

A Cross-Sectional Study to Compare Knowledge, Attitude and Practices of Dental and Medical Students About Toothbrush Maintenance and Use

Dr Prachi Mital¹, Dr Amit², Dr Deepak Raisinghani³, Dr Premlata Mital⁴,
Dr Neha Mehta⁵

¹Department of Conservative Dentistry & Endodontics, Mahatma Gandhi Dental College, Jaipur, Rajasthan, India

²Department of Oral & Maxillo-facial Surgery, Mahatma Gandhi Dental College, Jaipur, Rajasthan, India

³Department of Conservative Dentistry & Endodontics, Mahatma Gandhi Dental College, Jaipur, Rajasthan, India

⁴Department of Obstetrics & Gynecology, S.M.S. Medical College, Jaipur, Rajasthan, India

⁵Department of Conservative Dentistry & Endodontics, Mahatma Gandhi Dental College, Jaipur, Rajasthan, India

Corresponding Author: Dr Premlata Mital

DOI: <https://doi.org/10.52403/ijhsr.20231122>

ABSTRACT

Toothbrush is an important aid in maintaining oral health. It helps in eliminating dental plaques, food residues, and stains on the tooth surface. It may also play a significant role in disease transmission. Washing toothbrush before and after use, replacing the toothbrush every 3–4 months, and regular tooth brushing twice a day for 2–3 minutes are some of the practices required for maintenance of toothbrush. The present study was done to compare the knowledge, attitude, and practice of medical and dental students about toothbrush maintenance and use.

Methods: This was a cross-sectional, descriptive study. 385 participants were included in the study after obtaining written informed consent. The questionnaire consisted of 22 questions to assess knowledge, attitude and practice. The responses obtained were statistically analyzed.

Results: Knowledge of dental students was significantly more than medical students. There was significant difference in the attitude of dental and medical students when asked about various factors which affect toothbrush wear (p value - <0.00001). Majority of the dental (90.3%) and medical students (87.5%) brush their teeth twice a day and 60.6% dental and 54.5% medical students are in the practice of changing their toothbrush every 3 months. Most students are in the practice of washing their toothbrush before and after brushing. About 76% students were of the opinion that disinfection is necessary but only about 46% students disinfect their toothbrushes regularly.

Conclusion: Knowledge, attitude and practices regarding toothbrush maintenance and use was more in dental students than medical students.

Keywords: Dental students, medical students, Toothbrush maintenance

INTRODUCTION

Oral health is an essential element of an individual's health. According to American Dental Association (ADA), "oral health is a functional, structural, aesthetic, physiologic, and psychosocial state of well-being and is essential to an individual's general health

and quality of life"^[1] Poor oral hygiene can lead to the development of dental caries and periodontitis, and is also associated with heart disease, cancer, and diabetes.^[2-4] Most of the oral diseases are preventable. Tooth brushing is the most effective method for preventing dental caries or periodontitis.^[5]

Tooth brushing eliminates dental plaques, food residues, and stains on the tooth surface.^[6] Despite the efficacy of toothbrushes and their role in oral health, toothbrushes may play a significant role in disease transmission and increase the risk of infection because they can serve as a reservoir for microorganisms in healthy as well as medically ill adults.^[7-9] Contamination of toothbrush may occur from repeated use, oral cavity, environment, hands, aerosol contamination, and storage containers.^[9] Bacteria that attach to, accumulate, and survive on toothbrushes may be transmitted to the individual causing diseases such as dental caries, gingivitis, periodontitis, and stomatitis.^[10] Knowledge of correct maintenance and use of toothbrushes plays a pivotal role in oral health.^[8] Washing the toothbrush before and after use, replacing the toothbrush every 3–4 months, and regular tooth brushing twice a day for 2–3 minutes are some practices for the maintenance and use of toothbrushes.^[8,11] Medical and dental students can play an important role in the oral health education of individuals and groups and act as role models for patients, friends, families and the community at large.^[12] They are expected to have adequate knowledge about correct maintenance and use of toothbrushes and their attitude reflects their understanding of the importance of disease prevention and their responsibility for improving their patients' oral health.^[13,14] Therefore, the level of their own oral health behavior can serve as positive models for their patients, families and friends.^[14] Numerous studies have been reported on oral health practices among dental and medical students but very few studies have

been done in our state to assess knowledge, attitude, and practice of medical and dental students about toothbrush maintenance and use, so the present study was done to compare the knowledge, attitude, and practice of medical and dental students about toothbrush maintenance and use.

