



# Knowledge, Attitude and Behavior of Tunisian Dental Students about Oral Health: A Cross Sectional Study

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## ABSTRACT

**Objectives:** The aim of this survey was to assess aspects of oral health knowledge, attitudes and behavior among clinical dental students in Tunisia and to compare it with preclinical students.

**Materials and methods:** The English language version of the HU-DBI was distributed to preclinical and clinical students from different levels. Dichotomized (agree/disagree) responses to 20 HU-DBI items were provided in this study, with a maximum possible score of 12. A quantitative estimate of oral health knowledge, attitudes and behaviors was provided by the total of appropriate answers given to every statement by each group. Data were collected and statistically analyzed with the significance level set at  $P \leq 0.05$  within all tests.

**Results:** The overall median score of answers favoring good oral hygiene was marginally higher in clinical 7 than preclinical students 5.5 and showed statistical significance ( $p=0.000$ ). Similarly, the analysis of each item individually displayed statistically significant differences between preclinical and clinical participants in 9 items of the survey.

**Conclusion:** This study showed no effective differences in oral hygiene behavior between preclinical and clinical students in Tunisia. This reveals a weak effect of dental education on improving students' oral health habits in Tunisia and might demand the introduction of more courses emphasizing the importance of correct oral health behavior among health care providers.

**Keywords:** Oral health; Dental students; Tunisia; Questionnaire; HU-DBI

## INTRODUCTION

Oral health behaviors such as daily brushing, rinsing, flossing and regular dental visits are necessary to prevent rapid accumulation of plaque that can lead to long-term health problems such as periodontitis, dental caries or tooth loss and

may be a risk factor for various systemic conditions and diseases such as respiratory diseases, coronary heart disease, endocarditis, alzheimer and even preterm birth, low birth weight infants and alzheimer and dementia [1].

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According to the world oral health report, oral diseases are among the most prevalent diseases worldwide and produce abundant health and economic burdens, reducing quality of life for affected individuals and societies and 30%-60% of the adult population suffers from medium to severe periodontitis. The prevalence of periodontal diseases in the adult population depends on several factors, such as a patient's personality, lifestyle and health practices, education and other social and demographic factors. Health education is considered one of the fundamental elements in the success of disease prevention in several areas of health care, including oral and dental health. Key factors in oral diseases preventing are regular use of dental hygiene measures in addition to smoking cessation.

Among the most reliable methods of oral health education, attitudes and behavior of oral health providers towards their own dental and oral hygiene that can have a major impact on improving public oral health. As oral health attitudes display their mind's predisposition to oral health and reflect practically as oral health behavior, oral health providers can advise patients and present good examples of correct oral practices to raise the awareness on oral disease prevention as one of their substantial responsibilities.

The behavior and the attitudes of oral health providers could affect the delivery of oral health care and consequently, the oral health of their patients. For instance, dental students are expected to be a good example for oral health behavior.

Dental education in Tunisia is provided by the public dental faculty of monastir which is the only dental academic institution in the country. Students must complete a regular course of study for ten semesters (5 years) with an additional one-year internship. During the first years, students should succeed a six-semester pre-clinical period, focusing on biologic sciences, dental materials, general medicine and dental disciplines such as prosthesis, oral medicine and surgery, conservative odontology, orthodontics, periodontics. During this stage, students receive theoretical education about oral health care with minor practical application within the dummy-head training courses. This is followed by another six semesters of clinical study, including lectures, seminars and practical training. This educational process includes a series of progressive stages that commence with theory and simulation and end with a clinical training phase in which the student must fulfil the tasks of a professional dentist. This sharp preclinical clinical transition is of great educational importance for students, as their role shifts from being taught about oral hygiene and patient care to being responsible for real patients' oral health. Research highlights the importance of adjusting the dental curricula towards the strengthening of student's professional competence during this transitional phase, allowing clinical students to integrate theory and practice and to show correct attitudes towards their own oral health, as well as a professional and healthy oral care behavior as role models and educators to their patients [2].

