

Original Research Article

# Attitudes and Hygiene Practices towards Toothbrush Use among Saudi College Students; A Survey-based Study.

Talal AlMalki<sup>1</sup>, Feras Bagazi<sup>1</sup>, Alwaleed Hejazi<sup>1</sup>, Naif Khalid<sup>1</sup>, and Shahzeb Ansari<sup>2\*</sup>

<sup>1</sup>General Dentists, Riyadh, Saudi Arabia.

<sup>2</sup>Faculty of Preventive Dentistry, Riyadh Elm University, Saudi Arabia.

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**Introduction:** Good oral hygiene is dependent on the quality of tooth brushing, which comes with an important hazard in the form of a dirty toothbrush. It is imperative for the toothbrush user to maintain the cleanliness of toothbrush in order to achieve its complete efficacy. **Materials and methods:** This study is targeted towards the college students of Riyadh city, therefore all males and females more than 18 years of age were recruited to fill up the questionnaire. **Results:** A total of 880 male and female participants filled up the online survey, which comprised of 41% (n=357) males and 59% (n=523) females. The sample was divided into subgroups on the basis of type of socioeconomic status, where 3% (n=28) were low status, 87% (n=768) were moderate and 10% (n= 87) were of high status. **Conclusion:** Females showed a better knowledge and awareness of toothbrush maintenance as compared to males. Socioeconomic status was not strongly linked with the maintenance of toothbrush.

**Keywords:** Toothbrush, Oral hygiene, College students.

## INTRODUCTION

Toothbrush is one of those personal use products that are most commonly as well as frequently used by majority of the population. Good oral hygiene is dependent on the quality of tooth brushing, which comes with an important hazard in the form of a dirty toothbrush. It is imperative for the toothbrush user to maintain the cleanliness of the toothbrush in order to achieve its complete efficacy (Gupta et al, 2018; Shin & Nam, 2018).

There are several factors that play their part in causing this hazard to one's personal use product. Place of toothbrush storage is one of them, which is directly associated with the level of contamination of toothbrush when stored for a long period of time. A few societal cultures allow the design of their bathrooms in a way that the toothbrush is kept outside, thus preventing the bacteria including *E. coli* to contaminate the toothbrush. On the other hand, houses with multipurpose bathrooms tend to increase the chances of bacterial contamination as toothbrush is kept within the vicinity (Alkhatheri et al, 2017; Pesevska et al, 2016).

Keeping in mind the above-mentioned facts, it is becoming crucial to educate the public about the potential risks of using a contaminated toothbrush and maintain its cleanliness. Another factor which may play an important role in bacterial contamination includes prolonged use of toothbrush. It is

advisable to replace the toothbrush every 2-3 months as failure in doing so may result in bacterial invasion including Streptococcus, Staphylococcus, etc. (Naik et al, 2015; Raiyani et al, 2015).

Several studies have taken place to measure the knowledge and practice of the public towards the maintenance of toothbrush. An investigation done among the medical and dental students revealed that the dental students showed better attitudes when maintaining their toothbrush as compared to the medical students. This was mainly due to the fact that dental students possess a higher level of knowledge regarding toothbrush maintenance (Kumar et al, 2018).

Another study revealed a lack of awareness among dental patients regarding the maintenance of toothbrush. They exhibited a low level of knowledge about proper placement and storage of toothbrush to avoid bacterial contamination as compared to dental students who showed better knowledge and awareness (Pereira et al, 2018). To tackle this health hazard, there have been multiple methods introduced and advised in order to maintain the hygiene of toothbrushes. Several materials have been used in this regard including Sodium hypochlorite, Ethyl alcohol, Povidone Iodine, and dishwasher, which have shown promising results (Amirabadi & Sasannejad, 2016).

## STUDY HYPOTHESES

Knowledge about toothbrush hygiene and maintenance is low among Saudi college students.

