is shown in table2., which shows that tooth discoloration is more common in females, Students in the age group of 20-24 years, Students from the BPT program, and students from Oceania and Americas(in the other category) countries compared to the other categories. No significant association between tooth

discoloration and gender, nationality. However, there was significant association between the study program and tooth discoloration.

Table 2. Shows the frequency of tooth discoloration following dental procedure. It was found that 14.9 % of the sample reported they had prior dental procedures. Of the 13 students who underwent dental procedures in the past, Root Canals were found to be the most frequent procedure that led to tooth discoloration

Table 2. The frequency of tooth discoloration following dental procedure

Dental procedure	No.	%
Yes	13	14.9
No	74	85.1
Type of Procedure	No.	%
Root Canal Treatment	5	38.5
Braces	4	30.8
Fillings	1	7.7
Bleaching	2	15.4
Veneers	1	7.7

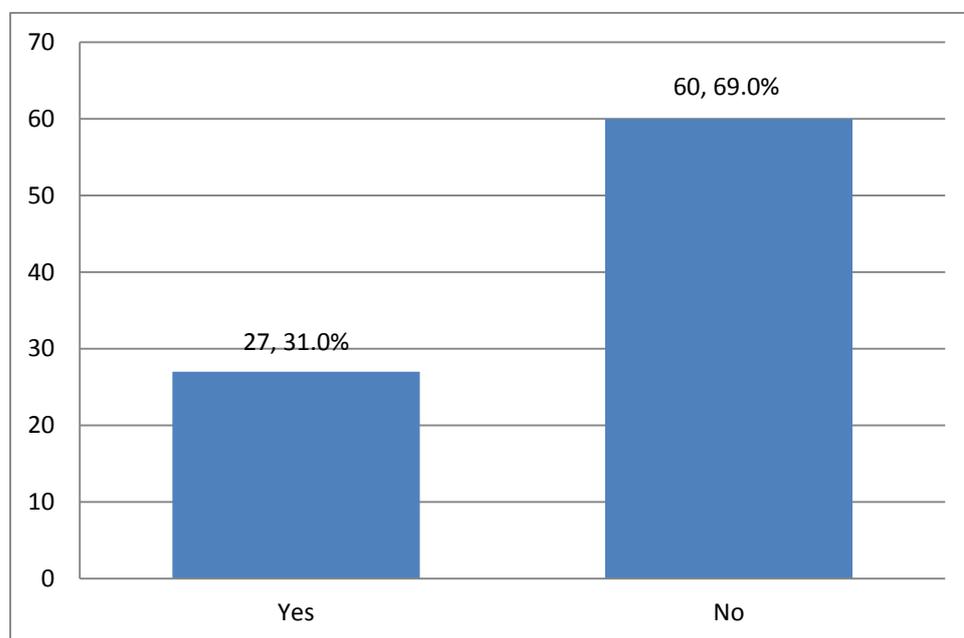


Figure 2. Distribution by perception of tooth discoloration after trauma

It was found that 31.0% of the sample reported discoloration following dental trauma

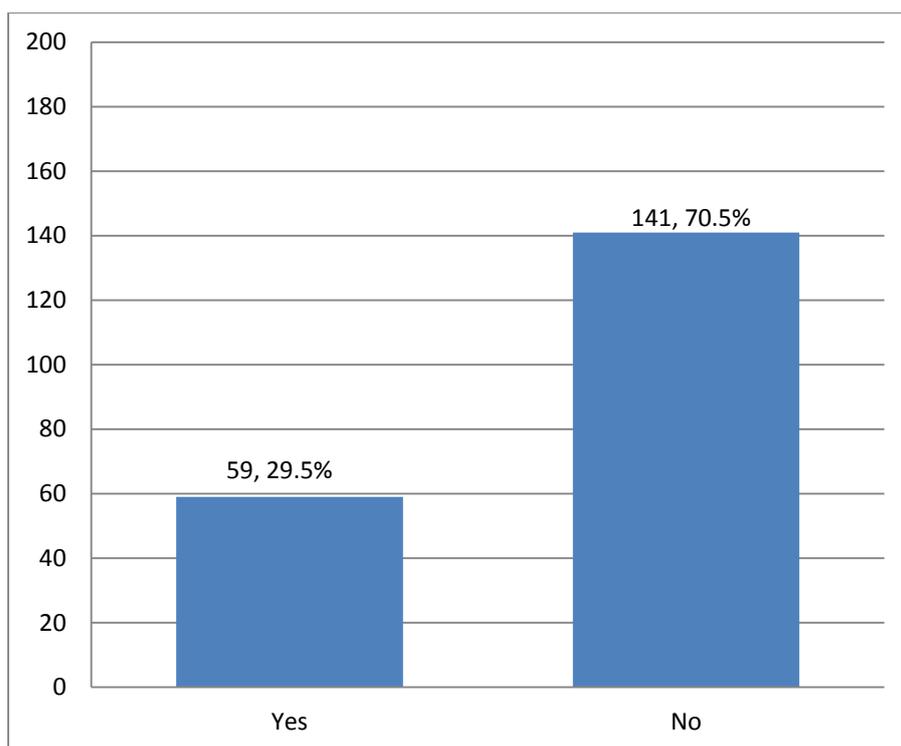


Figure 3. Tooth discoloration in participants by tobacco use

Figure 3 shows that 29.5% of the participants were consuming tobacco.