Recently, several studies evaluated this educational transition in different regions of the world comparing the oral health attitudes and behavior among preclinical and clinical dental

students as primary signs for educational progress as attitude is defined as the way in which a person views and evaluates something or someone. Attitudes determine whether people like or dislike things and therefore how they behave towards them. Dental students are expected to play a critical role in instructing public oral health; their attitude reflects their understanding of the importance of disease prevention and their responsibility for improving their patient's oral health. Therefore, the level of their own oral health behavior can serve as positive models for their patients, families and friends.

Several outcomes displayed significant improvements of oral health manners in clinical students using the Hiroshima University-Dental Behavioral Inventory (HU-DBI) questionnaire revealed interesting facts regarding differences in dental health attitude and behavior among undergraduate dental students, whereas others observed a less effective preclinical-clinical transition. Examining the literature, no similar investigation was found in Tunisia. Limited data regarding the attitude and behavior of dental students in Egypt were noted.

Thus, this study aimed to assess the self-reported oral health knowledge and attitudes and behavior among preclinical and clinical dental students in Tunisia by using a shortened Hiroshima University-Dental Behavior Inventory (HU-DBI) questionnaire in order to answer our research question which is the difference of oral health knowledge, attitude and behavior among undergraduate dental students from all levels. Consequently, it may open the way for the Tunisian dental university to assess its curricula to encourage needful oral health practices and positive behavioral attitudes and to increase their responsibility to motivate good oral health habits in their patients [3].

## MATERIALS AND METHODS

This cross-sectional study of oral health knowledge, attitude and behavior in the faculty of dental medicine at Monastir (Tunisia) was carried out on dental students within the scholarly year 2022-2023.

A convenience consecutive sampling technique was employed to select dental students from 1<sup>st</sup> to 6<sup>th</sup> level who were invited to complete the questionnaire. English self-administered questionnaire, consisting of 20 items in a dichotomous response based on HU-DBI was distributed among 720 dental students. Stratified simple random sampling were used to include homogeneous groups of preclinical students (1<sup>st</sup> and 3<sup>rd</sup> year) and clinical students (5<sup>th</sup> and 6<sup>th</sup> year) by selecting randomly participants from each stratum.

To limit information bias, they were provided with a full explanation regarding the nature of the study, allowed to interact with the researcher for understanding the questions without leading their answers and asked to write exactly what they feel, conduct and perform and to provide us with the best of their knowledge.

To determine the number of responding students needed for a significant database, the following cochrane formula was used:

$$n = n^{\circ} / (1 + (n^{\circ} - 1) / N)$$

- The dental student population size (N=800) and the simple size recommendation is  $n^{\circ}=135$
- A confidence level of 95%
- A margin of error of 5%

Based on these conditions it was determined that within the study population, at least 117 students were needed for a statistically significant sample size ( $n$ =the adjusted simple size). This study enrolled 200 volunteer Tunisian students from the faculty of dental medicine aged between 19 and 30 years old [4].

All dental students attending courses of all semesters, willing to participate in the research and answer the questionnaire were enrolled in this study. Students who did not complete the questionnaire were excluded. All participants signed an informed consent with a promise of anonymity and their data confidentiality. Approval from the dental research committee of the faculty of dental medicine was obtained.

In the current study, data on oral health attitude and behavior was collected using a shortened version of the HU-DBI questionnaire consisting of 20 items describing aspects of oral health behavior and attitudes. Each item consisted of a dichotomous response (agree/disagree).

The questionnaire was designed to record self-reported oral health (knowledge) (Items no: 2, 8, 10, 15, 19), oral health attitude (Items No: 6, 11, 14) and oral hygiene behavior (Items no: 4, 9, 12, 16). Items 4, 9, 11, 12, 16 and 19 are given 1 point if the respondent agrees. Also, Items 2, 6, 8, 10, 14 and 15 are given 1 point if the respondent disagrees. Hence, the maximum possible score is out of 12 and the minimum score is 0. The higher the score means the better the oral health attitude and behavior for each student. HUDBI questionnaire included eight dummy items which are not included in the final scoring system. The questionnaire was pretested and face-to-face validated in 60 students and showed an acceptable reliability (Cronbach's alpha score=0.7).