MATERIALS & METHODS

This was a cross-sectional, observational, questionnaire-based study done to evaluate and compare knowledge, attitude, and practice of medical and dental students about toothbrush maintenance and use. Sample size of 385 was calculated at 80% study power and α error 0.05 and confidence level of 95%. The participants who were willing to participate in the study were included after obtaining written informed consent. The questionnaire consisted of 22 questions, of which 7 were knowledge based, 7 were attitude based, and 8 were practice based. The responses obtained were analyzed.

STATISTICAL ANALYSIS

Qualitative data were represented by frequencies and percentages. Chi-square test was used to compare the results and a p value of <0.05 was considered to be significant.

RESULT

Figure 1 shows profile of the participants. Out of 385 participants, 200 (51.9%) were medical students and 185 (48.1%) were dental students. The mean age of medical students was 26.8 ± 3.46 years and that of dental students was 24.1 ± 5.86 years. Age of the medical students was significantly more than dental students (p value – 0.000)

Figure 1: Profile of the patient

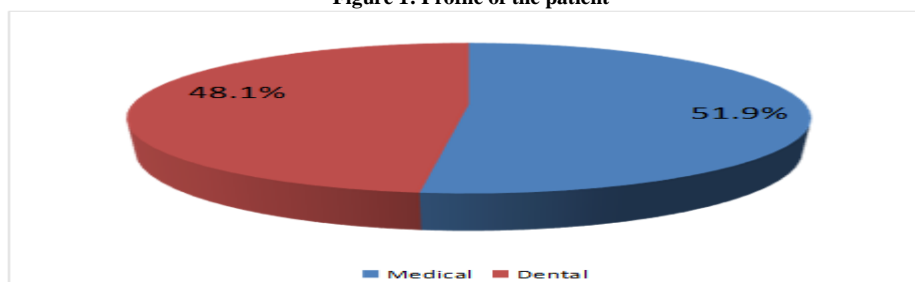


Table 1: Comparison of knowledge of dental and medical students about toothbrush maintenance and use

S. No	Variables to assess knowledge	Dental Students (n = 185)		Medical students (n = 200)		p Value
		No.	%	No.	%	
1	Is cleaning your toothbrush important for oral hygiene?					0.9
	Yes	180	97.4	194	97.0	
	No Do not know	3 2	1.6 1.1	4 2	2.0 1.0	
2	Is mouthwash more beneficial than using a toothbrush for cleaning teeth?					0.002
	Yes	169	91.4	161	80.5	
	No Do not know	9 7	4.9 3.8	11 28	5.5 14.0	
3	Does a toothbrush protect from the presence of bacteria?					0.02
	Yes	112	60.5	93	46.5	
	No Do not know	21 52	11.4 28.1	31 76	15.5 38.0	
4	Does a toothbrush help in the removal of plaque?					0.02
	Yes	103	55.7	83	41.5	
	No Do not know	51 31	27.6 16.7	71 46	35.5 23.0	
5	What is the microorganism responsible for contamination of toothbrush?					0.01
	Bacteria	180	97.5	178	89.0	
	Virus	3	1.5	15	7.5	
	Fungi None	1 1	0.5 0.5	4 3	2.0 1.5	
6	Is toothbrush disinfection necessary?					0.6
	Yes	143	77.3	151	75.5	
	No Do not know	19 23	10.3 12.4	18 31	9.0 15.5	
7	What is the source of your knowledge?					-
	Dentists	113	61.1	153	76.5	
	Lectures	42	22.7	21	10.5	
	TV and Internet None of the above	19 11	10.3 5.9	19 7	9.5 3.5	

