

# Gender differences in oral health status and behavior of Greek dental students: A meta-analysis of 1981, 2000, and 2010 data

Eleni Mamai-Homata, Haroula Koletsi-Kounari, Vasileios Margaritis<sup>1</sup>

Department of Preventive and Community Dentistry, Dental School, National and Kapodistrian University of Athens, Athens, Greece, <sup>1</sup>Department of Public Health, College of Health Sciences, Walden University, Minneapolis, Minnesota, USA

**Corresponding author** (email: <vasileios.margaritis@waldenu.edu>)

Dr. Vasileios Margaritis, College of Health Sciences, Walden University, 100 Washington Avenue, S. Suite 900, Minneapolis, Minnesota - 55401, USA.

## Abstract

**Background:** The aim of this study was to investigate the oral health status and behavior of Greek dental students over time, and to meta-analyze these findings to test the widely documented hypothesis that women have better oral health behavior, oral hygiene, and periodontal status but higher dental caries rates than men. **Materials and Methods:** A total sample of 385 students was examined using identical indices to assess oral health and behavioral data initially in 1981 while the years 2000 and 2010 were selected due to significant changes that took place in the dental curriculum in the 1990s and 2000s. Data by gender concerning the outcome variables recorded in every one of the three surveys were analyzed using Mantel-Haenszel and continuous outcomes methods. **Results:** A significant improvement in the oral health status and behavior of students was observed over time. The meta-analysis of data by gender showed that females brushed their teeth significantly more often than males [summary odds ratio (OR): 1.95 and 95% confidence interval (CI): 1.08–3.54]. Males and females were found to have a similar risk of developing dental caries. **Conclusion:** The hypothesis that young women have better oral hygiene habits compared to men was confirmed. However, the hypothesis that women have better oral hygiene and periodontal status but exhibit higher dental caries experience than men was not supported by the findings of the study.

**Key words:** Behavior, dental curriculum, gender gap, meta-analysis, oral health, sex differences

## INTRODUCTION

During the last 30 years, several studies have been conducted all over the world in order to investigate the possible sex differences in oral health status and behavior in populations of various age groups and characteristics. Most of these studies concluded that females bear a higher burden of dental caries compared to males.<sup>[1]</sup> Higher caries prevalence among females

has been traditionally attributed to: (a) Earlier tooth eruption among girls and hence, longer exposure of their teeth to the cariogenic oral environment, (b) easier access to food supplies by women and frequent snacking during food preparation, (c) vomiting, neglected oral hygiene, and nutritional changes during pregnancy, and (d) social factors (e.g., women's social role in the society and family, ritual fasting).<sup>[2,3]</sup>

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Recently, evidence has been provided to demonstrate that higher caries rates in women may also be explained by differences in salivary composition and flow rate, hormonal fluctuations during puberty, menstruation and pregnancy, and genetic variations.<sup>[2,4]</sup> On the other hand, it is generally accepted that with the exception of puberty and pregnancy, females exhibit lower periodontal diseases prevalence and severity than males.<sup>[5-7]</sup> This difference is mainly attributed to better oral health behavior and hygiene status among females<sup>[5,8]</sup> while hormonal and other physiological and behavioral differences between the two genders may also contribute to the higher risk for periodontal diseases in males than in females.<sup>[5]</sup>

Over the last 30–35 years, there has been evidence of decreasing caries prevalence in children and adolescents in developed countries due to improvements in oral health behaviors, increased exposure to fluorides, and application of effective caries prevention programs. On the contrary, the prevalence of dental caries among middle-aged adults was high as the disease affected nearly 100% of the population in a majority of the studies while most developed countries showed high decayed, missing, and filled teeth (DMFT) values.<sup>[9]</sup> However, in some studies a decline in caries experience has been reported that is mainly attributed to a reduction in missing teeth.<sup>[10,11]</sup>

Trends in periodontal diseases are more complicated but it seems that a decline in gingivitis during adolescence is common in developed countries, reflecting an increased social awareness and better oral hygiene.<sup>[6]</sup> There is also evidence that the prevalence of severe periodontal diseases in middle-aged adults is declining.<sup>[12,13]</sup>

Although there are plenty of data concerning the prevalence and severity of dental caries and periodontal diseases in children, adolescents, and middle aged adults, changes in the oral health of young adults are not well-documented while most studies concerning this age group include convenient samples of university students and military personnel. In Greece, epidemiological data concerning the oral health and hygiene status as well as the oral health behaviors of young adults have been collected among dental students in 1981, 2000, and 2010. During these 30 years, significant changes took place in the curriculum of Athens Dental School. The number of dental courses in the first six semesters gradually increased while some medical courses were geared to the needs of dental medicine. Furthermore, in 1981 and 2000, third year students did not participate

in clinical experiences, whereas in 2010 they had to achieve a defined level of clinical competency before advancing to the fourth year. These changes might have a significant impact on the oral health status and behavior of dental students.