Differences between preclinical and clinical as well as male students and female students global scores were assessed by non-parametric the Mann-Whitney U test (two independent groups of quantitative variables). In addition, every item was analyzed individually by the *chi-square* test comparing the "agree" responses of preclinical and clinical students to this item of the survey.

Statistical analysis was performed by SPSS software (The statistical analysis was performed using the software SPSS version 20.). The significance level (p-value) for all tests was set at 0.05. For a complex evaluation of probability, the multivariate logistic regression model was used calculating the OR (odds ratio) and its 95% CI [5].

## RESULTS

A total of 200 dental students participated in the survey resulting in a statistically significant sample size and a response rate of 99%. Participants included 100 (50.5%) preclinical (semesters 1-6) and 98 (45.5%) clinical (semesters 7-12) students. Approximately 65.2% of the students were females and 34.8% males [6].

The medium rank of HU-DBI score was 7 and of age was 22.5. The distribution of students according to the education level, age and sex is given in **Table 1**. The percentages of "agree" responses to the 20 items of the HUDBI questionnaire were presented in **Table 2**. Going to the dentist seems to be a priority for 83.8% of the dental students especially for the girls (87.6%) bleeding gums (item-2) were reported in 30.8% of the participants; 58.1% answered that it was impossible to prevent gum disease with only tooth brushing (item-14); and 51% reported that they postponed going to the dentist until they had a toothache (item15). In addition, 45.5% of the students felt that they sometimes took too much time to brush their teeth (item-19). A higher response of "agree" for item-12 ("Checking the teeth in the mirror after brushing"; (91.4%) and item-9 ("brush each of my teeth carefully"; 62.6%) was found. Nearly 86% of the girls worried about their breath while 1 male student out of 13 seemed to worry about the color of his teeth. The summative estimate of dental health behavior was calculated from 12 items in the HU-DBI questionnaire. The overall HU-DBI median of the global score of HU-BDI was 7, the global score of answers favoring a good oral hygiene was marginally higher in clinical 7 than preclinical students 5.5 with statistical significance ( $p=0.000$ ). Comparing both genders of the participants, females displayed a non-significantly higher median HU-DBI score 7 than males 6. Similarly, the analysis of each item of the survey displayed statistically significant differences between preclinical and clinical participants, in items 2, 6, 8, 10, 11, 13, 17, 18, 20 of the survey ( $p=0.05$ ).

**Table 1:** Distribution of the students by level of education, age and gender.

Variables	Total (n=198)	Preclinical (n=100)	Clinical (n=98)
Median age	22.5 (20-24)	20 (19-22)	24 (22-26)
Males (%)	34.8	40	29.6
Females (%)	65.2	60	70.4

Clinical students showed better results than preclinical students regarding most of the items especially item “I think I don’t brush well” with a statistical significance ( $p < 0,01$ ) (Table 2).

**Table 2:** Questionnaire items and the percentage of the agree responses by level of education and gender.

Variables	Gender		p	Level of education		p	Total (%)
	Males (%)	Females (%)		Preclinical (%)	Clinical (%)		
Q1	23.2	12.4	0.049	21	11.2	0.062	16.2
Q2	34.8	28.7	0.376	42	19.4	0.001	30.8
Q3	34.8	42.6	0.282	38	41.8	0.582	39.9
Q4	52.2	39.5	0.088	49	38.8	0.148	43.9
Q5	15.9	5.4	0.014	12	6.1	0.151	9.1
Q6	53.6	42.6	0.14	54	38.8	0.032	46.5
Q7	13	10.1	0.528	12	10.2	0.688	11.1
Q8	55.1	44.2	0.144	58	37.8	0.04	48
Q9	56.5	65.9	0.194	59	66.3	0.288	62.6
Q10	20.3	17.1	0.574	30	6.1	0	18.2
Q11	26.1	14	0.035	12	24.5	0.023	18.2
Q12	13	93.8	0.102	91	91.8	0.834	91.4
Q13	56.5	85.3	0	65	85.7	0.001	75.3
Q14	55.1	59.7	0.53	62	54.1	0.26	58.1
Q15	58	47.3	0.152	57	44.9	0.089	51
Q16	20.3	4.7	0.01	11	9.2	0.672	10.1
Q17	27.5	18.6	0.146	29	14.3	0.012	21.7
Q18	39.1	18.6	0.02	35	16.3	0.03	25.8
Q19	47.8	44.2	0.24	42	49	0.325	45.5
Q20	46.4	51.9	0.456	36	64.3	0	50