Table 1 compares knowledge of dental and medical students about toothbrush maintenance and use. 97.4% dental and 97% medical students are of the opinion that cleaning of toothbrush is important for oral hygiene. 91.4% dental students and 80.5% medical students are of opinion that mouthwash is more beneficial than using toothbrush for cleaning teeth and this belief was significantly more in dental students (p value – 0.002). There was significant difference in the knowledge of dental students (60.5%) and medical students (46.5%) when asked about ‘does toothbrush

protect from the presence of bacteria?’ (p value – 0.02). Knowledge of dental students was significantly more than medical students when asked ‘does a toothbrush help in removal of plaque?’ (55.7% vs 41.5%, p value 0.02) and bacteria are responsible for contamination of toothbrush (97.5% vs 89.0%, p value- 0.01). Majority of the students (77.3% dental students and 75.5% medical students) are of the opinion that toothbrush disinfection is necessary. In both groups main source of knowledge gain was from dentists followed by lectures.

Table 2: Comparison of attitude of dental and medical students about toothbrush maintenance and use

S. No	Variables to assess Attitude	Dental Students (n = 185)		Medical students (n = 200)		p Value
		No.	%	No.	%	
1	Does toothbrush material affect its lifespan?					0.1
	Yes	167	90.3	172	86.0	
	No Do not know	5 13	2.7 7.0	15 13	7.5 6.5	
2	Toothbrushes made in foreign countries are better					0.3
	Yes	159	85.9	163	81.5	
	No Do not know	11 15	5.9 8.2	12 25	6.0 12.5	
3	What factors affect the toothbrush wear?					<0.00001
	Brushing technique	2	1.1	4	2.0	
	Duration of brushing Pressure applied while brushing	1 1	0.5 0.5	5 7	2.5 3.5	

	All of them	181	97.9	184	92.0	
4	Is it okay for you to share toothbrush?					
	Yes	3	1.6	3	1.5	0.9
	No	169	91.4	181	90.5	
	May be	13	7.0	16	8.0	
5	How a toothbrush gets contaminated?					0.02
	External environment	12	6.5	17	8.5	
	Oral cavity	19	10.3	38	19.0	
	Contact with another toothbrush	21	11.4	23	11.5	
	Not washing it properly	23	12.4	33	16.5	
	All of them	110	59.4	89	44.5	
6	How a toothbrush can transmit the infection?					0.4
	Sharing the toothbrush	135	72.9	151	70.5	
	Sharing the toothpaste	27	14.6	25	12.5	
	Sharing the same toothbrush holder	20	10.8	13	6.5	
	Using frayed bristled toothbrush	13	7.0	11	5.5	
7	Do closely arranged bristles retain more bacteria?					0.4
	Yes	168	90.8	173	86.5	
	No	5	2.7	7	3.5	
	Do not know	12	6.5	20	10.0	

Attitude of dental and medical students about toothbrush maintenance and use is compared in Table 2. 90.3% dental and 86% medical students are of the opinion that toothbrush material affects its lifespan. 85.9% dental and 81.5% medical students believed that toothbrushes made in foreign countries are better. There was significant

difference in the attitude of dental and medical students when asked about various factors which affect toothbrush wear (p value - <0.00001) and 'how a toothbrush gets contaminated?' (p value - 0.02). Most of the students in both groups did not want to share their toothbrushes with other individuals.

Table 3: Comparison of practices of dental and medical students about toothbrush maintenance and use

