Al-Mukhtar Journal of Sciences 40 (2): 57-67, 2025
Doi: /doi.org/10.54172/

Research Article **Open Access**

Evaluation of the Oral Health Knowledge, Attitude, and Behavior among Preclinical and Clinical Dental Students in Benghazi, Libya

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Received:
06 January 2025

Accepted:
28 October 2025

Publish online:
31 December 2025

Abstract

Oral hygiene awareness is essential for oral health, as a lack of oral hygiene education leads to neglect of oral hygiene practices. Maintaining good oral hygiene requires efforts from dental professionals and patients. The present study aims to evaluate oral health knowledge, attitude, and behavior among preclinical and clinical dental students at Benghazi University. A cross-sectional study was conducted on dental students at the University of Benghazi utilizing an online questionnaire. Twenty-six questions were designed to assess dental students' knowledge, attitude, and behavior regarding oral health. The data was statistically analyzed using one-way ANOVA tests and Student's t-test. 186 students voluntarily participated. The data showed statistically significant differences in knowledge, attitude, and behavior scores between both preclinical and clinical dental students (P<0.0001). Moreover, the differences in all categories' scores revealed a significant increase with academic years (P < 0.0001). However, the variance in scores of both genders presented was not statistically significant (P > 0.01). This study displayed improved knowledge, attitude, and behavior with the year of study.

Keywords: Oral Health, Knowledge, Attitude, Behavior, Dental Students, Benghazi.

INTRODUCTION

Periodontal disease remains prevalent globally and is a common condition (Bascones-Martínez et al., 2009; Needleman et al., 2018). Oral diseases have a detrimental impact on individuals' self-confidence and overall health (Petersen et al., 2005; Yüzer Alsaç et al., 2024). Adolescent patients with deteriorated oral health are more likely to have a poor self-image compared to those with good oral health (American Academy of Pediatric Dentistry, Adolescent oral health care, 2024).

Teeth may be lost, influencing function and aesthetics due to untreated periodontal disease, although it is not a life-threatening disease. The main cause of periodontal disease is an accumulation of dental biofilm (Taba et al., 2005; Trévoux & Angleraud, 1985). The foremost reason for collecting dental biofilm is improper tooth-brushing procedures (Hoover & Lefkowitz, 1965; Loe et al., 1965). Therefore, poor oral hygiene is a key etiological factor in periodontal disease (Hujoel et al., 2005).

The understanding of preventive periodontal diseases depends on dentists' attitudes toward oral health behavior (Özyemişci-Cebeci et al., 2014). Patients can improve their oral health maintenance procedures when educated and motivated. Maintaining good oral hygiene requires efforts from both dental professionals and patients themselves. Dentists play a crucial role in educating and motivating their patients, families, and communities (S. Bhat et al., 2014; Chandra Shekar et al., 2011).

Dental students should possess moral knowledge of oral health care education according to professional standards, as they will be dentists and have an essential role in education and motivation (P. Bhat et al., 2010; Özyemişci-Cebeci et al., 2014).

Oral hygiene awareness is a necessary requirement for oral health, as the lack of oral hygiene education is a reason for neglecting oral hygiene practices. Learning in dental institutions is ineffective unless it leads to a reflective change in students' attitudes and behavior toward enhancing their oral care (P. Bhat et al., 2010).

Information about oral hygiene knowledge, attitudes, and behavior among Libyan dental students remains limited. It is important to consider that students at the Faculty of Dentistry, University of Benghazi, can help disseminate preventive information among their families and society, as they comprise the majority of graduated dental students in Benghazi. Consequently, this study aimed to compare the knowledge, attitudes, and behaviors related to oral hygiene between preclinical and clinical dental students at the University of Benghazi, Libya.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted among dental students in the academic year 2023–2024. The Scientific Research Ethics Committee (SREC) of the Faculty of Dentistry, University of Benghazi, reviewed and approved the study protocol (Reference Code: 0248). An Electronic questionnaire, adopted and modified from Özyemişci- Cebeci et al. and Ahamed et al., was submitted online to dental students of the Faculty of Dentistry, University of Benghazi (Ahamed et al., 2015; Özyemişci-Cebeci et al., 2014). One hundred eighty-six individuals voluntarily participated, consisting of 22 first-year students, 70 second-year students, 46 third-year students, and 48 fourth-year students. They completed an electronic questionnaire, yielding a response rate of 75%.
The questionnaire included 26 questions designed to assess students' knowledge, attitudes, and behaviors, with multiple-choice and yes/no questions.