Table 3. Tooth discoloration among smokers and nonsmokers

Tobacco Consumption	Groups	Discoloration in Teeth				P value
		Yes		No		
		No.	%	No.	%	
Tobacco	Users	37	62.7	22	37.3	0.001
	Non-Users	50	35.5	91	64.5	
Tobacco Type	Cigarettes	12	63.2	7	36.8	0.857
	Sheesha	15	57.7	11	46.3	
	Snuff	3	75.0	1	25.0	
	Dokha	7	70.0	3	30.0	

Table 3 shows tooth discoloration among smokers and non-smokers. The reported frequency of tooth discoloration was significantly higher among smokers (62.7%) compared to non-smokers (35.5%). Participants who were consuming snuff reported highest frequency of tooth discoloration.

Table 4 shows the association between tooth discoloration and frequency of intake of tea and coffee. The table shows that 52% of participants who consumed tea >2 times/day perceived to have tooth discoloration and 60% of participants who consumed coffee >2 times/day perceived to have tooth discoloration. There is a significant association between tooth discoloration and frequency of coffee consumption ( $p < 0.020$ ).

Table 4. Tooth discoloration by the frequency of tea and coffee consumption

Frequency	Discoloration of Teeth				P Value
	Yes		No		
	No.	%	No.	%	
Tea					
Rarely/Never/Occa.	27	40.3	40	59.7	
Once a day	16	39.0	25	61.0	0.313
>2 times/day	13	52.0	12	48.0	
Coffee					
Rarely/Never/Occa	36	48.0	39	52.0	
Once a day	14	37.8	23	62.2	0.020
>2 times/day	9	60.0	6	40.0	

Note: The number of participants in the two groups 2-4/ week and >4 times/ week were merged

Table 5 shows the association between tooth discoloration and frequency of intake of colored drinks. Higher frequency of tooth discoloration was noticed among participants who were consuming all types of colored drinks. No significant associations between tooth discoloration and consumptions of any types of colored drinks.

Table 5. Tooth discoloration based on the frequency of type of colored drink

		Discoloration of Teeth				P Value
		Yes		No		
		No.	%	No.	%	
Cola	Yes	55	45.1	67	54.9	0.572
	No	32	41.0	46	59.0	
Mirinda	Yes	43	44.8	53	55.2	
	No	44	42.3	60	57.7	

Energy Drinks	Yes	43	45.7	51	54.3	0.457
	No	44	41.5	62	58.5	
Others	Yes	33	47.8	36	52.2	0.370
	No	54	41.2	77	58.8	

Table 6 shows the relationship of tooth discoloration and self satisfaction. There is significant association between tooth discoloration and self -satisfaction of the participant. Lack of self- satisfaction is more commonly reported by participants who had tooth discoloration

Table 6. Relationship of tooth discoloration and self - satisfaction

Tooth Discoloration	Self Satisfaction				P value
	Yes		No		
	No.	%	No.	%	
Yes	45	51.7	42	48.3	0.049
No	74	65.5	39	34.5	

Table 7 shows the association of discoloration with tooth brushing frequency and technique. Higher frequency of tooth discoloration was noticed among participant who were not brushing their teeth daily, those who change their brush every 2 month or less, and those who brush their teeth in rotation direction.

Students who have approached the dentist for cosmetic improvements of their smile by undergoing tooth bleaching were 33(16.5%), while the rest did not go to the dentist for any bleaching treatment 167(83.5%).

43(21.5%) participant have stated that they are using some kind of bleaching agents, while 157(78.5%) are not using any bleaching agents.

Table 7. Association of discoloration with tooth brushing frequency and technique

Frequency of tooth brushing	Tooth Discoloration				P Value
	Yes		No		
	No.	%	No.	%	
Not Daily	4	66.7	2	33.3	0.586
Once daily	32	41.6	45	58.4	
Twice daily	39	41.9	54	58.1	
>2 times daily	12	50.0	12	50.0	

Frequency of changing brush	of tooth	Yes No.	%	No No.	%	P Value
<2 month		55	47.8	60	52.2	0.390
3-6 months		26	37.1	44	62.9	
>6 months		6	40.0	9	60.0	
Tooth Discoloration						
Frequency of tooth brushing		Yes No.	%	No No.	%	P Value
Horizontal		27	50.9	26	49.1	0.432
Vertical		23	29.5	55	70.5	
Rotation		37	53.6	32	46.4	

## DISCUSSION

Throughout the latter stages of the 20<sup>th</sup> century there has been a gross progression in demand for cosmetic improvements of the physical appearance. With advanced techniques in the arts and sciences of the dental field, the demand of the wider public has embarked on the threshold of perfecting their smiles to an ideal appearance in terms of alignment and color<sup>12</sup>. The current study was conducted to evaluate the prevalence of self-reported tooth discoloration amongst young adults enrolled in educational studies of the health related profession.

