

Oral Hygiene and Nutrition Habits of Young People in Greece Aged 18 to 25 and Review of the Literature*

SUMMARY

Purpose: The aim of this paper is to document the oral hygiene and nutrition habits of young people (aged 18 to 25) in Greece.

Material and Methods: In a random sample of 100 people in Greece aged 18 to 25, a questionnaire including 23 questions (4 demographical and 19 other) was given. The frequency, the usual reason for visiting the dentist, the frequency of brushing, the type of toothbrush and the criteria for choosing toothbrush and toothpaste were searched. The nutrition habits were recorded as frequency in receiving sugar or no sugar meals during the day. The statistical analysis included frequencies and the use of chi-square test for interrelation with the demographical questions.

Results: 72% of the sample visits the dentist at least once a year, while the reason for visiting was prevention in 69%. 85% brushes at least twice a day, and the same percentage uses medium hardness toothbrush. The choice of the toothpaste is based on flavour and fragrance in 25%. The frequency of receiving sugar meals was recorded as 45% once daily and 43% in 2 or 3 times daily ($p < 0.05$ between smokers and non smokers). 78% of the young people receives less than 5 meals and snacks per day. There was no statistically significant difference between different available monthly budgets in the sample for the oral hygiene and nutrition habits.

Conclusion: More than 1/3 of young people in Greece aged 18 to 25 visits the dentist at least once yearly for prevention and uses medium hardness toothbrush. The frequency of sugar consumption was significantly higher in smokers when compared to non smokers. Statistically significant differences were not observed between males and females except for the frequency in brushing ($p < 0.05$). A review of the literature was performed for issues related to this project.

Keywords: Oral Hygiene; Nutrition Habits; Young People; Greece

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Introduction

Oral hygiene is a significant factor for oral health and life quality for a society's citizens¹. 2 of the most common and important diseases in the population worldwide are caries and periodontal disease, where the prevalence is high in societies of low socio-economic level². The habits in oral hygiene and nutrition play an important role in oral

and physical health. Frequent dental visits, accompanied by personal oral hygiene with the use of brushing, dental floss and oral mouth rinse, lead to a diminishment in the prevalence of caries and periodontal problems³⁻⁷. The correct and up to date information of the population from the dentists constitutes a significant factor. Prevention is considered necessary in modern societies and accompanies its evolution. The regular preventive check up from the early years of a person's life can lead to an in time diagnosis of the diseases mentioned above^{8,9}. Poor oral health is influencing quality of life by causing dental

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pain and loss of the ability to feed and communicate as well¹⁰. Also, differences in oral hygiene seem to exist due to factors related to geography and civilization¹¹⁻¹³.

A significantly high number of studies have been performed in order to record the oral hygiene and nutrition habits in certain groups of the population like children, elders or pregnant women¹⁴⁻¹⁷. The documentation of these data will help in taking measures that aim at the

improvement of oral health in high risk groups of the population. The current study aims to fill the gap in the literature concerning the oral and nutrition habits of young people, and especially those aged between 18 and 25, which is not enough studied up to today. This study's purpose is to search habits related to oral health in a population facing a vast economical and social crisis, the population of Greece nowadays.

Questionnaire

1. GENDER
 - MALE
 - FEMALE
2. LEVEL OF EDUCATION
 - HIGH SCHOOL GRADUATE (3 CLASSES)
 - HIGH SCHOOL GRADUATE (6 CLASSES)
 - ADVANCED EDUCATIONAL INSTITUTE STUDENT
 - TECHNOLOGICAL EDUCATIONAL INSTITUTE STUDENT
 - ADVANCED EDUCATIONAL INSTITUTE GRADUATE
 - TECHNOLOGICAL EDUCATIONAL INSTITUTE GRADUATE
3. AVAILABLE MONTHLY BUDGET)
 - 0-250 Euros
 - 250-500 Euros
 - >500 Euros
4. ARE YOU SMOKERS?
 - YES
 - NO
5. HOW OFTEN DO YOU VISIT THE DENTIST?
 - 1 TIME/ 6 MONTHS
 - 1 TIME/ 12 MONTHS
 - 1 TIME/ MORE THAN 12 MONTHS
 - IN CASE OF PAIN
6. USUAL REASON FOR VISITING THE DENTIST
 - PAIN
 - PREVENTION
 - DENTIST'S RECOMMENDATION
 - AESTHETICAL REASON
7. HOW OFTEN DO YOU BRUSH YOUR TEETH?
 - 1 TIME/ DAY
 - 2 TIMES/ DAY
 - 3 TIMES/ DAY
 - MORE THAN 3 TIMES/ DAY
 - A FEW TIMES A WEEK
 - RARELY
 - NEVER
8. HAS YOUR DENTIST SHOWN YOU BRUSHING?
 - YES
 - NO
9. HAS A DENTIST VISITED YOUR SCHOOL TO INFORM YOU ABOUT ORAL HYGIENE?(Need of brushing, type of brushing, etc)
 - YES
 - NO