Questionnaire and scoring criteria

Nine multiple-choice questions were selected to assess students' knowledge about oral health practices. A score of "1" was given for a correct answer, while a score of "0" was given for a wrong answer or "do not know" (Appendix I).
Six yes/no questions were included to evaluate students' attitudes. Yes, answers and questions that were marked with (N) were given a score of "1"; while no answer was given a "0" score (Appendix II).

Eleven questions were included to assess oral health behavior. Four questions were multiple-choice questions, with a score of "1" given for correct answers and "0" for incorrect answers. The remaining questions were yes/no. A "1" score was given to the yes answer and questions marked with (N), while a "0" score was specified to the no answer (Appendix III).

For statistical analysis, scores were computed based on students' responses. The findings were tabulated and analyzed using IBM SPSS version 29 (Armonk, NY: IBM Corp). Descriptive statistics

were calculated and presented as means and standard deviations. The significance level was set at $P \leq 0.05$, and individual scores were summed to obtain a total score. Student's t-test was used to assess differences in oral hygiene knowledge, attitudes, and behaviors between preclinical and clinical students, as well as the total score. Additionally, Student's t-test was used to evaluate differences between male and female students within preclinical and clinical groups. Furthermore, a one-way ANOVA test was used to investigate differences in scores across first- to fourth-year students.

RESULTS

A total of 186 students voluntarily participated in this study, with 105 (56.45%) females and 81 (43.55%) males. The data showed that 49% were preclinical dental students and 51% were clinical dental students. The distribution of students by educational year was 22, 70, 46, and 48, respectively, as shown in Table 1.

Table: (1). Dissemination of students by academic year and gender.

Year of study	Male	Female	Total
1st year	11	11	22
2nd year	30	40	70
3rd year	23	23	46
4th year	17	31	48
Total	81 (43.55 %)	105 (56.45%)	186

The mean scores for both genders and the total mean scores of the knowledge, attitude, and behavior of 1st- to 4t^{h}-year students were calculated, as shown in Table 2.

Table: (2). Mean and SD scores of the students based on the questionnaires and year of study.

Questionnaire	1st year (*n*=22)	2nd year (*n*=70)	3rd year (*n*=46)	4th year (*n*=48)
Knowledge (9 questions)				
Males	(0.323±0.136)	(0.530±0.186)	(0.995±0.023)	(0.995±0.023)
Females	(0.323±0.116)	(0.467±0.141)	(0.961±0.092)	(0.961±0.092)
Mean±SD	(0.323±0.123)	(0.494±0.163)	(0.978±0.069)	(0.978±0.069)
Attitude (6 questions)				
Males	(0.561±0.135)	(0.667±0.196)	(0.993±0.035)	(0.993±0.035)
Females	(0.621±0.151)	(0.775±0.198)	(0.986±0.048)	(0.986±0.048)
Mean±SD	(0.591±0.141)	(0.729±0.203)	(0.989±0.042)	(0.989±0.042)
Behavior (11 questions)				
Males	(0.397±0.148)	(0.482±0.215)	(0.818±0.140)	(0.818±0.140)
Females	(0.4545±0.172)	(0.564±0.183)	(0.838±0.122)	(0.838±0.122)
Mean±SD	(0.426±0.160)	(0.529±0.200)	(0.828±0.130)	(0.828±0.130)

SD: Standard deviation

Table 3 displays students' responses to oral health-related questions, categorized by knowledge, attitude, and behavior.

Table (3): The percentage of students' responses to oral health knowledge, attitude, and behavior questions.