S. No	Variables to assess practices	Dental Students (n = 185)		Medical students (n = 200)		p Value
		No.	%	No.	%	
1	How often do you brush?					0.06
	Once a day	4	2.2	14	7.0	
	Twice a day	167	90.3	175	87.5	
	More than twice a day	14	7.5	11	5.5	
2	How much time you take for brushing?					0.02
	<1 min	35	18.9	51	25.5	
	1 – 2 min	133	71.9	118	59.0	
	2 – 3 min	17	9.2	31	15.5	
3	Which type of toothbrush do you use?					0.009
	Soft	142	76.7	126	63.0	
	Hard	34	18.4	53	26.5	
	Do not know	9	4.9	21	10.5	
4	How often do you change your toothbrush?					0.04
	Every month	11	5.9	13	6.5	
	Every 3 months	112	60.6	109	54.5	
	Every 6 months	53	28.6	52	26.0	
	More than 6 months	9	4.9	26	13.0	
5	What is the indicator for changing toothbrush?					0.6
	Fraying of bristles	114	61.6	111	55.5	
	Fading of colour of bristles	28	15.1	34	17.0	
	Bent of bristles	12	6.5	14	7.0	
	No specific reason	31	16.8	41	20.5	
6	When do you wash your toothbrush?					0.03
	After brushing	12	6.5	26	13.0	
	Before and after brushing	173	93.5	174	87.0	
7	How do you wash your toothbrush?					0.1
	Rinsing it with tap water	163	88.1	185	92.5	
	Rinsing it with warm water	22	11.9	15	7.5	
8	Do you disinfect your toothbrush regularly?					0.3
	Yes	91	49.2	89	44.5	
	No	94	50.8	111	55.5	
9	Where do you place your toothbrush?					
	In the bathroom in a cap holder after drying	106	57.3	99	49.5	

	In the bathroom openly in brush holder	47	25.4	53	26.5	0.3
	Outside the bathroom in a cap holder	25	13.5	37	18.5	
	Anywhere	7	3.8	11	5.5	

Table 3 compares practices of dental and medical students regarding toothbrush maintenance and use. Majority of the dental (90.3%) and medical students (87.5%) brush their teeth twice a day. There was no significant difference in the frequency of tooth brushing (p value – 0.06). There was significant difference in time taken for brushing (p value – 0.02). 71.9% dental students and 59% medical students brush their teeth for 1 – 2 minutes. 60.6% dental and 54.5% medical students are in the practice of changing their toothbrush every 3 months, 28.6% dental and 26% medical students changed their toothbrush in every 6 months. There was significant difference in the frequency of toothbrush change (p value -0.003) in both groups. Fraying of bristles was the most common indicator for changing toothbrush. 93.5% dental and 87% medical students are in the practice of washing their toothbrush before and after brushing, the difference was statistically significant (p value - 0.03). Most of the participants (88.1% dental and 92.5% medical students) washed their toothbrush with tap water. 49.2% dental students and 44.5% medical students are disinfecting their toothbrush regularly and there was no significant difference in this habit (p value – 0.3). 57.3% dental students keep their toothbrush in a cap holder after drying, 25.4% keep toothbrush openly in a brush holder, 13.5% keep their toothbrush outside bathroom in a cap holder. 49.5% medical students keep their toothbrush in a cap holder after drying, 26.5% keep in bathroom openly in a brush holder and 18.5% keep their toothbrush outside bathroom in a cap holder, there was no difference in two groups (p value – 0.3).

DISCUSSION

Toothbrush is one of the most important tools used to clean the teeth, gums and tongue and is used to maintain good oral health. Over the years role of toothbrush is

increasing as people are becoming aware of oral health. Tooth brushes get contaminated with microorganisms present both inside and outside the oral cavity.^[15] The storing of toothbrushes after using makes it easier for microorganisms to flourish more in moist conditions.^[16] This study was done to assess and compare the knowledge, attitude and practices of dental and medical students about toothbrush maintenance and use. The knowledge, attitude and practices of dental students about toothbrush maintenance and use were better than medical students. This may be due to incorporation of toothbrush maintenance and oral hygiene practices in their textbooks.

In present study knowledge of dental students were significantly more than medical students. 97.4% dental and 97% medical students in present study are of the opinion that cleaning of toothbrush is important for oral hygiene. Our observation is consistent with observation made by Rathod S et al. They observed that 84.3% dental and 94% medical participants were of the opinion that cleaning of toothbrush is important for oral hygiene.^[17] When asked “does mouthwash more beneficial than using a toothbrush for cleaning teeth?” 91.4% dental and 80.5% medical students agreed in present study. In a study done by Rathod S et al, 46.3% dental and 39% medical participants agreed that mouthwash is more beneficial than using a toothbrush for cleaning teeth.^[17] In present study 60.5% dental students and 46.5% medical students were of the opinion that a toothbrush protect from the presence of bacteria while in a study done by Rathod S et al 37.2% dental and 49% medical participants were of the opinion that a toothbrush protect from the presence of bacteria.^[17] 55.7% dental and 41.5% medical students in present study were of the opinion that a toothbrush helps in the removal of plaque. This is consistent with observation made by Rathod S et al in their study.^[17] In present study, 97.5%

dental and 89% medical students believed that bacteria are the main causative agent for toothbrush contamination. The results of this study are similar to the previous studies, which also reported bacteria as the main causative agent for toothbrush contamination.^[15,18-21]