The aims of this study were to investigate possible changes in the oral health status and behavior of Greek dental students over time, and to meta-analyze these findings in order to test the hypothesis that females have better oral health behavior as well as better oral hygiene and periodontal status but exhibit higher dental caries experience than males.

## MATERIALS AND METHODS

All Greek students who attended the sixth semester of Athens Dental School, and specifically the Preventive Dentistry course were invited to participate in the survey in 1981, 2000, and 2010. The students' age range was 19–25 years (mean age 21.3 years, 22.2 years, and 21.0 years, respectively). In each of these years, all the students were examined but because of a reduction in the number of students admitted in the dental school during the 1990s, the sample size was 180 students in 1981, 109 in 2000, and 96 in 2010. The attrition rate was 10.4%, 4.4%, and 3% in 1981, 2000, and 2010, respectively.

The examinations were performed at a university dental clinic using dental mirrors and periodontal probes. Prior to each survey, four dental Doctor of Philosophy (PhD) students (12 examiners in total) were trained and calibrated. Interexaminer reliability and agreement were assessed with an experienced investigator (E-MH) as the gold standard. For the examined indices, levels of concordance were very good (kappa coefficient  $\geq 0.83$ ) in all three surveys (0.83, 0.84, and 0.86 in 1981, 2000, and 2010 surveys, respectively). The Ethical Committee of Athens Dental School gave its approval prior to the start of the study, and informed written consent forms were obtained from all the participants.

The clinical recorded variables were coronal caries, periodontal status, and oral hygiene status. Coronal caries was measured using the DMFT index and was diagnosed at the caries into dentine threshold.<sup>[14]</sup> The periodontal conditions were measured using the Community Periodontal Index (CPI)<sup>[15]</sup> and are presented according to the highest score recorded for each person (indicating the prevalence of conditions). The oral hygiene status was recorded by means of the simplified

oral hygiene index (OHI-S).<sup>[16]</sup> Behavioral data were collected through a structured questionnaire that was completed face-to-face at the time of the clinical examination. These questionnaires included simple questions about oral hygiene habits such as brushing frequency and the reason for visiting a dentist. The internal consistency of this survey was satisfactory (Cronbach's alpha coefficient  $\geq 0.90$ ).

The outcome variables were DMFT, CPI, and OHI-S scores of the subjects as well as brushing frequency and reason for dental attendance. Initial data analysis relied on descriptive statistics; bivariate examination of statistical associations was conducted performing Chi-square and nonparametric tests (Kruskal-Wallis and Mann-Whitney *U*), using gender and year of examination as the independent variables. Mann-Whitney *U* tests were also applied for performing *post hoc* pairwise group comparisons when the Kruskal-Wallis nonparametric test was used. Finally, in order to meta-analyze data by gender concerning the outcome variables recorded in every one of the three surveys (CPI scores were recorded only in 2000 and 2010), Mantel-Haenszel and continuous outcomes methods were used.<sup>[17]</sup> Because there were three possible pairwise comparisons, the Bonferroni-adjusted *P* value needed for significance at the 0.05 level was 0.05/3 or 0.017. The analyses of coded data were performed using IBM (Armonk, NY) Statistical Package for the Social Sciences (SPSS) statistics software version 20.0.

## RESULTS

### Brushing frequency and reason for visiting a dentist

The data concerning brushing frequency and reason for visiting a dentist by gender and year of examination are presented in Table 1. As can be seen, regular tooth brushing ( $\geq$ twice per day) was claimed by 57%, 82.6%, and 83.5% of the respondents in 1981, 2000, and 2010, respectively but these differences were significant only between 1981 and 2000/2010 ( $\chi^2 = 34.626, P < 0.017$ ). The percentage of those reporting that they brushed their teeth less than once a day was relatively low in 1981 (9.5%) and very low in 2000 and 2010 (0.9% and 1.1%, respectively). Females brushed their teeth more often than males while significant differences by gender were found in the survey of 1981 ( $\chi^2 = 23.709, P < 0.017$ ) and in the summarized data of meta-analysis [summary odds ratio (OR): 1.95 and 95% confidence interval (CI): 1.08–3.54].