Preclinical dental students showed better oral health attitudes than the clinical group in most of the items related to oral health attitudes such as rejecting the idea of having dentures is required when they are old ( $p=0.032$ ). The number of clinical students who believed that brushing teeth was possible without toothpaste (9.48%) was significantly higher than preclinical students (1.79%) ( $p < 0.05$ ).

Clinical students showed similar or inferior positive behaviors related to tooth brushing and prevention than preclinical

participants. Considering gender, the males can be considered as statistically having better oral health behavior even though, the statistics showed that they don’t use the dental loss or check their teeth in a mirror after brushing ( $p=0.102$ ) or brush each of their teeth more carefully ( $p=0.194$ ) more often than the girls [7] (Table 3).

**Table 3:** HU-DBI scores of preclinical/clinical and male/female dental students.

Variables		Median HU-DBI score	Max	Min	P
Gender	Females	7 (5-8)	10	2	NS
	Males	6 (5-8)	10	1	
Level of education	Preclinical	5.5 (4-7)	9	1	0
	Clinical	7 (6-9)	10	2	
Total		7 (5-8)	10	1	

The study showed that the score of knowledge was slightly higher in the group of clinical students with a statistically significant difference ( $P < 0.05$ ). The scores of attitude and the behavior were similar in the two groups although there was not a statistical significant difference for the behavior score ( $p = 0.180$ ).

Scores of knowledge attitude and behavior were also similar between men and women although, no statistically significant gender difference was revealed ( $p = 0.191$ ,  $p = 0.586$ ,  $p = 0.364$ , respectively) (Table 4).

**Table 4:** HU-DBI scores of preclinical/clinical and male/female dental students.

Variables		Knowledge		Attitude		Behavior	
		Median HU-DBI score	p	Median HU-DBI score	p	Median HU-DBI score	p
Level of education	Preclinical	3 (2-3)	0	1 (0-2)	0.003	2 (2-3)	NS
	Clinical	3.5 (3-4)		1 (1-2)		2 (2-3)	
Gender	Females	3 (2-4)	NS	1 (0.5-2)	NS	2 (2-3)	NS
	Males	3 (2-4)		1 (1-2)		2 (1-3)	

## DISCUSSION

In recent years, significant oral health developments have been introduced to the Tunisian oral health system in order to decrease rates of oral disease detected in the population. Nevertheless, up to the present time, no investigation assessed the oral health attitudes and behaviors of dental students in Tunisia as future oral health professionals. Owing to this deficiency, this study aimed to assess and compare aspects of oral health attitudes and behavior between preclinical and clinical dental students in the dental university of Monastir to evaluate the didactic preclinical-clinical transition and the preparedness of clinical dental students as future dentists of the society and health educators to their patients [8].

Hiroshima college dental conduct stock survey (HU-DBI) is an effective instrument in recognizing contrasts in verbal wellbeing practices among dental undergraduates from distinctive nations due to the contrast within the wellbeing instruction systems and the educational modules dissimilarities of dental universities. It may be well utilized as a premise for creating extra programs pointed at improving dental student's states of mind and behaviors.

One of the most reduced agree responses for clinical students was about bleeding gum (item-2) compared with the preclinical group. This might reflect their mindfulness towards periodontal disease avoidance due to extend in their clinical encounter.