In this study 90.3% dental and 86% medical students are of the opinion that toothbrush material affects the life span and 85.9% dental and 81.5% medical students believed that toothbrush made in foreign countries are better. The result of present study is consistent with that of M Janatolmakan et al, where 84.7% medical students agreed that toothbrush material affects the life span and 73.8% students agreed that that toothbrush made in foreign countries are better.^[22] When attitude of participants was assessed regarding the factors responsible for toothbrush wear, it was found that 97.9% dental and 92% medical students were of the opinion that all the option mentioned (brushing technique, duration and pressure applied) were responsible for toothbrush wear. Result of present study was in agreement with observation made by Rathod S et al.^[17] In present study 91.4% dental and 90.5% medical students did not want to share their toothbrushes with other individuals and there was no significant difference in this regard (p value-0.9). This is in line with the observation of Manali Deb Barma et al^[15] and M Janatolmakan et al^[22] but in contrast with that of S B Venkatesh et al^[21] where only 45.96% participants do not share toothbrush with other individuals. In present study, participants in both groups (72.9% dental and 70.5% medical students) believed that sharing the toothbrush is the most common mode of transmission of infection from a toothbrush followed by sharing the toothpaste (14.6% dental and 12.5% medical students). In a study done by Keerthana Ravikumar and Vignesh Ravindran, 47% participants believed that sharing toothbrush is the most common mode of transmission followed by sharing toothpaste (36%).^[22]

The Centers for Disease Control and Prevention (CDC) recommends brushing twice a day specifically for preventing dental caries.^[8] Many studies have assessed the oral health attitude and practices among dental undergraduates in different countries, found that most students brush their teeth at least twice a day.^[21,23] In present study 90.3% dental and 87.5% medical students brush their teeth twice a day which is consistent with the study done by Kumar et al where 77.33% of the dental students brushed twice a day compared to 53.33% of the medical students, hence indicating better oral hygiene measures adopted by dental students.^[24] Results of the present study are in contrast with the study done by Keerthana Ravikumar and Vignesh Ravindran where 43% participants brush their teeth twice a day.^[20] Result of another study by Benjamin *et al* conducted in the University of Nairobi showed that 27.5% of the dental and 39% of the medical students brushed twice daily, and the values were much lower than those reported in our study.^[25] In present study 71.9% dental and 59% medical students spent 1 -2 minutes in brushing this is consistent with the study done by Antonija Tadin where about 70.5% respondents brush their teeth for two to three minutes^[5] while in a study done by A. Vinita Mary et al, 45.3% participants brushed their teeth for 2 minutes.^[26] In present study 76.7% dental and 63% medical students use toothbrush with soft bristles. This is significantly more for dental students than medical students (p value – 0.009) while in a study done by Rathod S et al, 47.1% dental and 51% medical students used toothbrush with soft bristles.^[17] In a study done by H. Lalrintluanga et al, only 38% participants used toothbrush with soft bristles.^[27]

In present study most dental (93.5%) and medical (87%) students wash their toothbrushes before and after tooth brushing this is in line with study of Maryam Janatolmakan et al.^[22] Washing the toothbrush before and after tooth brushing is necessary because the toothbrush contains a

significant number of microorganisms after tooth brushing.^[28] In this study, 88.1% dental students and 92.5% medical students wash their toothbrushes by rinsing them with tap water and 57.3% dental and 49.5% medical students keep their toothbrush in a cap holder after drying, 25.4% dental and 26.5% medical students keep their toothbrush openly in a brush holder.

