

Knowledge Attitude and Practice of Dentists Regarding Toothbrush Hygiene and Disinfection in Private Dental Colleges of Lucknow City India: A Cross-sectional Study

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ABSTRACT

Background: A toothbrush is one of the most important aids used for cleaning teeth by most people in the world. So, knowledge regarding toothbrush disinfection is of utmost importance to everyone, especially the dental fraternity. With this in mind this study aims to understand the Knowledge Attitude and Practice of dentists regarding toothbrush hygiene and disinfection in private dental colleges of Lucknow City.

Materials and methods: This was a cross-sectional questionnaire-based study, which included the undergraduates (UGs, interns), postgraduates (PGs), and faculty members of the four private dental colleges who gave the consent to participate in the study. The statistical analysis was done using SPSS version 22, the Chi-square test was used and p -value <0.05 was considered statistically significant.

Results: There was a statistically significant difference regarding toothbrush contamination, mode of storing the toothbrush, and the various practice used for toothbrush disinfection among the interns, postgraduates, and faculty members who participated in the study. It was also seen that the general awareness and practice of toothbrush disinfection was higher among the female participants in the study, which was also a statistically significant result.

Conclusion: There was a statistically significant difference in the perceptions about toothbrush contamination and disinfection among postgraduates and interns that might be attributed to their higher academic knowledge and clinical experience.

Keywords: Dentists knowledge, Oral hygiene, Questionnaire on oral self care, Toothbrush disinfection.

International Journal of Clinical Pediatric Dentistry (2022): 10.5005/jp-journals-10005-2341

INTRODUCTION

Over 700 bacterial species, as well as fungi, viruses, and transient microorganisms, are present in the oral cavity that may or may not cause various diseases.¹ Oral health is an integral part of general health. It, directly and indirectly, reflects the overall well-being of an individual; thus, maintaining oral hygiene becomes a crucial factor.² The use of toothbrushes and/or dental floss is essential to removing dental biofilm and for preventing dental caries and periodontal diseases.³ While toothbrushes play a pivotal role in the mechanical method of plaque control, they also act as reservoirs of microorganisms in healthy, diseased, or medically ill patients.⁴

The issue of the contamination of toothbrushes was reported by Cobb as early as in 1920,⁵ Glass in 1992 observed that injuries to oral tissues are aggravated by the use of contaminated toothbrushes when compared with sterile ones, and may even cause bacteremia and sometimes septicemia after brushing.⁶ Taiji, Rogers⁷ reported that toothbrushes are usually stored in bathrooms and present a high level of contamination, considering that this environment is highly contaminated, mainly by enteric bacteria dispersed by aerosols. Contaminated toothbrushes are likely to play an important role in many oral and systemic diseases, causing septicemia and diseases of gastrointestinal, cardiovascular, respiratory, and renal systems.⁸

The microorganisms which contaminate the toothbrushes are known to maintain their viability ranging from 1 day to 1 week,⁹ these along with other factors like storage circumstances, toothbrush location, placing the toothbrushes in close proximity with toothbrushes of other family members, and the survival time of microorganisms cause the reintroduction of potential pathogens and cross-infection in the oral cavity.¹⁰

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How to cite this article: Potlia I, Singh P, Chauhan H, *et al.* Knowledge Attitude and Practice of Dentists Regarding Toothbrush Hygiene and Disinfection in Private Dental Colleges of Lucknow City India: A Cross-sectional Study. *Int J Clin Pediatr Dent* 2022;15(1):79–84.

Source of support: Nil

Conflict of interest: None

So, the manner in which the microorganisms are removed from the toothbrush and its disinfection has become a matter of critical concern in recent years.^{7,11} A few popular methods of disinfection of toothbrush are soaking in alcohol, soaking in disinfecting solution, using antimicrobial rinses, washing toothbrush in the dishwasher, using of a microwave oven, and ultraviolet light, also drying in sun, using table salt to absorb moisture and placing the brush in a closed cabinet containing formaldehyde gas are suggested.¹²

Though literature search yields many articles comparing the various methods of toothbrush disinfection, there are very few articles assessing the knowledge of the dental professionals relating to methods of toothbrush disinfection or the proper methods of

storing the toothbrush. Keeping this in mind the aim of the present study was to assess the knowledge, attitude, and practices of dental professionals in dental college.