Figure 1. Questionnaire (first page)

Material and Methods

In a random sample of 100 young people living in Greece, aged 18 to 25, a questionnaire of 23 questions was electronically provided (Fig. 1). It included 4 demographical questions and 19 questions about oral hygiene and nutrition. The participation was voluntary, self-administrated, the participants were recruited consecutively and the completion of the questionnaire was performed anonymously. The questionnaires were strictly provided electronically, with no restriction to the gender, educational level, origin, and their smoking habits. The exclusion criteria included: (1) Age more than 25 years old; (2) Age less than 18 years old; (3) Students or graduates of dental schools.

This age group selected has not been studied enough like other age groups, such as children, elders etc, have.

The demographical questions were: (1) The gender (male or female); (2) The level of education (high school graduates, advanced educational institute's graduates, technological educational institute's graduates, advanced educational institute's students and technological educational institute's students); 3. The available monthly budget (less than 250 €, 250 to 500 €, more than 500 €); and (4) Smoking (yes or no).

The frequency of dental visits and the usual reason for visiting, the frequency of brushing, the use of dental floss and mouth rinse were a few of the questions aiming to record the oral hygiene habits of the sample. The criteria for choosing toothpaste and toothbrush, as well as the use of electrical toothbrush, were also searched in the questionnaire.

The frequency of receiving sugar meals during a day as well as the frequency of meals and snacks were also questions included to determine the nutrition habits of the

sample. The frequency of sugar consumption was defined in the questionnaire as: "Number of sugar meals in a day including sweets, refreshments, coffee with sugar, etc". Another element that was studied was a personal opinion for the prevention measures that these young people were using, their personal opinion for their oral health evaluation and their willingness to seek dental hygiene methods themselves (for example in the web and in valid sites like the Greek Dental Federation).

The data collected was analyzed statistically. For the interrelation with 4 demographical questions, the chi-square test, Statistical Package for Social Sciences (SPSS) version 22 was used and statistical significance was set to 0.05. Statistical significant differences in the sample's responses are searched for: (1) gender; (2) level of education; (3) available monthly budget; and (4) smoking.

Results

From a total of 100 participants that constituted the sample of the current project, 38 (38%) were male while 62 (62%) were female (Tab. 1). As far as the educational level is concerned: 53 (53%) were students of advanced educational institutes, 22 (22%) were graduates of advanced educational institutes, 6 (6%) were graduates of technological educational institutes and 1 (1%) was a high school graduate. The sample was considered insufficient and inappropriate for the extraction of inferences for the educational level and the oral hygiene and nutrition habits by the authors (Tab. 1). 50% of the sample had an available monthly budget of 250 to 500 €, 27% less than 250 €, while 23% had more than 500 €, 36% were smokers, whereas 64% were non smokers (Tab. 1).

Table 1. The Sample's Responses on Demographical Questions

DEMOGRAPHICAL QUESTION		FREQUENCY	PERCENTAGE
GENDER	Male	38	38%
	Female	62	62%
EDUCATIONAL LEVEL	High School Graduate (3 classes)	1	1%
	High School Graduate (6 classes)	7	7%
	Advanced Educational Institute Student	53	53%
	Technological Educational Institute Student	11	11%
	Advanced Educational Institute Graduate	22	22%
AVAILABLE MONTHLY BUDGET	Technological Educational Institute Graduate	6	6%
	0-250 €	27	27%
	250-500 €	50	50%
SMOKING	>500 €	23	23%
	Yes	36	36%
	No	64	64%