In a study done by Rathod S et al many medical (68%) and dental ((50.4%) participants reported that they washed their toothbrush with normal tap water and stored it inside the bathroom in an open environment.^[17] According to the study done by Soumya et al the practice of storing toothbrush in the bathrooms or toilets after rinsing leads to the harbouring of millions of microorganisms and dispersal of enteric bacteria through aerosols from toilet flushing or from contaminated fingers and skin commensals and pseudomonas from the bathroom.^[18] Earlier studies have observed a higher number of bacteria in toothbrushes stored in closed containers compared to those open environments.^[19,29,30] Increased chances of bacterial survival on toothbrushes are observed with the use of a toothbrush cap. A. Mehta et al in their study observed that a wet toothbrush can increase bacterial growth and lead to accumulation of microbes in toothbrush. Therefore, it is important to dry the toothbrush before using the cap. ^[31] Recommendations for storage of toothbrush include using cup hooks for hanging the brushes, using a brush box, using closed and vented containers.^[29]

In present study most of the participants (60.6% dental and 54.5% medical students) changed their toothbrushes every 3 months. This practice is significantly more in dental students than medical students (p value – 0.04). The result of present study is in line with that of Rathod S et al,^[17] and Peker et al^[19] and M Janatolmakan et al.^[22] In a study done by Manali Deb Barma et al approximately, 69% of the participants had the habit of changing their toothbrush once every 3 months.^[15] L. Bunetel et al in their

study stated that a toothbrush should be replaced every three months.^[32]

Dental practitioners considered a toothbrush as the most common oral hygiene tool.^[30] Contamination of the toothbrushes occurs due to several factors like storage conditions, toothbrush location, sharing of toothpaste, reintroduction of microorganisms in the oral cavity, and cross-infection.^[20] Proper disinfection of the toothbrush is necessary for bacterial growth prevention.^[33,34] We assessed knowledge and practice of dental and medical students regarding toothbrush disinfection and observed that 77.3% dental and 75.5% medical students were of the opinion that toothbrush disinfection is necessary but only 49.2% dental and 44.5% medical students disinfect their toothbrushes regularly. S B Venkatesh et al in their study found that 84.3% participants were of the opinion that that toothbrush disinfection is necessary but only 24.89% participants disinfect their toothbrushes regularly.^[21] Similarly, Peker et al. examined the knowledge and behaviour of dentists in a dental school regarding toothbrush disinfection and found that a minority of dentists disinfected their toothbrushes.^[35] In a study done by Keerthana Ravikumar and Vignesh Ravindran, about 80% of participants indicated that toothbrush disinfection was required and of all individuals about 53% of dentists declared that they disinfected their own toothbrushes.^[20] In a study done by Manali Deb Barma et al, 91.58% of the participants had knowledge about toothbrush disinfection but only 12% reported disinfecting their own toothbrush.^[15]