MATERIALS AND METHODS

This cross-sectional study was conducted among the four private dental colleges in Lucknow city, from September to October 2019. Dental students (interns), postgraduates, and faculty of the four dental colleges who were interested and gave consent were included in the study. All the participants were provided with written informed consent prior to their involvement in the study. This study was approved by the Ethics Board of the Institutional Ethics Committee of the College.

A questionnaire was developed from previous literature (Sowmya et al. and Peker et al.). Internal consistency was checked using Cronbach’s alpha which was found to be 0.78. A pilot study was conducted among 50 postgraduates and interns to check the feasibility of the study. The sample size was calculated using the formula $SS = z^2 pq/d^2$. Considering the prevalence of knowledge 50%, 95% confidence level, and 80% power, a sample size of 384 was obtained, which was rounded off to 400.

Standard questionnaire was prepared and distributed to the participants, distribution of the study participants is given in (Figures 1 and 2, which contained 13 items in three parts: demographics, personal toothbrush/toothpaste use, and toothbrush disinfection. Each participant was asked to fill out the questionnaire by him/herself, the questionnaire was collected back on the same day to avoid any misplacement of the same. Of the 400 questionnaires that were distributed to dentists, 17 forms were filled out incompletely and were excluded from the study, resulting in 383 evaluated forms. Data were statistically analyzed by using SPSS-22.0 with descriptive statistics and Chi-squared tests as appropriate. Differences with a p-value of less than 0.05 were considered statistically significant.

RESULTS

Of the 383 study subjects, 36 were postgraduates, 322 were undergraduates, and 25 were faculty members and the majority of the study participants were females 62% (Fig. 1). Nearly three-fourths of them belonged to upper-middle class in all the groups. Most of them used toothbrushes and toothpaste, followed either vertical or horizontal toothbrushing methods, twice daily before meals.

Most of the study participants among the undergraduate students and postgraduate students stored their toothbrushes in a separate container not shared by family members in contrast to the faculty members who stored their toothbrushes in a container shared by family members and this was a statistically significant result (Table 1). Most of the study participants said they did not share their toothpaste with anyone and that they carried their toothbrushes in a separate pouch while traveling which was significant with respect to age, qualification, and gender (Table 1) and it was seen that the female participants were more conscious regarding the same in both the questions (Figures 2 and 3).

While most of the participants said that they suggested their patients about changing their toothbrushes every 3 months which was again significant with respect to age, qualification, and gender where more female participants were seen to suggest the same to their patients (Table 2).

Though most of the UG and PG participants said they had knowledge regarding toothbrush disinfection in contrast to the faculty members, very few of them (UG and PG) seemed to practice toothbrush disinfection by themselves (both results significant with respect to age and qualification, Table 2). It was seen that most of the participants used normal tap water to disinfect their toothbrushes (result was significant with respect to age and qualification, Table 2).

DISCUSSION

The increased awareness of the need for good oral health and the emphasis on preventive procedures by dental professionals have prioritized toothbrushes as the most common oral hygiene aid to promote oral health and prevent dental diseases. Commonly, after use, toothbrushes are rinsed with plain water and stored in the bathroom¹³ and there is a high chance of cross-infection by sharing or keeping them in close proximity.¹⁴

According to American Dental Association, for sound oral hygiene, appropriate toothbrush care and maintenance are important considerations and a person should change his/her toothbrush every 3–4 months.¹⁵ Which was a similar and highly significant, both in terms of age and qualification, response given by most of the participants of this study who agreed that a toothbrush should be changed in a period of 3 months. Similar to this, on asking if they recommended the same to their patients, the majority of the participants (23 of 25 faculty members and 155 of 322 UGs stated