72% of the sample visits the dentist at least once a year, and in detail, 44% visits once a year and 28% once every 6 months. The main reason for the visit is prevention in 69% of the sample. 93% brush their teeth at least once daily - 11% once a day, 53% 2 times a day, 29% 3 times a day (Tab. 2). Statistically significant differences were noted between males and females regarding the frequency of brushing ($p<0.05$). Females seem to have a higher frequency in brushing where 48.3% of them brush 3 or more times a day compared to 5.3% of the males

(Tab. 3). Medium hardness toothbrush is used in 85% of the sample, while dental floss is used by only 32% (and 20% of the sample only a few times in a week); dental mouth rinse is used by 44%, and 48% states that has used electrical toothbrush mainly due to advertisement and convenience in use (Tab. 4). A dentist has performed a demonstration of oral hygiene methods for 77% of the sample and in 47% of the cases a dentist has visited the school in the past to inform students about oral hygiene habits.

Table 2. Oral Hygiene Habits of the Sample

Oral Hygiene Habits		
Dental Visit Frequency	1 time/ 6 months	28%
	1 time/12 months	44%
	1 time/ more than 12 months	13%
	in case of pain	13%
Reason of visit	never	2%
	pain	18%
	prevention	69%
	dentist's recommendation	2%
	aesthetical reason	9%
	no visit	2%
Brushing frequency	1 time/ day	11%
	2 times/ day	53%
	3 times/ day	29%
	more than 3 times a day	3%
	a few times a week	3%
	rarely	1%

Table 3. Gender and Brushing Frequency

Brushing Frequency	Male		Female		TOTAL
1 time/ day	6	15,8%	5	8,1%	11
2 times/ day	26	68,4%	27	43,5%	53
3 times/ day	2	5,3%	27	43,5%	29
More than 3 times a day	0	0,0%	3	4,8%	3
A few times a week	3	7,9%	0	0,0%	3
Rarely	1	2,6%	0	0,0%	1
TOTAL	38	100%	62	100%	100
p- value					<0.05

Table 4. Oral Hygiene Products' Used in the Sample

The product				
	Soft	9%		
	Medium	85%		
	Hard	6%		
Toothbrush Hardness	Yes (48%)	Easy in use	20%	
		Difficulty in brushing	2%	
		Dentist's recommendation	4%	
		Advertisement	22%	
	No		52%	
		Yes (32%)	2 times/ day	3%
			1 time/ day	7%
			1 time/ 2 day	2%
			A few times a week	20%
			No	68%
Use of Dental Mouthrinse	Yes (44%)	2 times/ day	9%	
		1 time/ day	8%	
		1 time/ 2 days	3%	
		A few days a week	24%	
	No	56%		

The criteria for choosing toothbrush and toothpaste varied. 29% of the participants stated that they choose their toothbrush randomly, while 26% chooses according to the dentist's recommendation. Other reasons include the brand (15%), the aesthetics - colour/ design (10%) and the cost (9%). When choosing toothpaste, the taste and flavour seem to play an important role, followed by the dentist's recommendation, the random choice, the brand and the advertisement (Tab. 5).

Almost half of the sample performs dental debridement at least once a year (17% once every 6 months and 30% once a year). 16% of the sample visits the dentist for debridement once every 12 to 24 months, whereas 10% in more than 24 months. 28% has received 2 to 3 times debridement in a life time, 27% more than 5, 16% 4 to 5, and the same percentage has never received debridement in a life time. At the same time, 64% of the participants admit that their gums bleed during brushing.

Table 5. Criteria for choosing toothbrush and toothpaste in the sample

Toothbrush Choice	Cost	9%
	Brand	15%
	Aesthetic (colour, design)	10%
	Advertisement	1%
	Dentist's recommendation	26%
	Random Choice	29%
	Other reason	10%
Toothpaste Choice	Cost	6%
	Brand	16%
	Flavour-Fragrance	25%
	Advertisement	4%
	Dentist's recommendation	19%
	Random Choice	19%
Other reason	11%	

As far as nutrition habits are concerned, 88% consumes 1 to 3 sugar meals per day. Only 5% consume more than 5, and 4% none sugar meal per day (Tab. 6). For the number of meals and snacks during a day, 79% answer that they receive less than 5, 19% 5 to 7, and 2% more than 7. Also, statistically significant difference was found in the frequency of sugar meals received between smokers and non smokers ($p < 0.05$). In detail, 11.1% of the smokers in the sample consume sugar meals 4 or more times a day in contrast to 6.25% of non-smokers for the same frequency (Tab. 7).