CONCLUSION

Present study showed that knowledge, attitude and practices regarding toothbrush maintenance and use was good in the participants but it was better in dental students than medical students as oral health is incorporated in their text book.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. American Dental Association. ADA Policy - Definition of Oral Health. (2014). Accessed: May 20, 2017: <http://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/adapolicy-definition-of-oral-health>.
2. Cetinkaya H., Romaniuk P. Relationship between consumption of soft and alcoholic drinks and oral health problems. *Cent. Eur. J. Public Health*. 2020; 28:94–102. doi: 10.21101/cejph. a5745.
3. Cianetti S., Valenti C., Orso M., Lomurno G., Nardone M., Lomurno A.P., Pagano S., Lombardo G. Systematic Review of the Literature on Dental Caries and Periodontal Disease in Socio-Economically Disadvantaged Individuals. *Int. J. Environ. Res. Public Health*. 2021; 18:12360. doi: 10.3390/ijerph182312360.
4. Pitts N.B., Zero D.T., Marsh P.D., Ekstrand K., Weintraub J.A., Ramos-Gomez F., Tagami J., Twetman S., Tsakos G., Ismail A. Dental caries. *Nat. Rev. Dis. Primers*. 2017; 3:17030. doi: 10.1038/nrdp.2017.30.
5. Tadin A, Poljak Guberina R, Domazet J, Gavic L. Oral Hygiene Practices and Oral Health Knowledge among Students in Split, Croatia. *Healthcare (Basel)*. 2022 Feb 21;10(2):406. doi: 10.3390/healthcare10020406.
6. D. P. Rao and S. McFaul, "Tooth "aches": injuries related to toothbrush use," *Paediatrics and Child Health*. 2018; 24(1): e40–e44,
7. S. Pesevska, K. Ivanovski, S. Mindova et al., "Bacterial contamination of the toothbrushes," *J Int Med Res*. 2016; 9(1): 6.
8. S. Kumar, J. Tadakamadla, and N. W. Johnson, "Effect of toothbrushing frequency on incidence and increment of dental caries: a systematic review and meta-analysis. *J Dent Res*. 2016; 95(11):1230-1236.
9. Petersen PE. The World Oral Health Report 2003: Continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. Geneva: World Health Organization; 2003.
10. Kumar G, Sethi AK, Tripathi RM, Pratik, Barman D. Assessment of Knowledge, Attitude, and Practice of Dental and Medical Interns toward Toothbrush Maintenance and Replacement in Bhubaneswar City, Odisha, India. *J Pharm Bioallied Sci*. 2018 Apr-Jun;10(2):77-82. doi: 10.4103/JPBS.JPBS_22_18.
11. M. P. C. Van Leeuwen, F. A. Van der Weijden, D. E. Slot, and M. A. M. Rosema, "Toothbrush wear in relation to toothbrushing effectiveness," *International Journal of Dental Hygiene*. 2019; 17(1): 77–84.
12. Baseer MA, Alenazy MS, AlAsqah M, AlGabbani M, Mehkari A. Oral health knowledge, attitude and practices among health professionals in King Fahad Medical City, Riyadh. *Dent Res J*. 2012; 9:386-92.
13. J. Kerr and S. Singh, "Nursing students' attitudes and practices of oral health self-care," *African Journal for Physical Activity and Health Sciences*. 2018; 24(2): 142–154.
14. Azhar Abdulrahman Al-wesabi, Fatma Abdelgawad, Hisako Sasahara and Kamal El Motayam. Oral health knowledge, attitude and behaviour of dental students in a pBDJ Open (2019) 5:16. <https://doi.org/10.1038/s41405-019-0024-x>
15. Manali Deb Barma, Jayashri Prabakar, Meignana Arumugham Indiran, Pradeep
16. Kumar.R, Srisakthi Doraikanan. Knowledge, attitude and practice regarding toothbrush disinfection among dental students in Chennai: A cross sectional study. *International Journal of Pharmaceutical Research*. 2020; 20(4): 2132-2142
17. Naik R, Ahmed R, Telagi N, Anil BS, Spoorthi BR. Contaminated tooth brushes-potential threat to oral and general health. *Journal of Family Medicine and Primary Care* 2015; 4:444. <https://doi.org/10.4103/2249-4863.161350>.
18. Rathod S, Burad P, Bhure S, Kaule S. Assessment of Knowledge, Attitude and Practice of Dental Professionals with Other Health Professionals towards Toothbrush Maintenance. *J Adv Res Dent Oral Health*. 2023; 8(1&2): 6-14.
19. Sowmya KR, Puranik MP, James JM, Sabbarwal B. Perceptions about toothbrush contamination and disinfection among dental students in Bengaluru City: A cross-sectional study. *Indian J Dent Res* .2017; 28:646-9
20. Peker I, Akarslan Z, Basman A, Haciosmanoglu N. Knowledge and behavior of dentists in a dental school regarding toothbrush disinfection. *Braz Oral Res*. 2015; 29:48.
21. Ravikumar K, Ravindran V. Knowledge and behavior of undergraduate students in a dental