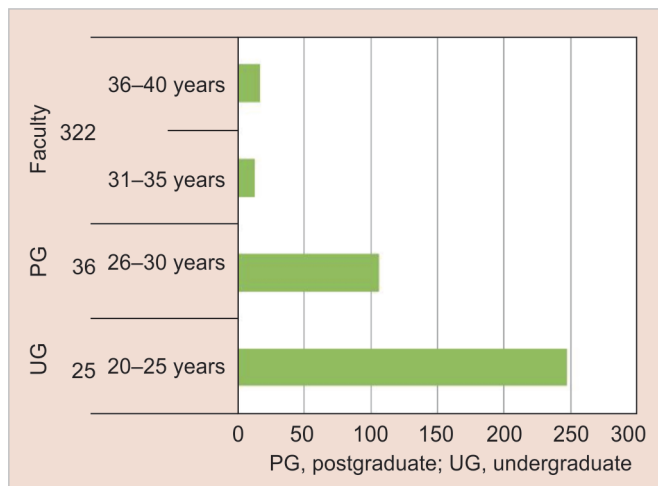


Fig. 1: Distribution of study subjects as per qualification and age

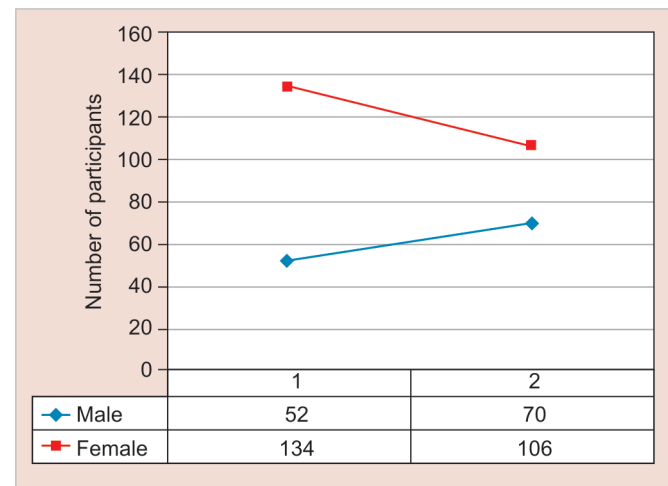


Fig. 2: Do you share your toothpaste with other individuals?



Table 1: Descriptive results of the questionnaire with analysis of Chi-square test with age and qualification

1. Question: How often do you change your toothbrush?							
Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
Once a month	31	9	1	0	39	2	0
Twice a month	44	14	0	0	55	3	0
Once in 3 months	140	54	8	17	172	24	23
After 3 months or more	32	29	4	0	56	7	2
p-value	0.001				0.007		
2. Question: How often do you brush your teeth?							
Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
Once a day	86	40	3	0	121	7	1
Twice a day or more	247	106	13	17	201	29	24
p-value	0.017				0.000		
3. Question: How do you store your toothbrush?							
Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
In a toothbrush holder shared with other family members	73	32	6	17	104	1	23
In a separate container not shared with family members	101	30	5	0	120	15	1
Covering the brush with a cap	73	41	2	0	97	18	1
Any other	0	3	0	0	1	2	0
p-value	0.000				0.000		
4. Question: In your opinion, is contact between toothbrushes an important issue?							
Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
No	30	13	2	0	42	3	1
Yes	217	93	11	17	280	33	24
p-value	0.802				0.669		
5. Question: Do you share your toothpaste with other individuals?							
Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
No	129	66	3	0	171	26	1
Yes	118	40	10	17	151	10	24
p-value	0.000				0.000		
6. Question: How do you carry your toothbrush while traveling?							
Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
In a separate pouch	194	74	6	0	239	33	2
In the pocket of any bag/suitcase	51	28	6	17	77	3	22
Do not carry/ brush with fingers	2	4	1	0	6	0	1
p-value	0.000				0.000		

Descriptive statistics were done using Chi-square test, $p < 0.05$ was considered statistically significant, UG, undergraduates; PG, postgraduates

Table 2: Descriptive results of the questionnaire with analysis of Chi-square test with age and qualification

7. Question: Do you advise your patients regarding how often they should change their toothbrushes and/ or where and how their toothbrushes should be stored?

Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
I only make suggestions about the frequency of changing their toothbrushes	116	56	10	17	155	21	23
No	18	9	1	0	25	2	1
Yes	113	41	2	0	142	13	1
p-value	0.003				0.004		

8. Question: Do you have any knowledge about toothbrush cleaning and disinfection?

Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
No	74	29	8	7	91	15	22
Yes	173	77	5	10	231	21	3
p-value	0.000				0.000		

9. Question: Do you disinfect your own toothbrush?

Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
No	114	49	6	0	144	24	24
Yes	133	57	7	17	178	12	1
p-value	0.003				0.000		

10. Question: How do you disinfect your toothbrush?

Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
Soak toothbrushes in anti-microbial mouth rinse	37	31	4	0	53	17	2
Using normal tap water	194	61	9	17	240	18	23
Using distilled water	10	14	0	0	23	1	0
Any other	6	0	0	0	6	0	0
p-value	0.000				0.000		

11. Question: In your opinion is toothbrush disinfection necessary?

Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
No	21	9	2	0	27	4	1
Yes	226	97	11	17	295	32	24
p-value	0.541				0.883		

12. Question: For whom is toothbrush disinfection necessary?

Age:	20–25	26–30	31–35	36–40 years	Qualification		
	years	years	years		UG	PG	Faculty
Everybody	217	94	12	17	286	29	25
Special patient groups	30	12	1	0	36	7	0
p-value	0.471				0.061		

Descriptive statistics were done using Chi-square test, $p < 0.05$ was considered statistically significant, UG, undergraduates; PG, postgraduates

that they only suggested the same to their patients which were significant in terms of age, qualification, (Tables 1 and 2) and gender (Fig. 4). This is similar to a result from another study, where only half of the study participants advised the same to their patients.¹⁶

The next most important issue regarding toothbrush hygiene is the place where the toothbrush is stored. Most of the people staying with families are seen to store their toothbrushes on a shelf inside the bathroom or in a container where the brushes of other family members are also kept.¹⁷ This was similar to the

findings of the present study, which was highly significant with respect to age and qualification (Table 1). Where about 23 of 25 faculty members stated that they placed their toothbrushes in a container shared by other family members. However, about 120 of the 322 undergraduates stated that they placed their toothbrushes in a separate container not shared by other family members, practicing the more preferable method of toothbrush placement to avoid contamination by contact of different toothbrushes.



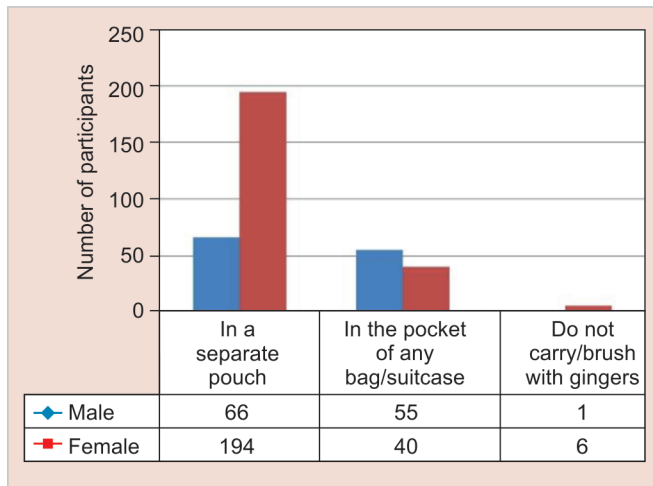


Fig. 3: How do you carry your toothbrush while traveling?

This could be like most of the undergraduates in the study resided in a hostel, where they have a common bathroom among many students, and this common bathroom does not have any place for keeping the toothbrushes of the students, so the students tend to keep the toothbrushes in their living rooms, which in turn becomes the ideal method of toothbrush storage since it is in an open environment, not in any closed cabinet and away from any aerosols which are otherwise produced in the toilet cum bathroom.

Also, it was seen that even the students who were day scholars, had a separate room with an attached bathroom which was used only by them. In this case, also the students did not share their toothbrush holder and toothpaste with any other family members, while the parents who shared the bathroom kept their toothbrushes in a common container and shared the toothpaste with their spouse, this was also the case with the faculty members who were married in the study. So, when asked, almost all the faculty members who participated in the study agreed that they shared their toothpaste with their families. Whereas 171 of 322 undergraduate students stated that they did not share their toothpaste with family members. This result was highly significant with respect to age and qualification (Table 1). This result could not be compared as the literature search did not reveal similar situations. This result was also highly significant with respect to gender ($p = 0.031$) where more females were seen to avoid sharing their toothpaste (Fig. 2).