In this study, a total of 87 students reported tooth discoloration, 43.5% of the entire sample. These results indicate that this problem is common among young adults and perceptive awareness of color deviation in the esthetics of their smile. Our result is in agreement with another study done in china, in which about half of the study population (48.9%) suffered from some tooth discoloration<sup>13</sup>.

With regard to age, no significant association was noticed between age and tooth discoloration that could be attributed to the small age range of our participants. Other researchers found that tooth discoloration is increased by age which is attributed to the increased thickness of dentin with aging that will gradual darkens the teeth<sup>2</sup>. A study conducted in Ramadi City of Al-Anbar Iraq, males were found to have an 18.98% higher rate of discoloration than females, a figure derived out of a total of 158 cases<sup>15</sup>.

In the current study, students from the BPT program had high reports of discolorations, with 75% of the students identifying with the issue. This observation could reflect greater concern of students in this program about the colour of their teeth. From the sample, only 6.5% of the participants had perceived discoloration following the completion of dental procedures. Of the 13 cases, the most significant reports perpetuated Root Canal treatment and Orthodontic Braces as the cause of the iatrogenic discoloration, 38.4% and 30.8% respectively. In a relevant study conducted in Isfahan, Iran, 19.8% of students displayed discoloration following

dental treatments<sup>10</sup>. This suggests that a significant portion of discoloration may be iatrogenic related.

Trauma was also found to be a likely etiological source of the reports. 51.9% of students who reported experiences of dental trauma reported tooth discoloration following the incident. According to the same study conducted in Isfahan, Iran by Ghalayani and Alizadeh, discoloration following trauma was found to be the 5<sup>th</sup> most common cause of discoloration, with a prevalence measured at 0.8% of the total populace in a sample of 1637 female students. It was also found that traumatic injuries causing tooth discoloration were found to be 0.6% higher in male adolescents<sup>10</sup>, further supporting evidence that discoloration may have a gender predisposition.

Our study shows that 29.5% of the students are tobacco smokers. Furthermore, 63.2% of these smokers reported discoloration. In contrast, users of snuff tobacco declared higher reports of discoloration at 75%. Conclusively, a high significance of discoloration was associated with the use of tobacco. Also, a positive association was drawn in relation to the duration of consuming tobacco products. 83.3% of students using tobacco products for the past 2-3 years made reports of tooth discoloration. In a study conducted by Al Khatib in the United Kingdom he concluded that there was a positive relationship between smoking and tooth discoloration as 54.3% of participants who were smokers from a sample size of 3215 reported discoloration within the ranges of mild to severe<sup>12</sup>.

Consumers of colored drinks depicted a positive relation of discoloration and frequency. 80% of students who consumed Cola and 66.7% of students who consumed Mirinda/Fanta more than twice a day reported discoloration. The previous assortments of soft drinks contributed to the findings of a study conducted in Isfahan which reported that 24.7% of its youthful sample presented external stains<sup>10</sup>. In the study conducted in Ramadi City Iraq, 0.059% of patients presented discoloration resulting from chromogenic factors, a dietary component of all colored drinks, including soft drinks, tea and coffee<sup>15</sup>. In this study a significant association was derived between consumers of coffee and discoloration. It was determined that 151 students of the sample consume tea/coffee, and of that population, 44.3% reported discoloration. The frequency of consumption also highlighted a positive correlation with discoloration. 66.7% of students who consumed tea more than 4 times a day reported discoloration.

Higher frequency of participants who lack self- confidence and self-satisfaction were found among those who had tooth discoloration, this is in agreement with a study from China in which 52.6% of the study population were dissatisfied with their tooth color<sup>13</sup>.

## **LIMITATIONS**

- 1) Time constraint lead to a small sample size
- 2) Confounding effect could not be excluded
- 3) Results of this study can not be generalized

## **CONCLUSION**

Tooth discoloration is common among college student with a prevalence of 43.5%. Significant associations were noticed between tooth discoloration and smoking,

academic program. Only 33 students (16.5%) had previously sought dentist for cosmetic improvements of their smile by undergoing tooth bleaching.

## RECOMMENDATIONS

1. As our study shows a significant association between smoking and tooth discoloration, we encourage spreading awareness in university students about the negative effects of smoking on the oral health and the colour of teeth. Thereby encouraging the students to quit smoking.
2. Also our study shows that there was a significant association between tooth discoloration and brushing technique. Participants who used the vertical action of brushing had the least tooth discoloration. Hence, the students must be encouraged to use the vertical brushing motion.
3. To avoid excessive intake of coffee which can stain the teeth

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