## AIMS OF THE STUDY

- To determine the current practice of Saudi college students towards the maintenance of toothbrush.
- To determine the knowledge of Saudi students regarding the frequency of toothbrush replacement and its maintenance.
- To compare the findings on the basis of educational level.

## MATERIALS AND METHODS

### Study Design

This is a cross-sectional study, which utilized a closed-ended questionnaire.

### Questionnaire Design

The questionnaire was constructed online using Google forms and began with questions related to demographics, including age, gender, educational level, socioeconomic status, etc. Furthermore, questions related to the current level of toothbrush maintenance and hygiene were recorded, inquiring several methods of decontamination, possible associated hazards if the toothbrush is not cleaned, frequency of toothbrush replacement, etc.

### Study Sample

This study is targeted towards the college students of Riyadh city, therefore all males and females more than 18 years of age were recruited to fill up the questionnaire. A total of 2000 Saudi college students were aimed to be included in this study.

## Validity and Reliability of the Questionnaire

The questionnaire was sent to the experts in research, which include a few faculty members of REU in order to confirm the validity. As far as the reliability is concerned, a pilot study was conducted using 20 online questionnaires filled randomly by university students. Reliability was tested using Chronbach's coefficient alpha in the Statistical Package for Social Sciences (SPSS) version 19.

## Statistical Analysis

Collected data was transferred from Google sheets to SPSS version 19, where descriptive as well as inferential statistics was conducted. Comparisons between groups were made with the value of significance kept under 0.05.

## RESULTS

A total of 880 male and females filled up the online survey, which comprised of 41% (n=357) males and 59% (n=523) females. The sample was divided into subgroups on the basis of type of socioeconomic status, where 3% (n=28) were low status, 87% (n=768) were moderate and 10% (n= 87) were of high status. The participants were also grouped on the basis of their frequency of dental visits, which demonstrated that 77% (n=346) have 0-2 dental visits, 15% (n=141) have 3-5 dental visits and 8%(n=68) have more than 6 dental visits.

## Validity and Reliability of the Questionnaire

According to the experts in REU, we made minor changes to our questionnaire before we distributed it to the study participants. As far as the reliability is concerned, we performed Chronbach's coefficient alpha in SPSS and the value retrieved was 0.87, which is acceptable to carry out the data collection after the pilot study.