Questions	Response of Preclinical (%)	Response of Clinical (%)	Correct response of students (%)
Oral health knowledge The main purpose of tooth brushing	9.7%	50.5%	60.2%
Meaning of gum bleeding	18.8%	50.0%	68.8%
Attitude Smoking in any form has bad effects on gums?	10.2%	50.5%	60.75%
Dentists play a role only in the treatment part and not in the prevention?	22.5%	50.5%	73%
Behavior How often do you brush your teeth each day?	19.3%	48.4%	67.7%
What type of tooth brushing methods do you employ?	9.1%	44.6%	53.7%
Do you use oral hygiene aids like dental floss and mouthwash?	22%	43%	65%

Table 4 shows statistically significant differences in all scores between preclinical and clinical students ($P < 0.0001$).

Table: (4). The comparison of knowledge, attitude, and behavior scores of preclinical and clinical students.

Questionnaire	Group	*n*	Mean±SD	*t* value	Significance
Knowledge	Preclinical	92	(0.453±0.171)	28.154	*P*<0.0001**
	Clinical	94	(0.981±0.058)		
Attitude	Preclinical	92	(0.696±0.199)	14.157	*P*<0.0001**
	Clinical	94	(0.993±0.034)		
Behavior	Preclinical	92	(0.504±0.196)	14.042	*P*<0.0001**
	Clinical	94	(0.836±0.116)		

***P* value is statistically highly significant. SD: Standard deviation

The difference in the total score of knowledge, attitude, and behavior together among preclinical and clinical students revealed a statistically highly significant difference ($P < 0.0001$) as demonstrated in Table 5.

Table: (5). The comparison of the total score of knowledge, attitude, and behavior of preclinical and clinical students.

Group	Number of students	Knowledge, behavior, and attitude (mean±SD)	*t* value	Significance
Preclinical	92	0.531±0.016	22.87	*P*<0.0001**
Clinical	94	0.922±0.006		

***P* value is statistically highly significant. SD: Standard deviation.

The comparison of the total score of knowledge, attitude, and behavior individually was analyzed between genders. These scores showed no statistically significant differences in all categories, i.e., knowledge ($P > 0.01$), attitude ($P > 0.01$), and behavior ($P > 0.01$). However, scores showed that females scored higher than males in attitude (0.870 ±0.188), (0.815 ±0.224) and behavior (0.694 ±0.214), (0.642 ±0.248), while males scored higher than females in knowledge (0.731 ±0.297), (0.711 ±0.292) respectively (Table 6 and Graph 1).

Table: (6). The comparison of scores of knowledge, attitude, and behavior of male and female students.

Questionnaire	Group	*n*	Mean±SD	*t* value	Significance
Knowledge	Males	81	0.731 ±0.297	0.461	*P*>0.01*
	Females	105	0.711 ±0.292		
Attitude	Males	81	0.815 ±0.224	1.823	*P*>0.01*
	Females	105	0.870 ±0.188		
Behavior	Males	81	0.642 ±0.248	1.542	*P*>0.01*
	Females	105	0.694 ±0.214		