The percentage of students who attended a dentist for checkup was significantly increasing over the years, from 39% in 1981 to 64.4% in 2000 and to 80% in 2010 (Table 1,  $\chi^2 = 46.075, P < 0.017$ ). Bivariate as well as meta-analysis of the data showed that no significant difference was observed by gender.

### Oral hygiene status

The mean OHI-S values in the overall samples in 1981, 2000, and 2010 were 0.76, 0.74, and 0.43, respectively

**Table 1: Brushing frequency and reason for visiting a dentist of Greek dental students by gender and year of examination and meta-analysis of the data**

Year	Gender	N	Percentage of participants who brush teeth			Percentage of participants who visited a dentist for	
			<Once a day	Once a day	$\geq$ Twice a day	Pain/treatment	Checkup
1981	Males	91	18.9	37.8	43.3	58.8	41.2
	Females	89	0.0	29.2	70.8	63.2	36.8
	Total	180	9.5	33.5	57.0	61.0	39.0
						$X^2=23.709, P<0.017$	$X^2=0.349, P>0.05$
2000	Males	33	0.0	21.2	78.8	34.4	65.6
	Females	76	1.3	14.5	84.2	33.3	66.7
	Total	109	0.9	16.5	82.6	33.6	66.4
						$X^2=1.149, P>0.05$	$X^2=0.011, P>0.05$
2010	Males	33	0.0	18.2	81.8	21.9	78.1
	Females	63	1.7	13.8	84.5	19.0	81.0
	Total	96	1.1	15.4	83.5	20.0	80.0
						$X^2=0.850, P>0.05$	$X^2=0.109, P>0.05$
			Brushing frequency vs year: $\chi^2=34.626, P<0.017$ only between 1981 and 2000/2010			Dental attendance vs year: $\chi^2=46.075, P<0.017$ among all three surveys	
Mantel-Haenszel Method			1.95 and 1.08-3.54 <sup>1</sup>			0.94 and 0.72-1.52	
Summary Odds Ratio and 95% CI							

<sup>1</sup>Odds ratios were calculated as having two categories: First-<once a day and once a day and second- $\geq$ twice a day. CI=Confidence interval

[Table 2]. Statistically significant differences were observed between the survey of 2010 and those of 1981 and 2000 (Kruskal–Wallis test,  $P < 0.017$ ). Women had better oral hygiene status than men in 1981 and 2000 but the observed differences were significant only in 1981 (Mann–Whitney  $U$  test,  $P < 0.017$ ). On the contrary, the oral hygiene status of males was slightly better than that of females in 2010. Meta-analysis of the data indicated that males had in summary higher OHI-S score than females (summary mean: 0.133) but this difference did not reach statistical significance.

### Periodontal status

The percentage of subjects with healthy periodontium in the overall sample was 22.9% in 2000 and 11.5% in 2010 [Table 3]. On the other hand, the percentages of students with calculus and shallow pockets of 4–5 mm were lower in 2010 than in 2000 (24% and 6.2% versus 56% and 8.3%, respectively). The most frequently observed condition in 2000 was calculus (56%) and in 2010 was bleeding (58.3%). Deep pockets of more than 6 mm were not observed in any of the two surveys. The number of persons who had as highest CPI score 0 and 1 was significantly higher in 2010 than in 2000 (69.7% versus 35.8%,  $\chi^2 = 23.647$ ,  $P < 0.017$ ). Chi-square

tests as well as meta-analysis of the data showed that no significant differences were observed genderwise although meta-analysis indicated that females were less prone to have higher CPI score than males (summary OR: 0.61 and 95% CI: 0.28–1.32).

### Coronal caries

The percentages of caries-free students in 1981, 2000, and 2010 were 2.2%, 18.3%, and 19.8%, respectively, and the mean DMFT scores were 10.53, 5.56, and 3.55, respectively [Table 4]. Filled teeth (FT) were the major component of the DMFT index in all three surveys. The mean DMFT score was significantly decreasing over time (Kruskal–Wallis test,  $P < 0.017$ ). The analysis of the results by gender revealed no significant differences in DMFT scores (Mann–Whitney  $U$  test,  $P > 0.017$ ) as well as in the percentages of caries-free students (OR<sub>1981</sub>: 3% and 95% CI: 0.306–29.400, OR<sub>2000</sub>: 1.305 and 95% CI: 0.468–3.641, OR<sub>2010</sub>: 0.645 and 95% CI: 0.204–1.919). The above findings were confirmed by the meta-analysis of the data, indicating that males and females had an almost similar risk of developing caries since caries-free summary OR was found very close to 1 (summary OR: 1.05 and 95% CI: 0.420–2.620).