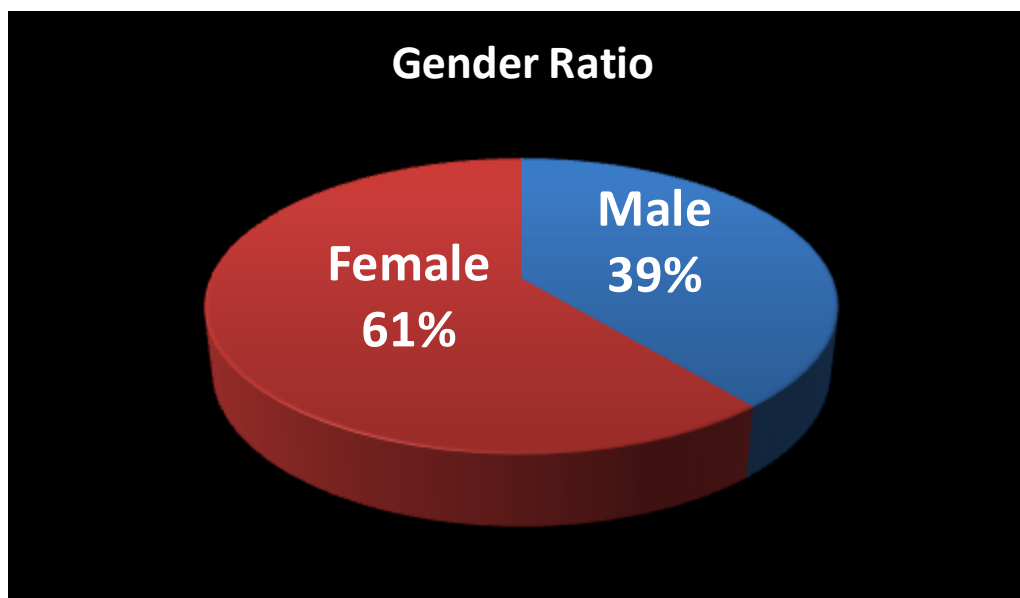


Fig. 1: Gender Ratio of Study Participants

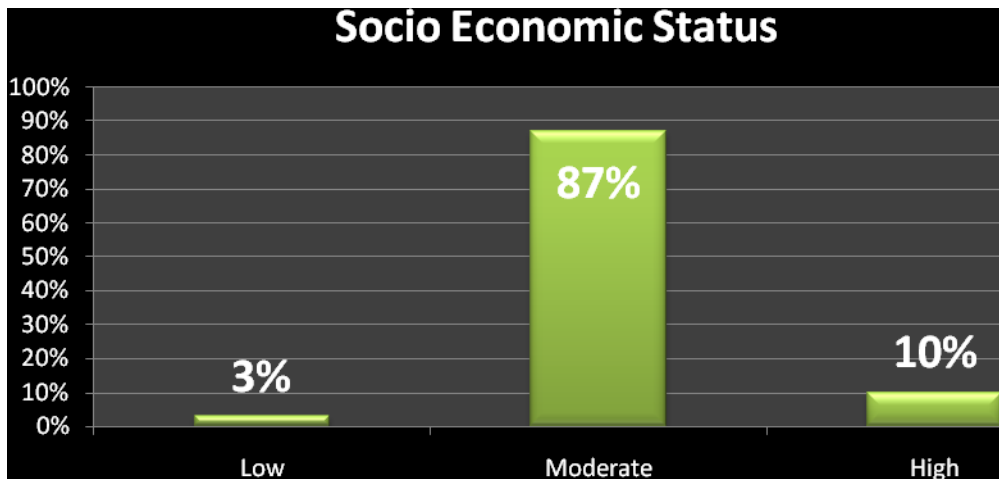


Fig. 2: Socio Economic Status Ratio of Study Participants

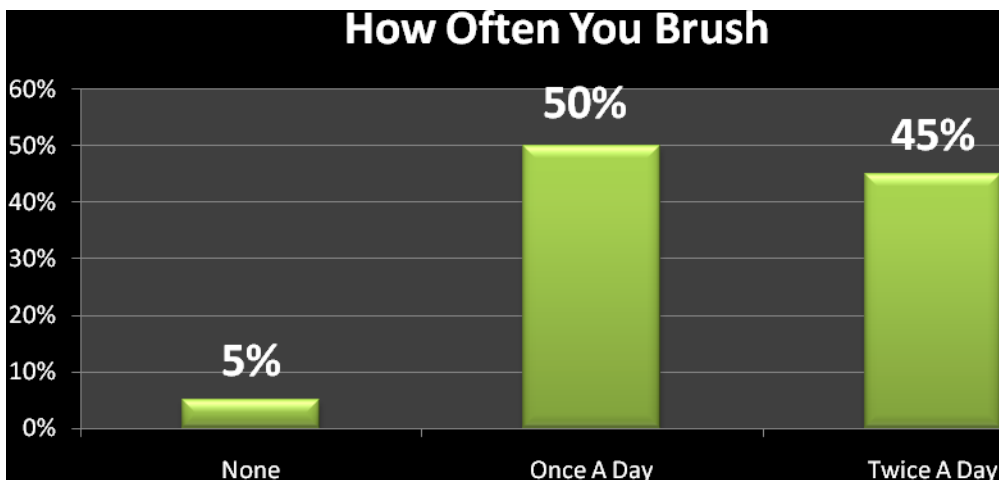


Fig. 3: Distribution of Study Participants on the Basis of How Often You Brush

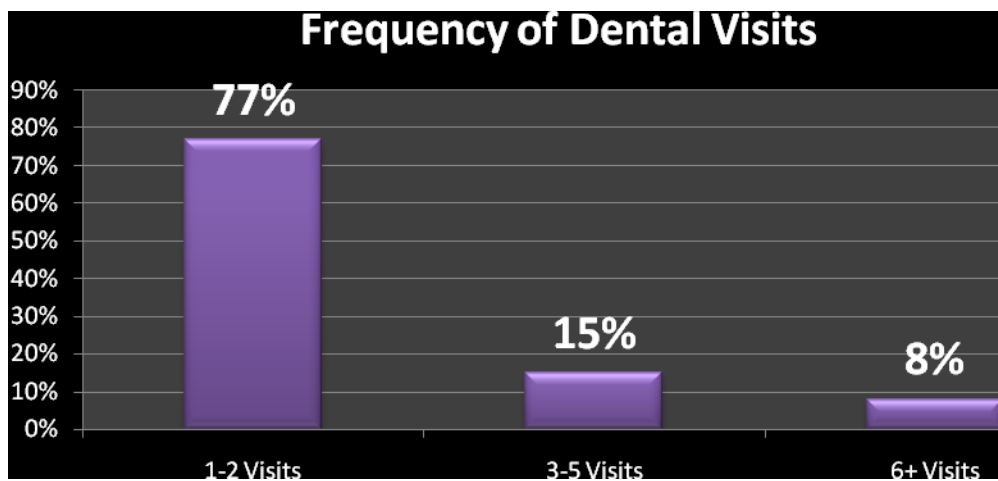


Fig. 4: Distribution of Study Participants on the basis of Frequency of Dental Visits

Table 1: Comparison of the Study participants on the basis of gender

Item	Male	Female	P- Value
How often do you change your toothbrush?	<b>Every 1 Month</b> 10%  <b>Every 3 Month</b> 26%  <b>Every 6 Month</b> 21%  <b>When it is Dirty and Damaged</b> 42%	<b>Every 1 Month</b> 9%  <b>Every 3 Month</b> 37%  <b>Every 6 Month</b> 29%  <b>When it is Dirty and Damaged</b> 25%	0.000
Where do you keep your brush?	<b>In the cupboard</b> 12%  <b>On the sink (in toilet)</b> 65%  <b>On the sink (outside toilet )</b> 23%	<b>In the cupboard</b> 15%  <b>On the sink (in toilet)</b> 61%  <b>On the sink (outside toilet )</b> 24%	0.435
Toothbrush may be contaminated with microorganisms when stored inside the toilet.	<b>Yes</b> 26%  <b>No</b> 12%  <b>May Be</b> 62%	<b>Yes</b> 38%  <b>No</b> 12%  <b>May Be</b> 50%	0.000
How do you maintain the toothbrush hygiene?	<b>Rinsing and drying only</b> 74%  <b>Covering with a cap</b> 21%  <b>soaking it in disinfectant</b> 5%	<b>Rinsing and drying only</b> 60%  <b>Covering with a cap</b> 33%  <b>soaking it in disinfectant</b> 7%	0.000
Has your dentist advice you about maintaining tooth brush?	<b>Yes</b> 18%  <b>No</b> 51%  <b>Don't Remember</b> 31%	<b>Yes</b> 18%  <b>No</b> 59%  <b>Don't Remember</b> 23%	0.028
Microorganisms capable of causing toothbrush contamination:	<b>bacteria</b> 32%  <b>Fungi</b> 5%  <b>Virus</b> 1%  <b>Don't Know</b> 63%	<b>bacteria</b> 43%  <b>Fungi</b> 5%  <b>Virus</b> 1%  <b>Don't Know</b> 50%	0.005