**P* value is not significant. SD: Standard deviation.

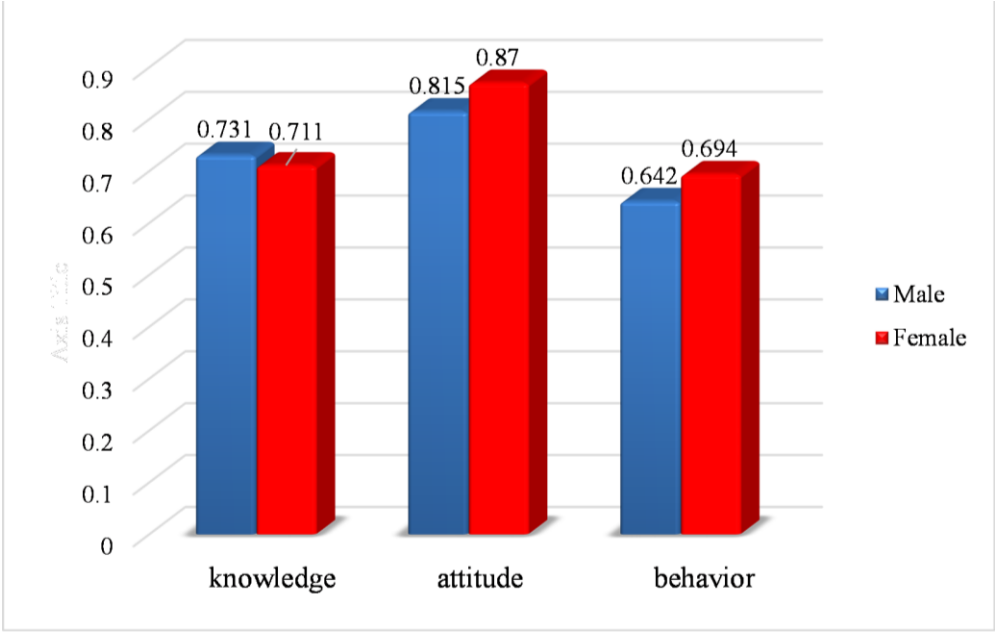

Figure: (1). Distribution of knowledge, attitude, and behavior based on gender.

The variance in the scores of the knowledge, attitude, and behavior across academic years was analyzed using a one-way ANOVA test, which revealed a highly significant increase with advancing academic year (*P*<0.0001) as shown in Table 7 and Graph 2.

Table: (7). The comparison of scores of knowledge, attitude, and behavior of 1st year to 4th year students.

Questionnaire	Mean±SD				F value	P value
	1st year	2nd year	3rd year	4th year		
Knowledge	(0.323±0.123)	(0.494±0.163)	(0.978±0.069)	(0.984±0.046)	330.157	*P*<0.0001**
Attitude	(0.591±0.143)	(0.729±0.203)	(0.989±0.042)	(0.997±0.024)	79.520	*P*<0.0001**
Behavior	(0.426±0.160)	(0.529±0.200)	(0.828±0.130)	(0.843±0.101)	70.777	*P*<0.0001**

***P* value is statistically highly significant. SD: Standard deviation.

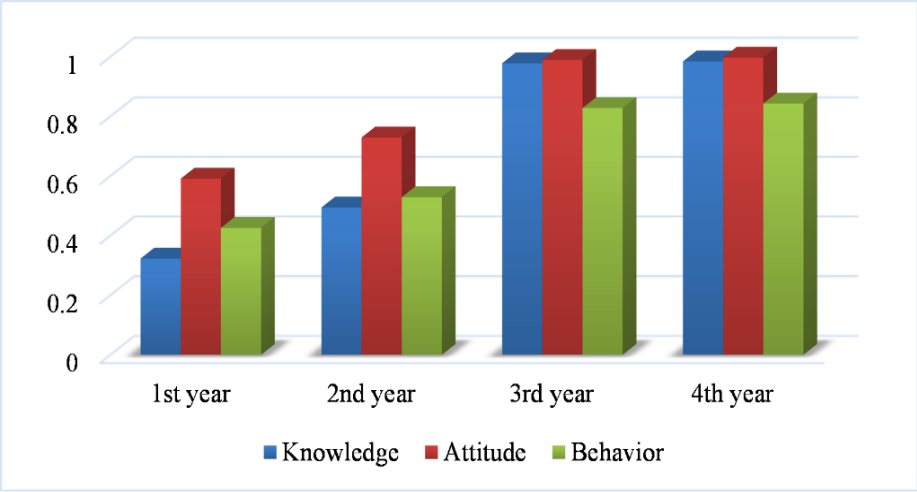

Figure: (2). Differences in the scores of knowledge, attitude, and behavior scores based on year of study.

DISCUSSION

This study evaluated the oral health knowledge, attitudes, and behavior of preclinical and clinical dental students in the University of Benghazi, Faculty of Dentistry. One of the imperative goals in health care units or dental schools is to graduate students who are able to educate and motivate their patients towards oral hygiene and oral health. Dental professionals are being called upon by the European Federation of Periodontology (EFP) to take proactive steps in preventing, diagnosing, and treating periodontal diseases (European Federation of Periodontology and the American Academy of Periodontology (EFP) Manifesto, 2013).