For personal perception of their oral hygiene, 71% of the participants evaluated it as satisfactory, while at the same time 61% of the sample stated that they believe they are not using all necessary oral hygiene methods for their oral health reassurance. 80% were willing to seek oral hygiene methods either with access in valid sites in the web or by visiting their dentist.

Table 6. Nutrition Habits in the Sample

Nutrition Habits		
Sugar meals consumption frequency in a day	None	4%
	1 time	45%
	2-3 times	43%
	4-5 times	3%
	>5 times	5%
Number of meals and snacks in a day	<5	79%
	5-7	19%
	>7	2%

Table 7. Frequency of sugar meals and smoking

Frequency in sugar meals consumption	Smokers		Non smokers		TOTAL
None	3	8,3%	1	1,6%	4
1 time/ day	13	36,1%	32	50%	45
2-3 times/ day	16	44,4%	27	42,2%	43
4-5 times/ day	3	8,3%	0	0,0%	3
>5 times/ day	1	2,8%	4	6,3%	5
TOTAL	36	100%	64	100%	100
p-value	< 0.05				

Discussion

Augmentation of the microbiotics load in the oral cavity leads with different mechanisms in 2 completely different pathologic situations: caries, as far as the hard dental tissues are concerned, and the gingivitis and periodontitis, as far as the soft tissues of the oral cavity are concerned. The need for preserving the load in low levels is related with absence of the previously mentioned diseases and also with the diminishment of the risk for development of other conditions that have been related today with the dental diseases.

Periodontitis and Systemic Diseases

As far as periodontal disease is concerned, there is today intense evidence that it is related with cardiovascular diseases¹⁸⁻²². At the same time, the National Health Institute of the US already from 1998 considers the participation of infections such as the

periodontal in the cardiovascular diseases pathology as possible^{22,23}.

In addition, there is strong evidence that relate periodontitis with interactive relations to diabetes mellitus²⁴⁻²⁶. This relationship renders necessary the control of every infection, as well as the periodontitis, especially in patients suffering from diabetes for the improvement of their overall health. As a result, the need for implementing impeccable dental hygiene also emerges.

Also, in bibliography there has been evidence that relates bad oral health with chronic obstructive pulmonary diseases²⁷⁻³⁰. This correlation up to today does not include acute pulmonary infections.

Finally, there is the correlation between periodontal disease and the preterm birth, which is still under investigation, but has some strong indications and that has been supported in a number of studies in the USA³¹⁻³³. These studies suggest an influence of the presence and evolution of periodontitis in the frequency of preterm birth.

The above suggest that there is evidence nowadays that connects the presence of periodontitis with certain systemic diseases. Also, the need for implementing dental hygiene as well as preventing dental infections that can relate to the overall health emerges.

Caries and Theory of the Focal Infection

As far as the influence of caries in general health is concerned, from ancient times in Greece, Hippocrates described the therapy of arthritis with the use of a tooth extraction³⁴. Later, the theory of the focal infection emerged after the establishment of the microbiological criteria of Robert Koch (1870-1880)^{35,36}. In 1900, British physician William Hunter suggested that the oral sepsis is the cause of systemic diseases^{35,37}. In dentistry, Weston Price in 1923 reported that teeth host bacteria that produce toxins after endodontic treatment³⁴. As a result, dentistry entered an era where dead or endodontically treated teeth were extracted^{34,38}. In 1919, C. Edmund Kells spoke out in public the first criticism against this theory³⁹. The end of it came in 1952 from the Journal of the American Dental Association⁴⁰. The revival of the theory came in the 90s with epidemiological studies that relate dental infections with systemic diseases bringing the concept of periodontal medicine in the forefront⁴¹. In a recent paper of the Journal of Indian Society of Periodontology (2012), it is stated that the oral cavity can act as a source of pathogenic microorganisms that can act in distant body parts, especially in immunocompromised hosts⁴². From 1920 until today, research has been driven to pleomorphic bacteria (especially L forms and Mycoplasma) where there is strong evidence for their etiological role in cryptic etiology diseases and especially autoimmune diseases^{43,44}.