### DISCUSSION

Dental students constitute a special population group concerning their oral health status and behavior since they have the best access to information and motivation for the prevention and treatment of oral diseases. For this reason, they usually have better oral health behavior and lower CPI scores compared to students of other academic disciplines.<sup>[18,19]</sup> On the other hand, their caries experience was found to be similar to that of other university students.<sup>[20]</sup> This can be explained by the fact that DMFT index is irreversible while for caries initiation and development, a sufficiently long period of time is needed. However, it seems that their dental education affects DMFT components since it was noticed that a decrease in the number of carious lesions was accompanied by an increase in the number of fillings as the students progressed from one academic year to the next.<sup>[18,20]</sup> Thus, the findings of this study were primarily compared to the ones pertaining to the oral health status and behaviors of dental students resulting in the best possible comparability.

The analysis of data concerning the oral health behavior of the dental students showed that the majority of them brushed their teeth at least twice daily in all three surveys, and that this practice has greatly improved

**Table 2: Oral hygiene status of Greek dental students by gender and year of examination and meta-analysis of OHI-S scores**

Year	Gender	N	OHI-S*		DI-S		CI-S	
			Mean	SD	Mean	SD	Mean	SD
1981	Males	91	0.92	0.69	0.77	0.53	0.14	0.28
	Females	89	0.60	0.37	0.56	0.34	0.04	0.11
	Total	180	0.76	0.58	0.67	0.36	0.09	0.22
*Mann–Whitney $U$ test, $P < 0.017$								
2000	Males	33	0.83	0.49	0.60	0.39	0.23	0.26
	Females	76	0.70	0.45	0.57	0.35	0.14	0.20
	Total	109	0.74	0.47	0.58	0.34	0.17	0.23
*Mann–Whitney $U$ test, $P > 0.05$								
2010	Males	33	0.33	0.30	0.26	0.26	0.06	0.12
	Females	63	0.49	0.46	0.38	0.36	0.12	0.20
	Total	96	0.43	0.42	0.34	0.33	0.10	0.18
*Mann–Whitney $U$ test, $P > 0.05$								

OHI-S vs year: Kruskal–Wallis test,  $P < 0.017$  only between 2010 and 1981/2000

Continuous outcomes method -0.133

OHI-S Summary Mean

\*=Statistical tests and correspondent  $p$  values. SD=Standard deviation, OHI-s=Simplified oral hygiene index

**Table 3: Periodontal health of Greek dental students by gender and year of examination and meta-analysis of CPI scores**

Year	Gender	N	Percentage of persons who had highest score				
			0 Healthy	1 Bleeding	2 Calculus	3 Pockets 4-5 mm	4 Pockets ≥6 mm
1981	Males	91	-	-	-	-	-
	Females	89	-	-	-	-	-
	Total	180	-	-	-	-	-
2000	Males	33	15.2	12.1	66.7	6.1	0
	Females	76	26.3	13.2	51.3	9.2	0
	Total	109	22.9	12.8	56.0	8.3	0
$\chi^2=2.515$ , $P>0.05$							
2010	Males	33	9.1	54.5	24.2	12.1	0
	Females	63	12.7	60.3	23.8	3.2	0
	Total	96	11.5	58.3	24.0	6.2	0
$\chi^2=3.145$ , $P>0.05$							
CPI categories vs year: $\chi^2=23.647$ , $P<0.017$ <sup>1</sup>							
Mantel-Haenszel Method			0.61 and 0.28-1.32				
Summary Odds Ratio and 95% CI <sup>1</sup>							

<sup>1</sup>Chi-square and odds ratios were calculated having two categories: First-0 (healthy) and 1 (bleeding) and second-2 (calculus) and 3 (pockets 4-5 mm). CI=Confidence interval, CPI=Community Periodontal Index

**Table 4: Caries experience of Greek dental students by gender and year of examination and meta-analysis of caries-free odds ratios**