In this study, the scores of each of the oral health knowledge, attitude, and behavior among preclinical and clinical dental students showed significantly greater scores in clinical students compared to preclinical students (Table 4, $P < 0.0001$ for knowledge, attitude, and behavior). This suggested that clinical years of study enhance students' understanding and adoption of oral health practices.

Concerning knowledge, the responses to questions about the main purpose of tooth brushing showed that 60.2% of students were likely to know the purpose, with 50.5% of them being clinical dental students. Similarly, when asked about the meaning of gum bleeding, 50% of clinical dental students demonstrated knowledge, compared to 18.8% of preclinical dental students. This finding is likely due to the inclusion of this topic in their academic curriculum. These findings align with Ahamed et al. and Sharda and Shetty's findings on oral health knowledge among dental students (Ahamed et al., 2015; Sharda & Shetty, 2008). Furthermore, studies on mass media campaigns also showed that education significantly improves oral health knowledge, reinforcing the importance of educational interventions (Mårtensson et al., 2006).

Regarding attitudes, 60.7% of students correctly identified the harmful effects of smoking on gums. The distribution of correct responses was 50.5% among clinical students and 10.2% among preclinical students. Additionally, 73% of students recognized that dentists play a role in prevention, not just treatment, with 50.5% of these being clinical students. This finding likely reflects the heightened awareness and education clinical students receive on these topics, as they are explicitly covered in the syllabus, which in turn positively influences their attitude scores. These scores were in agreement with the results of preceding studies (Ahamed et al., 2015; Mani et al., 2013; Sharda & Shetty, 2008).

Oral health depends on keeping good oral hygiene through ideal plaque control methods. Students' oral hygiene habits varied: 67.7% brushed twice daily (48.4% clinical, 19.3% preclinical), 53.7% used proper brushing technique (44.6% clinical), and 43% of clinical students and 22% of preclinical students used oral hygiene aids like floss and mouthwash. These findings indicate that clinical students exhibit more favorable oral health behaviors, which is consistent with the results of previous studies (Ahamed et al., 2015; Sharda & Shetty, 2008).

Moreover, the variance in the total scores of the knowledge, attitude, and behavior among clinical students and preclinical students' years was statistically highly significant (Table 5, $P < 0.0001$). The increased awareness of oral care through the clinical years of university study reflects the different learning levels of students, and this result was in line with some previous studies (Ahamed et al., 2015; Mani et al., 2013; Sharda & Shetty, 2008). However, Dagli *et al.* concluded that the level of awareness of clinical students was non-significant when compared with preclinical students (Dagli et al., 2008).

Concerning the difference in awareness between both genders, there were no statistically significant differences in all three categories (Table 6, $P > 0.01$), which implies that females and males have approximately equal awareness about their oral health. This result was in accordance with numerous previous studies that documented similar results (Ahamed et al., 2015; Dagli et al., 2008; Mani et al., 2013; Sharda & Shetty, 2008). In comparison, Al-Omari and Hamasha established that female students have better attitudes towards oral health than male students (Al-Omari & Hamasha, 2005).

Regarding the knowledge, attitude, and behavior of each academic year, the findings revealed that as students advanced through their academic years, their oral health awareness improved significantly, demonstrating a strong link between academic year and knowledge, attitudes, and behaviors (Table 7, $P<0.0001$). This was in contrast with preceding studies (Ahamed et al., 2015; Sharda & Shetty, 2008).

CONCLUSION

The results of this study indicated:

- Knowledge, attitude, and behavior towards oral health improve with advancing educational years.
- This enhancement is likely due to the inclusion of periodontal disease and preventive dentistry courses in the third year of dental studies.
- There is no significant difference in oral health awareness between genders.
- More focus on oral hygiene aids is needed in the academic curriculum.