The acknowledgement of these relations between oral and systemic diseases also emerges from the growing interest for creating scales and indexes of oral health. These tools apart from recording the oral health levels in individuals and populations can also be used for relating these levels with systemic diseases⁴⁵.

Molecular Basis of the Oral Cavity Diseases

Today, more than ever before, the role of the genetic background and its possible participation in the oral cavity diseases is investigated. Although the microbiological etiology of these diseases carries huge scientific documentation, already from 1960, modern multifactorial models relate only 20% of the extent of periodontal destruction with the presence and the microbial load. The final clinical image is finally formed from both environmental and genetically defined factors^{46,47}.

As far as periodontitis and its appearance or evolution is concerned, quite a few studies point genetic relations, mostly destructive, with mechanisms

that control the organism's defense. For example, the aggressive periodontitis has been related to the type of CD32 receptors of polymorphonuclears in conjunction with the elevated production of IgG2^{48,49}. At the same time, the interrelation of the parallel presence in both genes of the allele 2 of Interleukin 1 (IL 1) and the severe periodontal destruction is widely accepted⁵⁰. This relationship has been documented enough and is also used as a diagnostic tool.

For the appearance of caries, there is evidence that supports the presence of a relation with genetic background. The beginning of these investigations came with the genetic studies in twins. The concordance rate, the percentage of infection of 2 twins from the same multifactorial disease, is one of the indexes used. When this degree appears to be greater in monozygotic than dizygotic, there is important evidence that there is genetic contribution⁵¹. In 1930 Goldberg in such a study demonstrated that there is evidence of participation of the genetic factor in caries but concluded that such participation only contributes in the process⁵². Also, other studies supported the contribution of the genetic background in the development of caries. Memorable is the Minnesota study of twins reared apart, where twins that were reared apart participated. The participants were older than 40 years old and were exposed to different environments from shortly after their birth to the time of the study. This study showed evidence of the genetic factor participation in caries' experience again, this time setting aside the environmental factors that differed in the twins^{53,54}.

Although the above studies proved the involvement of genetic background in the appearance of caries, they did not succeed in connecting caries with specific genes.

Another direction of studies is the existence of syndromes that relate to morphological alterations of enamel and render it more susceptible to caries. For example, one of the syndromes that cause alterations to hard dental tissues and increased caries susceptibility is epidermolysis bullosa (EB). In 1993 Wright reached the conclusion that 2 types of this syndrome are related to the increased incidence of dental caries since they alter the hard tissues and render it more susceptible to caries⁵⁵.

A last direction of studies refers to the possible relationship between salivary function and the existence of xerostomia with the caries incidence⁵⁶.

It has become obvious from the above that the existence of a genetic influence in the appearance and evolution of oral cavity diseases, caries and periodontitis, is under investigation. The huge progress of genetics in nowadays allows the genetic control of the patients aiming in providing a personalized plan of therapy or prevention to each patient. If these scenarios are affirmed in the future, the significance of oral hygiene and its methods will become degraded, whereas other methods aiming to the specific factor responsible for the disease will arise.

Related Studies for Oral Hygiene and Nutrition Habits

Similar studies to the present one have been conducted in many countries worldwide and in different population groups (students, children, elders, adults etc). The results of these studies resemble in most of their outcomes. The frequency for brushing is recorded as 70% twice a day^{57,58,59}. Women seem to present a greater frequency in brushing as well as better oral health^{57,58,60,61} but also display a higher frequency of dental visits⁶⁰. The satisfactory oral hygiene habits relate to the female gender, the higher level of education, the non smokers and the patients who visit the dentist for preventive reasons⁵⁸.

The percentage in the samples that uses dental floss daily is minor^{57,58,59}. An important finding in bibliography is that a vast majority of children have been informed from school^{59,62}. The family also plays an important role, and this influence has been found in acquiring oral hygiene habits and in the frequency of brushing⁶³.

The Europeans' dental visiting frequency is averaged 2 times per year. 4 out of 10 European citizens visit once yearly, while 34% 2 times per year, 10% 3 and 13% 4 or more. For Greece, 2.7 visits per year are recorded⁶⁴. For the reason of dental visits, 50% of the Europeans is motivated for a check-up or debridement, 33% for a routine treatment and 17% for an emergency situation. Prevention is the main reason of the visit for United Kingdom (72%), Denmark (69%), Italy (67%) and Sweden (60%). In Greece, 42% visit their dentist for prevention according to the European Committee and at the same time the percentages rise for women and young adults⁶⁴.