Common mode of transmission of infection from toothbrush.	<b>Sharing the tooth brush</b> 75%  <b>Sharing the same tooth brush holder</b> 13%  <b>Use of frayed</b> 12%  <b>bristled toothbrush</b> 0%	<b>Sharing the tooth brush</b> 76%  <b>Sharing the same tooth brush holder</b> 8%  <b>Use of frayed</b> 16%  <b>bristled toothbrush</b> 0%	0.017
How you take your tooth brush while you travel	<b>Carry the same toothbrush that you are using</b> 40%  <b>Buy new toothbrush</b> 51%  <b>Never carry a toothbrush when travelling</b> 9%	<b>Carry the same toothbrush that you are using</b> 44%  <b>Buy new toothbrush</b> 53%  <b>Never carry a toothbrush when travelling</b> 3%	0.001
How do you carry your toothbrush in the luggage when you are traveling?	<b>Put it inside a special case</b> 39%  <b>Roll it with tissue paper 'Napkin'</b> 25%  <b>I don't carry my toothbrush when travelling</b> 15%  <b>Keep it in the luggage as it is</b> 21%	<b>Put it inside a special case</b> 55%  <b>Roll it with tissue paper 'Napkin'</b> 30%  <b>I don't carry my toothbrush when travelling</b> 6%  <b>Keep it in the luggage as it is</b> 9%	0.000
What's your practice of using toothbrush at the airport or long flight?	<b>Use same personal toothbrush</b> 25%  <b>Buy a new toothbrush at the airport or plane</b> 23%  <b>Do not use toothbrush at the airport or plane</b> 52%	<b>Use same personal toothbrush</b> 33%  <b>Buy a new toothbrush at the airport or plane</b> 23%  <b>Do not use toothbrush at the airport or plane</b> 44%	0.029
What are the indications of toothbrush change?	<b>Slayed/ bent</b> 49%  <b>More Than 3 Months Use</b> 31%  <b>More Than 6 Months Use</b> 21%	<b>Slayed/ bent</b> 31%  <b>More Than 3 Months Use</b> 42%  <b>More Than 6 Months Use</b> 27%	0.000

Table 2: Comparison of the Study participants on The Basis of Socioeconomic Status

Item	Low	Moderate	High	P- Value
How often do you change your toothbrush?	<b>Every 1 Month</b> 4%  <b>Every 3 Month</b> 30%  <b>Every 6 Month</b> 19%  <b>When it is Dirty and Damaged</b>	<b>Every 1 Month</b> 10%  <b>Every 3 Month</b> 34%  <b>Every 6 Month</b> 25%  <b>When it is Dirty and Damaged</b>	<b>Every 1 Month</b> 11%  <b>Every 3 Month</b> 24%  <b>Every 6 Month</b> 36%  <b>When it is Dirty and Damaged</b>	0.128

	48%	31%	29%	
Where do you keep your brush?	<b>In the cupboard</b> 7%	<b>In the cupboard</b> 14%	<b>In the cupboard</b> 15%	0.786
	<b>On the sink (in toilet)</b> 67%	<b>On the sink (in toilet)</b> 62%	<b>On the sink (in toilet)</b> 64%	
	<b>On the sink (outside toilet )</b> 26%	<b>On the sink (outside toilet )</b> 24%	<b>On the sink (outside toilet )</b> 20%	
Toothbrush may be contaminated with microorganisms when stored inside the toilet.	<b>Yes</b> 27%	<b>Yes</b> 33%	<b>Yes</b> 41%	0.165
	<b>No</b> 12%	<b>No</b> 11%	<b>No</b> 16%	
	<b>May Be</b> 62%	<b>May Be</b> 56%	<b>May Be</b> 43%	
How do you maintain the toothbrush hygiene?	<b>Rinsing and drying only</b> 74%	<b>Rinsing and drying only</b> 65%	<b>Rinsing and drying only</b> 66%	0.854
	<b>Covering with a cap</b> 19%	<b>Covering with a cap</b> 28%	<b>Covering with a cap</b> 27%	
	<b>soaking it in disinfectant</b> 7%	<b>soaking it in disinfectant</b> 6%	<b>soaking it in disinfectant</b> 7%	
Has your dentist advice you about maintaining tooth brush?	<b>Yes</b> 11%	<b>Yes</b> 18%	<b>Yes</b> 26%	0.174
	<b>No</b> 52%	<b>No</b> 57%	<b>No</b> 49%	
	<b>Don't Remember</b> 37%	<b>Don't Remember</b> 26%	<b>Don't Remember</b> 24%	
Microorganisms capable of causing toothbrush contamination:	<b>bacteria</b> 37%	<b>bacteria</b> 37%	<b>bacteria</b> 51%	0.150
	<b>Fungi</b> 0%	<b>Fungi</b> 5%	<b>Fungi</b> 7%	
	<b>Virus</b> 0%	<b>Virus</b> 1%	<b>Virus</b> 1%	
	<b>Don't Know</b> 63%	<b>Don't Know</b> 57%	<b>Don't Know</b> 41%	
Common mode of transmission of infection from toothbrush.	<b>Sharing the tooth brush</b> 65%	<b>Sharing the tooth brush</b> 76%	<b>Sharing the tooth brush</b> 79%	0.704
	<b>Sharing the same tooth brush holder</b> 15%	<b>Sharing the same tooth brush holder</b> 10%	<b>Sharing the same tooth brush holder</b> 8%	
	<b>Use of frayed</b> 19%	<b>Use of frayed</b> 15%	<b>Use of frayed</b> 13%	