- school regarding toothbrush disinfection. Drug Invention Today. 2019 ;12 (10):2157-2159.
22. Swapna Bettanapalya Venkatesh, Vignesh Kamath, Shibani Shetty, Smitha Sammith Shetty. Knowledge, Attitude and Practice of Undergraduate Students Regarding Toothbrush Contamination and Disinfection. Indian Journal of Forensic Medicine & Toxicology, October-December 2020, 14(4):4340-4345
 23. Maryam Janatolmakan, Saber Kakazadeh, Bahare Andayeshgar, Faranak Jafari and Alireza Khatony. Comparison of Knowledge, Attitude, and Practice of Nursing and Medical Students in Kermanshah, Iran, about Toothbrush Maintenance and Use. Journal of Environmental and Public Health Volume 2021, Article ID 6669029, 7 pages <https://doi.org/10.1155/2021/6669029>
 24. Wagle M, Trovik TA, Basnet P, Acharya G. Do dentists have better oral health compared to general population: A study on oral health status and oral health behavior in Kathmandu, Nepal. BMC Oral Health 2014; 14:23.4340-4345
 25. Kumar H, Behura SS, Ramachandra S, Nishat R, Dash KC, Mohiddin G. Oral health knowledge, attitude, and practices among dental and medical students in Eastern India – a comparative study. J Int Soc Prevent Communit Dent 2017; 7:58-63.
 26. Benjamin SN, Gathece LW, Wagaiyu EG. Knowledge, Attitude and Use of Mouthwash among Dental and Medical Students of the University of Nairobi. Int J Dent Oral Health. 2016;2(4):1-6. doi <http://dx.doi.org/10.16966/2378-7090.198>
 27. Vinita Mary, R. Kesavan, R. Hema Maheswari, Jasti Keerthi, S. Jenisha Priyavadhani, S. Fathima Zinnerah. International Journal of Research in Engineering, Science and Management. 2020; 3(10): 136-140
 28. H.Lalrintluanga, N Srivastava, A Gur, N Singh, N Bhargava. Oral health awareness, attitude and oral hygiene practice among nursing students of apollo school of nursing mizoram. RGUHS Journal of Dental Sciences, July 2019;11(2):29-35
 29. M. Efstratiou, W. Papaioannou, M. Nakou, E. Ktenas, I. A. Vrotsos, and V. Panis, “Contamination of a toothbrush with antibacterial properties by oral microorganisms,” Journal of Dentistry. 2007; 35(4): 331–337
 30. Ankola AV, Hebbal M, Eshwar S. How clean is the toothbrush that cleans your tooth? Int J Dent Hyg 2009; 7:237-40.
 31. Frazelle MR, Munro CL. Toothbrush contamination: a review of the literature. Nurs Res Pract. 2012; 2012:420630.
 32. Mehta, P. S. Sequeira, and G. Bhat, “Bacterial contamination and decontamination of toothbrushes after use,” The New York State Dental Journal. 2007; 73(3): 20–22.
 33. L. Bunetel, S. Tricot-Doleux, G. Agnani, and M. Bonnaure-Mallet, “In vitro evaluation of the retention of three species of pathogenic microorganisms by three different types of toothbrush,” Oral Microbiology and Immunology. 2000; 15(5), pp. 313–316.
 35. Bélanger-Giguère K, Giguère S, Bélanger M. Disinfection of toothbrushes contaminated with Streptococcus mutans. Am J Dent. 2011; 24:155-8.
 36. Spolidorio DM, Tardivo TA, dos Reis Derceli J, Neppelenbroek KH, Duque C, Spolidorio LC, Pires JR. Evaluation of two alternative methods for disinfection of toothbrushes and tongue scrapers. Int J Dent Hyg. 2011; 9:279-83.
 37. Peker I, Akca G, Sarikir C, Alkurt MT, Celik I. Effectiveness of alternative methods for toothbrush disinfection: an in vitro study. Scientific World Journal. 2014; 2014:726190.
- How to cite this article: Prachi Mital, Amit, Deepak Raisinghani, Premlata Mital, Neha Mehta. A cross-sectional study to compare knowledge, attitude and practices of dental and medical students about toothbrush maintenance and use. *Int J Health Sci Res.* 2023; 13(11):175-183. DOI: [10.52403/ijhsr.20231122](https://doi.org/10.52403/ijhsr.20231122)