According to the logistic regression analysis, most of the preclinical dental students had never been taught professionally how to brush, they were more likely to use a tooth brush which has hard bristles and to think that they cannot clean their teeth well without tooth paste. This can make clear why their gums tend to bleed when they brush their teeth and why students were more likely to worry about having a bad breath 83.4% of the respondents were correctly predicted by the model.

This finding is in agreement with the rate of concurrent reactions of level 5 in Patiala, India and roughly the same in Jordan [9]. Most of the dental undergraduates concurred that it was inconceivable to avoid gum disease with tooth brushing alone, since of their conviction that the foremost viable strategy to anticipate dental caries and gum diseases is the teeth brushing, but there are other strategies and methods with brushing, they may be uninformed of usually comparative to the full percentage of concurrent reactions in UAE.

Half of dental undergraduate students from all levels detailed that they "put off progressing to the dental practitioner until they have toothache", which is comparable to frequencies expressed among dental undergraduates in Japan. This can be due to the toll taken of dental administrations as well as fear of torment, past terrible dental encounters and the time required for visit in understanding with the considered done by Dagli, et al. The overall scores related to the preclinical students in this survey, are in agreement with the entire scores in Japan, India, Turkey and Croatia.



These latter were higher than Chinese, Sudanese and Yemeni dental understudies, but lower than British and Japanese students. This inconsistency may be related to contrast within the educational modules of the school, social state of mind and behavior. The comparison of information and conduct between preclinical and clinical students revealed that information, conduct of clinical understudies are higher than that of preclinical ones. This outcome is in consistence with studies carried in Turkey, Lithuania and India by who found that verbal wellbeing and conduct of clinical understudies is higher than that of preclinical.

This might be due to the expanding encounter of the clinical understudy's approximately verbal wellbeing care being in contact with patients in clinical environment. In expansion, as they advance in their dental instructions, understudies may ended-up more conscious and this may well be credited to that preventive courses and information assimilated by dental understudies had minor impact on their oral habits. Nevertheless, no contrasts within the demeanor of clinical understudies compared with preclinical students, this finding is in consistence with the results revealed by Al-Shiekh, et al. in Sudan [10].

This may be credited to the powerless information of students to preventive dentistry and this can be strengthened by the truth that the dental clinical students who had taken part within the consider were instructed preventive dentistry amid year 4 concurring to the university's educational module and this might have caused a destitute impact on their state of mind and behavior.

This consider uncovered that oral knowledge and attitude made strides with expanding scholarly levels, showing that there's an improvement encountered. Thus, more ponders are required in dental school in Tunisia. Dental students, as future wellbeing experts, ought to have a comprehensive dental instructive verbal wellbeing in school programs counting self-care administrations and preventive courses beginning from the 1<sup>st</sup> year of dental instruction.

Only nearby 16.2% don't worry much about visiting the dentist, as similarly described in other countries of northern Europe such as Germany. Among all students, females showed better oral health score than males as reported previously. This difference was similarly observed in the German population and could be attributed to the fact that women usually care more about their appearance and body and thus may be more concerned about accepting behaviors and habits that promote their dental health.

Overall, the majority of the participant's care about their oral health. Nevertheless, the more frequent good feedback about their brushing among preclinical dental students exhibited contrasting results to similar studies in other countries. This might be due to the possibility of regular dental check-ups of clinical students during their clinical semester courses by their fellow students or supervisors. However, the overall importance accorded to dental visits of both groups showed the highest percentage compared to similar studies performed in the middle East, Asia and Europe.

In accordance with previous studies, clinical students in Tunisia were also significantly more likely to clean their teeth without toothpaste (Item 14) compared to preclinical participants, in compliance with previous investigations in Turkey, Egypt and India (items 14). Also, in strong convergence with previous investigations, Tunisian clinical dental students indicated being more attentive about their dentition and oral health and caring more about their dental aesthetics and halitosis. Furthermore, clinical participants using a professional brushing technique and brushing carefully for each of their teeth, as well as a more use of soft dental brush and adequate technique expectedly demonstrated higher percentages. Moreover, preclinical students correspondingly stated being bothered about their gingival aesthetics, using soft tissue-unfavorable tooth brushes and reported bleeding gums more than the clinical group, indicating better self-reported periodontal health of the clinical students.