	bristled toothbrush 0%	bristled toothbrush 0%	bristled toothbrush 0%	
How you take your tooth brush while you travel	Carry the same toothbrush that you are using 44%  Buy new toothbrush 36%  Never carry a toothbrush when travelling 20%	Carry the same toothbrush that you are using 42%  Buy new toothbrush 53%  Never carry a toothbrush when travelling 5%	Carry the same toothbrush that you are using 48%  Buy new toothbrush 46%  Never carry a toothbrush when travelling 6%	0.010
How do you carry your toothbrush in the luggage when you are traveling?	Put it inside a special case 38%  Roll it with tissue paper 'Napkin' 35%  I don't carry my toothbrush when travelling 12%  Keep it in the luggage as it is 15%	Put it inside a special case 48%  Roll it with tissue paper 'Napkin' 29%  I don't carry my toothbrush when travelling 9%  Keep it in the luggage as it is 14%	Put it inside a special case 59%  Roll it with tissue paper 'Napkin' 18%  I don't carry my toothbrush when travelling 8%  Keep it in the luggage as it is 15%	0.390
What's your practice of using toothbrush at the airport or long flight?	Use same personal toothbrush 32%  Buy a new toothbrush at the airport or plane 4%  Do not use toothbrush at the airport or plane 64%	Use same personal toothbrush 30%  Buy a new toothbrush at the airport or plane 24%  Do not use toothbrush at the airport or plane 46%	Use same personal toothbrush 29%  Buy a new toothbrush at the airport or plane 19%  Do not use toothbrush at the airport or plane 52%	0.126
What are the indications of toothbrush change?	Slayed/ bent 42%  More Than 3 Months Use 38%  More Than 6 Months Use 19%	Slayed/ bent 38%  More Than 3 Months Use 39%  More Than 6 Months Use 23%	Slayed/ bent 40%  More Than 3 Months Use 25%  More Than 6 Months Use 34%	0.083