Another important aspect of toothbrush contamination is the method used to carry the toothbrush while traveling, while most of the UGs 239 and 33 PGs stated that they carried their toothbrushes in a separate pouch, however, most of the faculty members 22 of 25 said they carried them in any pocket of any suitcase/bag. They were both highly significant results with respect to age, qualification, and gender (Table 2 and Fig. 3) where a significantly higher number of females carried their toothbrushes in a separate pouch as compared to the males who participated in the study. This shows that in general females are more conscious about the toothbrush and their own oral hygiene when compared to males.

When asked if they had any knowledge about toothbrush disinfection, about 22 of 25 faculty members said they had no knowledge about the same, whereas, around 231 UGs and 21 PGs answered the same question positively, this result was significant with respect to age and qualification (Table 2). However, this result is in contrast to a similar question asked in a study¹⁷ where the increase in experience of the dental practitioners gave them more

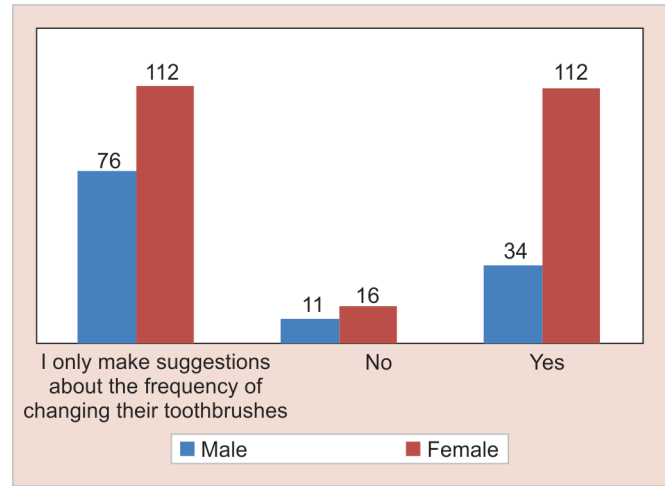


Fig. 4: Do you advise your patients regarding how often they should change their toothbrushes and/ or where and how their toothbrushes should be stored?

knowledge regarding toothbrush disinfection. This contrasting result may be as the students could be giving more ideal answers, while the faculty may be more honest about the same. Another reason for this answer could be, that the faculty members do realize that using normal tap water is just a method of cleaning the toothbrush rather than disinfecting it, while the students must be comprehending it as a homely method of toothbrush disinfection. This can be further substantiated with the answers received in the next two questions.

When asked if they disinfected their toothbrushes, almost all of the faculty members 24 of 25 and 24 of 33 PGs said they did not practice toothbrush disinfection. While about 178 of 322 UGs said they practiced toothbrush disinfection, this result was also significant with respect to age and qualification (Table 2). This result is similar to the findings of another study conducted by Perker et al.¹⁷ and Sowmya et al.¹⁶

When asked what means were used by the participants for toothbrush disinfection, the majority (23 faculty, 28 PGs, and 240 UGs) of the participants answered that they used normal tap water, this result was also significant with respect to age and qualification (Table 2). This clearly shows the lack of awareness among the dentist participants regarding the other methods which can be used for toothbrush disinfection at home.

On asking if toothbrush disinfection is necessary, almost all the study participants (24 Faculty, 32 PGs, and 295 UGs) answered yes, agreeing that toothbrush disinfection is important (Table 2). And when asked who should practice toothbrush disinfection, the majority of the UGs, PGs (286, 29), and all the faculty members said that it was important to be practiced by everyone (Table 2). The above two results of this study are similar to the findings of other studies conducted.^{10,16,17}

The present study assessed the perceptions regarding toothbrush contamination and disinfection among dental postgraduates, interns, and faculty members. Not many studies have been done in this regard. Hence, comparisons were made wherever possible. The results of this study are comparable to that of other studies conducted previously and have been mentioned when required. However, the difference in answers could be because the students (UGs and PGs) may have answered the questions more ideally giving more correct answers, compared to the faculty members, who were seen to answer more honestly. This could also be the limitation of this study.

The difference in the answers of the PGs and UGs could be attributed to the increased exposure of the postgraduate students academically in the form of CDE's, conferences, journals, etc.

CONCLUSION

The statistically significant difference regarding the perceptions about toothbrush contamination and disinfection was observed among interns, postgraduates, and faculty members which might be accredited to the difference in academic knowledge, exposure to a wide range of information, and clinical experience over the years between the groups.

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