Year	Gender	N	Caries free N %	Odds ratio (caries-free)	95% CI for OR	D Mean	M Mean	F Mean	DMFT* Mean (SD)
1981	Males	91	3 3.3	3.000	0.306-29.400	3.44	0.63	5.91	9.98 (5.63)
	Females	89	1 1.1			2.87	0.81	7.41	11.09 (6.00)
	Total	180	4 2.2			3.15	0.72	6.66	10.53 (5.83)
*Mann-Whitney U test, $P>0.05$									
2000	Males	33	7 21.2	1.305	0.468-3.641	1.55	0.12	3.79	5.45 (5.04)
	Females	76	13 17.1			1.34	0.04	4.25	5.61 (4.79)
	Total	109	20 18.3			1.40	0.06	4.11	5.56 (4.85)
*Mann-Whitney U test, $P>0.05$									
2010	Males	33	5 15.2	0.625	0.204-1.919	1.21	0.00	2.58	3.82 (3.16)
	Females	63	14 22.2			0.78	0.03	2.64	3.41 (2.98)
	Total	96	19 19.8			0.93	0.02	2.62	3.55 (3.03)
*Mann-Whitney U test, $P>0.05$									
DMFT vs year: Kruskal-Wallis test, $P<0.017$ among all three surveys									
Mantel-Haenszel Method Summary				1.05	0.420-2.620				
Caries-Free Odds Ratio by Gender									

\*=Statistical tests and correspondent p values. CI=Confidence interval, SD=Standard deviation, DMFT=Decayed, missing, and filled teeth

since 1981. Therefore, it becomes obvious that students attending the sixth semester of their studies are aware of the importance of oral hygiene in the prevention of oral diseases, especially during the last decade. The percentage of Greek dental students who brushed their teeth regularly was similar or higher than that observed in the same population group of most other countries.<sup>[21-24]</sup>

Significant changes have also been observed in the reason for visiting a dentist since the percentage of students who attended the dentist for checkup was doubled during a period of 30 years (from 39% in 1981 to 80% in 2010). Similar findings have been reported for Belgian dental students between 1989 and 1994,<sup>[23]</sup> indicating a better understanding of the importance of regular dental attendance over time.

The oral hygiene status of the dental students examined, as measured by the OHI-S index, demonstrated a significant improvement in 2010 compared to 1981 and 2000, mainly due to the remarkable decrease of the DI-S component. The differences observed between 1981 and 2010 could be attributed to the fact that a significantly higher percentage of students brushed their teeth twice daily in 2010 (83.5%) than in 1981 (57%). However, the differences in regular tooth brushing between 2000 and 2010 were minimal. Therefore, it is very likely that students examined in 2010 brushed their teeth more effectively.

The findings of the study concerning the periodontal status of students indicate an improvement over time since the percentage of those who had the highest of score 2 and 3 was significantly lower in the survey of 2010 compared to that in 2000. This difference between the two surveys resulted mainly from the remarkable decrease in the number of those with calculus. A plausible explanation for this observation is the frequent removal of calculus among students who attended a dentist for checkup, the number of which was significantly greater in the survey of 2010.

The level of coronal caries experience in Greek dental students was found to be significantly decreasing over the years. This finding may be mostly attributed to the observed improvements in health behavior of the participants and especially to the increased frequency of tooth brushing with fluoridated toothpastes. Furthermore, since a gradual increase in the number of students attending a dentist for checkup was noticed, a parallel increase in the number of students receiving topical fluoride treatments is probable. The mean DMFT score in 2010 (3.55) was similar to that observed for dental students in Finland,<sup>[25]</sup> Spain,<sup>[26]</sup> Tunisia,<sup>[27]</sup> and India<sup>[19]</sup> and lower than that reported for dental students in Serbia,<sup>[28]</sup> Lithuania,<sup>[21]</sup> Poland,<sup>[29]</sup> and Croatia.<sup>[18]</sup> Therefore, caries experience in Greek dental students can be considered as satisfactory compared to recent studies conducted in other countries in the same population group.

The significant improvement in the oral health status and behavior of Greek dental students observed over time [Tables 1–4] can be partly attributed to the overall improvement in the dental health status and behavior of children and adolescents over the last 30 years that is carried over into adult age. However, changes in Athens Dental School's curriculum such as the increase of dental courses in the first 3 years (from 10 in 1981, to 22 and 24 in 2000 and 2010, respectively), and the increase

of clinical practice by 1 year may have also played a role in this improvement.