Table 3: Comparison of the Study participants on the basis of brushing frequency

Item	None	Once A Day	Twice A Day	P- Value
How often do you change your toothbrush?	<b>Every 1 Month</b> 3%  <b>Every 3 Month</b> %  <b>Every 6 Month</b> 16%  <b>When it is Dirty and Damaged</b> 82%	<b>Every 1 Month</b> 8%  <b>Every 3 Month</b> 28%  <b>Every 6 Month</b> 26%  <b>When it is Dirty and Damaged</b> 39%	<b>Every 1 Month</b> 12%  <b>Every 3 Month</b> 40%  <b>Every 6 Month</b> 28%  <b>When it is Dirty and Damaged</b> 19%	<b>0.000</b>
Where do you keep your brush?	<b>In the cupboard</b> 16%  <b>On the sink (in toilet)</b> 58%  <b>On the sink (outside toilet )</b> 26%	<b>In the cupboard</b> 13%  <b>On the sink (in toilet)</b> 62%  <b>On the sink (outside toilet )</b> 26%	<b>In the cupboard</b> 15%  <b>On the sink (in toilet)</b> 64%  <b>On the sink (outside toilet )</b> 21%	<b>0.620</b>
Toothbrush may be contaminated with microorganisms when stored inside the toilet.	<b>Yes</b> 23%  <b>No</b> 3%  <b>May Be</b> 74%	<b>Yes</b> 31%  <b>No</b> 14%  <b>May Be</b> 56%	<b>Yes</b> 37%  <b>No</b> 10%  <b>May Be</b> 52%	<b>0.014</b>
How do you maintain the toothbrush hygiene?	<b>Rinsing and drying only</b> 70%  <b>Covering with a cap</b> 27%  <b>soaking it in disinfectant</b> 3%	<b>Rinsing and drying only</b> 70%  <b>Covering with a cap</b> 23%  <b>soaking it in disinfectant</b> 7%	<b>Rinsing and drying only</b> 60%  <b>Covering with a cap</b> 34%  <b>soaking it in disinfectant</b> 6%	<b>0.006</b>
Has your dentist advice you about maintaining tooth brush?	<b>Yes</b> 5%  <b>No</b> 46%  <b>Don't Remember</b> 49%	<b>Yes</b> 16%  <b>No</b> 55%  <b>Don't Remember</b> 30%	<b>Yes</b> 22%  <b>No</b> 58%  <b>Don't Remember</b> 20%	<b>0.000</b>
Microorganisms capable of causing toothbrush contamination:	<b>bacteria</b> 18%  <b>Fungi</b> 0%  <b>Virus</b> 0%	<b>bacteria</b> 34%  <b>Fungi</b> 6%  <b>Virus</b> 1%	<b>bacteria</b> 46%  <b>Fungi</b> 4%  <b>Virus</b> 1%	<b>0.000</b>



	<b>Don't Know %82</b>	<b>Don't Know 59%</b>	<b>Don't Know 49%</b>	
Common mode of transmission of infection from toothbrush.	<b>Sharing the tooth brush 82%</b>  <b>Sharing the same tooth brush holder 8%</b>  <b>Use of frayed 11%</b>  <b>bristled toothbrush 0%</b>	<b>Sharing the tooth brush 75%</b>  <b>Sharing the same tooth brush holder 10%</b>  <b>Use of frayed 15%</b>  <b>bristled toothbrush 0%</b>	<b>Sharing the tooth brush 76%</b>  <b>Sharing the same tooth brush holder 9%</b>  <b>Use of frayed 15%</b>  <b>bristled toothbrush 0%</b>	<b>0.872</b>
How you take your tooth brush while you travel	<b>Carry the same toothbrush that you are using 26%</b>  <b>Buy new toothbrush 24%</b>  <b>Never carry a toothbrush when travelling 50%</b>	<b>Carry the same toothbrush that you are using 47%</b>  <b>Buy new toothbrush 47%</b>  <b>Never carry a toothbrush when travelling 5%</b>	<b>Carry the same toothbrush that you are using 38%</b>  <b>Buy new toothbrush 61%</b>  <b>Never carry a toothbrush when travelling 1%</b>	<b>0.000</b>
How do you carry your toothbrush in the luggage when you are traveling?	<b>Put it inside a special case 24%</b>  <b>Roll it with tissue paper 'Napkin' 16%</b>  <b>I don't carry my toothbrush when travelling 42%</b>  <b>Keep it in the luggage as it is 18%</b>	<b>Put it inside a special case 41%</b>  <b>Roll it with tissue paper 'Napkin' 32%</b>  <b>I don't carry my toothbrush when travelling 10%</b>  <b>Keep it in the luggage as it is 17%</b>	<b>Put it inside a special case 60%</b>  <b>Roll it with tissue paper 'Napkin' 24%</b>  <b>I don't carry my toothbrush when travelling 6%</b>  <b>Keep it in the luggage as it is 10%</b>	<b>0.000</b>
What's your practice of using toothbrush at the airport or long flight?	<b>Use same personal toothbrush 21%</b>  <b>Buy a new toothbrush at the airport or plane 11%</b>  <b>Do not use toothbrush at the airport or plane 68%</b>	<b>Use same personal toothbrush 28%</b>  <b>Buy a new toothbrush at the airport or plane 20%</b>  <b>Do not use toothbrush at the airport or plane 52%</b>	<b>Use same personal toothbrush 32%</b>  <b>Buy a new toothbrush at the airport or plane 28%</b>  <b>Do not use toothbrush at the airport or plane 39%</b>	<b>0.000</b>
What are the indications of toothbrush change?	<b>Slayed/ bent 71%</b>  <b>More Than 3 Months Use 8%</b>	<b>Slayed/ bent 44%</b>  <b>More Than 3 Months Use 33%</b>	<b>Slayed/ bent 29%</b>  <b>More Than 3 Months Use 46%</b>	<b>0.001</b>