In addition, most of the preclinical students thought that their teeth would get worse despite daily brushing, reflecting less oral health knowledge as described in earlier surveys. Observing all items of the current study and the HU-DBI score of both participating groups, preclinical and clinical dental students in Tunisia reflected overall similar oral health attitudes to their colleagues in European, middle-eastern and Asian countries. Thus, we can say that the Tunisian's oral health system has proven his efficiency.

Nevertheless, the clinical students presented a higher, statistically significant, HU-DBI score than the preclinical participants. This is not consistent with multiple studies performed worldwide that suggests an insignificant effect of the students' preclinical-clinical transition and their required awareness as role models or educators to their patients. Furthermore, it might indicate possible difficulties during the progressive stages of this transition. One of the factors that might lead to the observed decline in oral health behavior in the clinical group might be the increased stress during the clinical semesters, particularly during the phase of preclinical-clinical transition due to performance pressure and clinical requirements. With increased levels of stress, students tend to neglect their oral health care leading to adverse effects on their oral and dental health.

This perceived stress might even show more pronounced effects on students living away from home in both of the study groups. Indeed, between getting used to classes, making new friends, settling into the dorms, as well as other situations and anxieties facing students living away from home along with simultaneous routine and diet changes, students might neglect their oral health. Nevertheless, while this might affect the results of all students living away from home, it shows very slight differences between preclinical and clinical students in the current survey. Furthermore, the higher levels of academic stress during the clinical semesters appears to be a possible factor affecting their behavior observed in the survey. Previous studies also noted a decreased self-care of medical students during the transition to the clinical stage of their education in spite of their increasing knowledge about health behavior.

One of the important factors that should also be considered due to its role in the development of student's health behavior is the design and content of the university curricula. In Tunisia like in Germany, the dental school is state and tax funded. It incorporates a standardized curriculum that concludes with the award of a dental degree after successful accomplishment of all state board exams.

The curriculum defining the minimum requirements, number of classes and examination guidelines is designed by federal officials and successively written into law. It intends to ensure that all dental students in Tunisia university receive the same level of education and can provide equal patient care regardless of the location of their dental training. However, the university have the freedom to implement these requirements in a design and order as they see suitable, on condition that they are following the legal guidelines. Concerning the mentioned influence of curricula on the oral health manners and development of dental students, certain strategies might be needed in Tunisia to achieve the expected outcome of preclinical-clinical student transition. Curricular reviews and changes in dental school to completely integrate behavioral and social sciences into the dental curricula besides biomedical knowledge could help students become holistic and patient-centered practitioners. It also provides students with practical understanding of how to manage educational work-based stress and performance anxiety.

Furthermore, a curricular reformative approach looking to provide a correct and healthy transition from the preclinical to the clinical phase could likewise help the students become more responsible for their oral health as patient educators and for overall patient wellbeing. The difficult transition from pre-clinical to clinical training is a result of various and simultaneous educational variables, such as curricular design, content differences and organizational problems. An early and gradual contact with the clinical environment, as well as an integrative teaching between the preclinical and clinical training, could be suggested as a possible solution to improve the learning outcomes of the transitional stage to the clinical semesters.

It is also important to mention the crucial role of Tunisian dental associations in raising awareness and strengthening student's attitudes towards oral health. Being a member of this kind of organization, can explain why some participants of the survey have a better level of knowledge or attitudes than the others.

Gum bleeding is one of the first signs of gingivitis or periodontitis and is an indicator of the quality of personal oral hygiene. Only 19.4% of clinical dental students complained of gum bleeding while tooth brushing, compared to 25% of Japanese, 45% of Finnish and 15% of Greek students. This might reflect their awareness towards periodontal disease prevention due to increase in their clinical experience. This finding is in accordance with the percentage of agree responses of clinical level in Patiala, India and approximately the same in Jordan.