Similar studies have been performed regarding nutrition habits of some population groups. In an epidemiological study of Konig et al⁶⁵, no statistically significant difference due to gender were observed related to nutrition habits. The frequency and quantity of receiving sugar meals is related to caries susceptibility⁶⁶. Ismil et al⁶⁷ reported that people aged 9 to 29 present greater risk for caries as the frequency of sugar meals received increases. The consumption of 450gr of refreshment between meals per day presents 1.86 greater possibility of high DMFT value⁶⁷. Also Burt et al⁶⁸ came to the same conclusion about sugar consumption. In a study from Hinds et al⁶⁹ in 1500 preschool children, 22% of low consumption of sugar meals presented caries compared to 40% of high consumption of sugar meals. Similar results about sugar meals were found in a study with children 4 years old where the dmft value was double for sugar consumption in more than 4 meals per day⁷⁰ as well as in a study of Holbrook et al⁷¹.

Europeans receive an average of food or drink 5 times per day. 30% reports at least 6 intakes, while 47% receives up to 4. In Greece, 3.9 meals are received in average. 15% of Europeans receives sweets often in their nutrition, while for Greeks the percentage rises to 20%.

Refreshments present a high resonance in Europe, where 19% is consumed often - 21% in Greece. Young adults aged 15 to 24 and working Europeans present higher frequency in consumption⁶⁴.

Prevention and Crisis

The question that arises is in what degree is prevention affected by the socio-economic crisis that has arisen in Greece but in the rest of Europe too in the past few years. Studies in Greece show that there is a correlation between the provided health services and the crisis. The economical depression in Greece creates injustices in the accessibility of health service⁷².

13% in average of the state's budget in the European Union member states end in Health⁷³. In 2010 the budget for health remained stable in many countries, whereas in others it diminished⁷³. According to the records of the European Observatory for health and security issues and the Global Organization for Health, there is an augmentation, especially in Greece and Spain, in the difficulties to access primary health care⁷³. In Estonia, Ireland, and Slovenia the nations' provided dental care are in decline while in Iceland the exemptions from dental charges in low-income people are expanding⁷³. In Iceland, there seems to be no negative effect of the economic crisis in the dental habits of the population⁷⁴.

The economical crisis overall has led many governments in reduction of the state expenses for health⁷³. The prevention due to the economical but also social crisis has been sidelined and neglected both from societies and governments.

Conclusion

The information regarding oral hygiene and nutrition habits in a population group can help in resolving the problems that may be observed.

Half of the sample hasn't received at school visit by a dentist in order for him to inform them about methods of improving their oral health and to promote the value of prevention in modern dentistry;

More than one third of these participants visits their dentist at least once a year, for preventive reasons and has obtained the habit of brushing their teeth 2 to 3 times per day;

Statistically significant difference observed between females and males concerning their frequency in brushing has appeared before in the literature^{13,57,58,60};

The higher frequency in consuming sugar meals from smokers against non-smokers is also important. Other papers report similar results: satisfactory level of oral health shows a higher prevalence in women, in non-smokers and people of a higher educational level^{13,75,76};

The use of complimentary methods for oral hygiene is considered poor and at the same time 1 out of 5 participants stated that they have never received dental debridement up to today.

As far as nutrition habits are concerned, the adoption of a balanced nutrition that will provide all the necessary elements for the organism is highly important. In the current study, the consumption of sugar meals is considered satisfactory^{66,77}, since such meals are received once to 3 times a day.

In an educational system of the 21st century and in a member state of the European Union, the lack of preventive dentistry appears to constitute a problem. It is important that the reassurance of oral health becomes a routine, since it can lead to a decline of the prevalence for periodontal disease and caries when combined with correct and balanced nutrition.

Worth noting is the finding of absence of statistically significant difference in habits due to the different available monthly budgets in young people in Greece. The lack of adequate statistically significant results could be partially explained by the size of the sample, indicating that further studies, including bigger samples, should be conducted to bring results that could be implemented in everyday practice of dentistry.

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