The effect of gender on the oral health status and behavior of students was initially tested by bivariate analysis and then by meta-analysis of the data. We considered meta-analysis as the most appropriate methodology in order to test the hypothesis of the present study since it comprises the effect sizes as well as the precision of the included studies and avoids problems associated with the statistical conclusions arising from individual tests.<sup>[30]</sup> In addition, the degree of between-study homogeneity was relatively high<sup>[30]</sup> since the subjects were of similar origin (in each survey almost 60% of the students came from Athens and 40% from the provinces) and the recorded indices were identical. Furthermore, since socioeconomic determinants have been identified as very important for patients in their utilization of dental care services<sup>[31]</sup> and although there is no information about the socioeconomic status of the students included in this study, they all lived in an urban environment (Athens) for at least 3 years at the time when the surveys took place and had more or less the same opportunities to obtain education and health care. Therefore, all the subjects of the sample were considered to be of a similar educational background.

According to the results of the bivariate analysis, the only significant differences between males and females were observed in the study of 1981 and concerned brushing frequency and oral hygiene status. This meant that females brushed their teeth significantly more often and had a better oral hygiene status than males. However, according to meta-analysis of the data only tooth brushing frequency was significantly affected by gender.

The finding that females had more positive behavior than males concerning brushing frequency was in accordance with those reported for dental students of several other countries although in most of these studies, sex differences were greater.<sup>[32–35]</sup> This difference could be attributed to the fact that women usually care more about their body and appearance and therefore, they may be more concerned about adopting behaviors and habits, which promote their dental health.<sup>[35]</sup> Also, it has been reported that women have lower oral health self-assessment<sup>[36,37]</sup> and thus, they tend to be more ready to adopt better oral health behavior as they age or acquire dental health knowledge, compared to men.<sup>[38]</sup>

The hypothesis that females have better oral hygiene and periodontal status but exhibit higher dental caries experience than males is not supported by the findings of this study. The lack of significant difference in OHI-S scores between the two genders is probably due to the fact that male and female dental students are equally informed about oral hygiene instructions and consequently they are equally able to remove dental plaque effectively. The above observation may also explain the lack of significant difference in CPI scores between males and females since it is well-documented that the periodontal health is greatly affected by the oral hygiene status. Furthermore, several previous studies in dental students as well as in adolescents and young adults<sup>[27,39-41]</sup> have not found significant differences in CPI scores by gender. On the other hand, some other studies reported that men were more prone to develop severe periodontal conditions compared to women.<sup>[11,42-46]</sup> However, most of these studies concern middle-aged adults and senior citizens. Therefore, it seems that gender differences in periodontal health are more pronounced in older individuals, primarily due to prolonged exposure to risk factors.

Meta-analysis of the present study's data concerning caries prevalence indicated that young males and females had an almost similar risk of developing caries. This finding is actually contradictory to what is widely known and documented,<sup>[1,4]</sup> according to which higher caries rates were found more often among females than males, especially in mature adults. Yet it is in accordance with relatively recent studies in other countries.<sup>[25,29,47-49]</sup> Consequently, caries experience differences by gender seem to be reduced during the last few years but this is attributable to as yet unknown factors. Therefore, further research is required probably focusing not only on the traditional and well-established factors, which are related to gender difference in caries but also on more unexplored causes such as the increased use of noncariogenic sugar substitutes, the widespread use of antibiotics by both genders, and herd immunity,<sup>[50,51]</sup> which may eliminate the "gender gap" in caries prevalence and experience.

The present study had several limitations. To begin with, as it has already been mentioned, dental students constitute a special population group concerning their oral health status and behavior. Therefore, the findings of this study were primarily compared to the ones pertaining to the oral health status and behaviors of dental students, and they were not generalized to other similar age groups. Also, the number of participants was

relatively small in each survey although the attrition rates were low. Further, no specific information was provided on the socioeconomic status of the students included in this study. Finally, certain information was retrieved from the students' reports (e.g., brushing frequency) and therefore, they were subject to recall bias.

## CONCLUSIONS

In conclusion, the results of the present study suggest a significant improvement in the oral health status and behavior of Greek dental students over time. This observation can be partly attributed to the overall improvement in the dental health status and behavior of children and adolescents over the last 30 years that is carried over into adult age. However, changes in the curriculum, such as the increased time of clinical practice and the integration of a significant number of dental courses in the first 3 years, may have also played a role in this improvement. Additionally, differences in oral health between young males and females appeared to be eliminated or at least reduced during the last 30 years. Since these findings are supported by some relatively recent reports, further research is required in order to detect some as yet unknown factors, which may be responsible for this change.

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## Conflicts of interest

There are no conflicts of interest.

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