Dental student's awareness about dental plaque was reported in (item-4 if they noticed some white sticky deposits on their teeth. There was a low percentage in agree responses for all levels and it might be due to misinterpretation of this question as whether their teeth were clean or not instead of being aware of plaque. Also, during our questionnaire distribution, students were asking about the meaning of white sticky deposits.

A lower percentage of clinical students agreed that they "can't help having false teeth when they were old" in than preclinical students, this might be explained by fact that as educational level progressed, students become more attentive about their dentition, aware of the limitations and the impact of dentition loss on their dental function and aesthetic. This percentage is in accordance with that in UAE.

In addition, most of the preclinical students had less oral health knowledge as they thought that their teeth would get worse despite daily brushing and they had never been taught professionally how to brush their teeth. This can be explained by the fact that students had low oral health awareness and poor knowledge when they started their dental education. A possible cause of this is the lack of effective impactful school-based oral health programs at the national level that seek to help children improve and maintain their oral health. Since the dental students are not receiving this before they enter dental school, oral health programs can be included in the preclinical curriculum to promote oral health awareness and knowledge. The finding of items 8 and 10 is in accordance to that in UAE and Britain [11].

At the same time a very low percentage of clinical students agreed that they had never been taught professionally how to brush their teeth. Some clinical students interpreted this question that they had never been taught by their dentists, as all of them had had lectures and practice on oral hygiene. However, this finding showed a lack of effective oral health and prevention programs which should motivate all dentists concerning not only the treatment, but prevention as well.

A higher total "agree" responses for "brush each of my teeth carefully" and "Checking the teeth in the mirror after brushing" were reported in all academic years, reflecting higher aesthetic awareness among the dental students. This percentage is very close to that in Bangalore, India. Most of the dental students agreed that it was impossible to prevent gum disease with tooth brushing alone, because of their belief that the most effective method to prevent dental caries.

In concordance with the results found in the Lithuanian survey, a very low proportion of Tunisian students agreed that they could clean their teeth well without using any toothpaste. Probably they lacked knowledge about the importance of the mechanical removal of dental plaque and the secondary role of the toothpaste. Advertisements of toothpastes and the refreshing sensation after their use may influence the formation of student's opinion.

Only a small percentage of respondents, compared to their Japanese peers, used hard-bristled toothbrushes or brushed their teeth with strong strokes. To the best of our knowledge, this study was the first assessment of the dental education impact on the oral health behaviors of Tunisian dental students.

However, it has some limitations. First of all, as this is a cross-sectional study, any changes in HU-DBI scores cannot be attributed completely to the curricular level. Analyzing co-variables such as gender, age could play a major role influencing the results of the survey. Ideally, sociodemographic analysis should be added to the survey with an evaluation of the same students in preclinical and clinical stages with additional clinical oral health assessment.

However, as there is an equality of dental education among the students, it would be also interesting to give an indication of general health attitudes which may be different. Furthermore, it is possible that students responding to the questionnaire reported better oral health attitudes and behavior than they actually had, as they are familiar with correct dental health practices. In addition, evaluating simple items of the HU-DBI as the frequency of tooth brushing does not deliver the full picture regarding the overall quality of oral hygiene and might need clinical assessment.

Clinical dental students of Tunisia university were better motivated regarding their oral health and showed a marginally higher HU-DBI score of oral health attitudes and knowledge than preclinical students with statistically significant difference. Nevertheless, this amelioration was not noticed in the behaviors. This might reveal a non-effective transition of the students from the preclinical to the clinical stage to fulfil their role as oral health educators to their patients. A curricular review and reform are recommended to achieve the expected oral health manners from dental students and allow a successful preclinical clinical transition. Further studies complemented by clinical assessment may be needed to explore the exact status of oral health in both groups and for a deeper investigation of their oral health attitudes and behavior [12].

## CONCLUSION

Dental education had a significant positive impact on the oral health and behavior. The attitudes of dental students should be further improved by initiating a comprehensive program that would emphasize the importance of oral hygiene before the start of the clinical program.

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## CONFLICTS OF INTEREST

No conflicts of interest.

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