While this study provides valuable insights into the oral health knowledge and behaviors of dental students, further research is warranted to explore longitudinal effects, comparative analyses, and socioeconomic influences on oral health. Future studies can build upon these findings to inform curriculum development and promote optimal oral health practices.

This study has limitations inherent to self-reported data, where scores may be influenced by social desirability bias or incorrect responses despite maintaining confidentiality. Additionally, to minimize respondent fatigue, the questionnaire was kept concise with a focused set of questions.

ACKNOWLEDGEMENT

I would like to express my appreciation to the entire group of volunteers from the Faculty of Den-

tistry at the University of Benghazi in Benghazi, Libya, who participated in this study.

ETHICS

The Scientific Research Ethics Committee (SREC) of the Faculty of Dentistry/University of Benghazi reviewed and approved the study protocol (Reference Code: 0248).

Duality of interest: The author declares no duality of interest associated with this manuscript.

Author contributions: N.A.E. designed the study, performed the research, analyzed the data, and contributed to the writing and editing.

Funding: The authors received no funding from any organization for the submitted work.

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Appendix I: Oral health Knowledge questions (Multiple Choice Questions) {9Q}

1. Normal for healthy gums to bleed occasionally
   a) Agree
   b) Not Certain
   c) Disagree
2. I will lose my teeth if I get older
   a) Agree
   b) Not Certain
   c) Disagree
3. The main purpose of tooth brushing:
   a) Prevention of tooth decay and gum disease.
   b) Achievement of cleaner and brighter teeth.
   c) To remove stains on teeth.
   d) Don't know.
4. Meaning of dental plaque:
   e) Discoloration of teeth
   f) Soft deposits on teeth
   c) White patches on teeth
   d) Don't know
5. Meaning of gum bleeding:
   a) Gum disease (inflammation of gums)
   b) Infection of the tooth
   c) Calcium deficiency
   d) Don't know
6. Effects of fluorides on teeth:
   a) Prevention of gum disease
   b) Prevention of tooth decay
   c) Cleaning of teeth
   d) Don't know
7. Can the health of teeth and mouth affect the health of the body:
   a) Yes
   b) No
   c) Don't know
8. Poor oral hygiene is associated with heart disease
   a) Yes
   b) No
   c) Don't Know
9. Ideal brushing materials are:
   a) Toothpaste and finger
   b) Toothpaste and brush
   d) Don't know

Appendix II: Attitude towards oral health questions: (Yes/NO type) {6Q}

1. Dentists should be visited regularly?
   a) Yes
   b) No
2. Smoking in any form has bad effects on gum?
   a) Yes
   b) No
3. Well cleaning of teeth can be done without using toothpaste? (N)
   a) Yes
   b) No
4. Hardness of the bristles of the brush has any effect on teeth and gums?
   a) Yes

b) No

5. Immediate replacement of missing teeth by artificial teeth is necessary?
   a) Yes
   b) No
6. Dentists play a role only in the treatment part and not in the prevention? (N)
   a) Yes
   b) No

Appendix III: Behavior of student towards oral health maintenance: (Multiple Choices and Yes/No type questions) {11Q}

1. Do you brush your teeth:
   a) Yes
   b) No
2. How often do you brush your teeth each day:
   a) Once in a day
   b) Twice in a day
   c) Thrice and more
   d) Sometimes
3. When you brush your teeth:
   a) In the morning
   b) In the morning and before going to bed
   c) In the morning, before going to bed and after eating sweet foods.
4. How do you clean your teeth:
   a) Toothpaste and finger
   b) Toothpaste and brush
5. Brush each of your teeth carefully:
   a) Yes
   b) No
6. What type of tooth brushing methods do you employ?
   a) Vertical
   b) Horizontal
   c) Combined
7. Cleaning of the tongue:
   a) Yes
   b) No
8. Do you use oral hygiene aids like dental floss and mouthwash:
   a) Yes
   b) No
9. Do you have bleeding from gums while brushing teeth: (N)
   a) Yes
   b) No
10. Visit to dentist only after having toothache: (N)
    a) Yes
    b) No
11. Use of dye to check cleaning of teeth:
    a) Yes
    b) No