	<b>More Than 6 Months Use</b> 21%	<b>More Than 6 Months Use</b> 24%	<b>More Than 6 Months Use</b> 26%	
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## DISCUSSION

This study was conducted to assess the practice of college students towards the maintenance of their toothbrush. We divided the study sample into several groups including gender, socioeconomic status and brushing frequency on a daily basis. When comparing on the basis of gender, several statistically significant comparisons were achieved when inquired about changing the toothbrush with females being more efficient (p-value: 0.000), contamination of toothbrush if stored in toilet being responded mostly by females (p-value: 0.000), most females covered their toothbrushes with cap (p-value: 0.000), knowledge about microorganisms (p-value: 0.005) and keeping the toothbrush in a special case when travelling (p-value: 0.000). Therefore, the females showed a significantly higher level of knowledge and awareness regarding the maintenance of their toothbrush. Previous studies have reported that the best time to change the toothbrush is every three months especially if it is bent or splayed (Abraham, Cirincione & Glass, 1990). Similar findings were revealed in our study with majority of the participants supporting this information.

Another comparison was achieved when socioeconomic status was associated with maintaining toothbrush hygiene. Overall, there was no statistically significant difference achieved when the responses were compared. However, majority of the low socioeconomic group reported that they never travelled with their toothbrush (p-value: 0.010). Apart from this, all other comparisons were found to be statistically insignificant. Contrary to our findings, several studies have demonstrated a strong association with socioeconomic status and the quality of oral hygiene (Elger et al, 2019; Rani et al, 2017).

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Finally, several significant comparisons were observed when the study participants were compared on the basis of their daily brushing frequency. Subjects brushing twice a day reported to have changed their toothbrushes every three months (p-value: 0.000), contamination of toothbrush in toilet (p-value: 0.014), using a cover to store the toothbrush (p-value: 0.006), two times brushing subjects bought a new toothbrush whenever they travelled (p-value: 0.000) and majority of the same group reported that the right indication to replace their toothbrush is after every three months regardless of the condition (p-value: 0.001). Similar findings were reported by Yadav (2015) regarding the maintenance of toothbrush especially the hygiene when storing it in the toilet.

## CONCLUSIONS

- Females showed a better knowledge and awareness of toothbrush maintenance as compared to males.
- Socioeconomic status was not strongly linked with the maintenance of toothbrush.
- Participants brushing twice a day showed a much better attitude towards toothbrush storage and overall maintenance.
- There is a need for dentists informing their patients about the right method and protocol of toothbrush storage and maintenance.

## CONFLICT OF INTEREST

There is no conflict of interest among the authors.