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Research Article

Assessment of Knowledge, Attitude and Practice of Dental Professionals with Other Health Professionals towards Toothbrush Maintenance

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A B S T R A C T

Background: It is important to access the knowledge, attitude and practice of the students regarding toothbrush maintenance. The study aimed to assess the knowledge, attitude and practice of dental professionals as compared to other health professionals.

Material & Methods: A questionnaire-based study was conducted among 320 dental, medical and nursing health professionals. It included a close-ended questionnaire with 15 questions divided into 3 sections i.e., knowledge, attitude, and practice regarding toothbrush maintenance.

Result: When dental participants were compared with medical participants, a statistically significant difference was found for questions like, "factors affecting toothbrush wear" and "does a toothbrush help in removal of plaque" with p-values of 0.016 and 0.019 respectively. The same results were found when dental participants were compared with nursing participants but statistically significant results were obtained in the question of whether mouthwash was more beneficial than using a toothbrush for cleaning teeth, with a p value of 0.040.

Conclusion: Dental students, as compared to others, are more aware of toothbrush maintenance and hygiene techniques.

Keywords: Toothbrush Maintenance, Dental, Nursing, Medical Professionals

Introduction

Toothbrushes are a vital tool for maintaining proper oral hygiene in both community and hospital settings. Toothbrushes can act as a reservoir for microorganisms in healthy, oral-diseased, and medically unwell adults, hence they may play a substantial role in disease transmission and infection risk. Brush contamination is common in healthy people after repeated use.[1]

Every individual should be aware of proper brushing procedures, as the pressure used when brushing can irritate the gingiva and alter the bone around the teeth, leading to periodontal disease. As a result, correct toothbrush handling is equally important for maintaining oral hygiene.[2]

In 1920, Cobb suggested the concept of toothbrush contamination after use, when he proposed that a contaminated toothbrush was a cause of repeated oral

cavity infection.[3] Oral cavities, surroundings, hands, aerosol pollution, and storage containers can all contaminate toothbrushes. Bacteria on the toothbrush can cause a variety of disorders, including dental caries, gingivitis, periodontitis, and stomatitis. Contaminated toothbrushes have been linked to a variety of oral and systemic disorders, including septicemia, as well as gastrointestinal, cardiovascular, pulmonary, and renal issues.[4-6] Maintaining and replacing your toothbrush is an important part of maintaining proper oral hygiene. The absence of public awareness is proportional to the public's attitude toward proper toothbrush maintenance.

Brushes stored in restrooms are significantly infected with bacteria distributed by aerosols, according to Taji and Rogers.[7] As a result, toothbrushes must be disinfected before use. For healthy teeth, the American Dental Association (ADA) suggested disinfecting toothbrushes. The lack of proper toothbrush care, which might lead to contamination or negative consequences, has not been acknowledged. Dentists are vital in prescribing effective oral hygiene maintenance aids for keeping good oral health, yet there is a scarcity of knowledge on the topic.

Dental professionals also play a role in the promotion of oral health, thus it's equally important to learn about dental students' Knowledge, Attitude, and Practice (KAP). As future dentists, dental students' attitudes and health beliefs influence not only their oral self-care habits, but also their patients' ability to care for their teeth.[8,9] Oral health education and promotion, according to studies, can improve an individual's understanding of oral health as well as their attitudes toward it, resulting in better behaviour.

Well-known literature is there for tooth brushing methods but not on toothbrush disinfection and maintenance. Hence, the study aimed to assess the knowledge, attitude and practice of dental professionals as compared to other health professionals regarding toothbrush maintenance.

Materials and Methods

Study Design

A questionnaire-based study was done as shown in Figure 1.

Study Setting

The study was conducted among dental, medical and nursing health professionals. The protocol study was submitted to the Institutional Ethics Committee and ethical clearance was obtained (IEC/VSPMDCRC/07/2020). Participants in the study were informed about it and ensured that their participation was entirely voluntary. All procedures performed in the study were conducted in accordance with the ethical standards given in the 1964 Declaration of Helsinki, as revised in 2013.

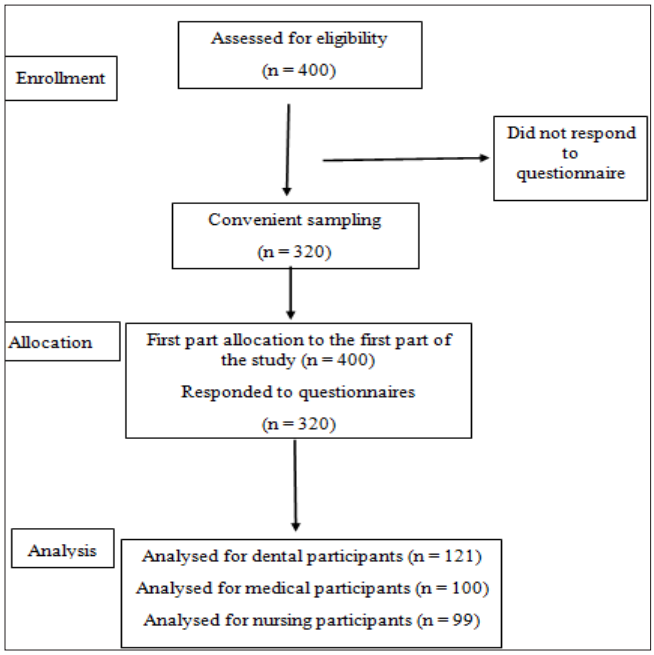

Figure 1.Flowchart of Search Process

Participants

As for the survey, we selected dental, nursing and medical undergraduate students. Data were collected using structured pro-forma of the Google Form that consisted of two parts. The first part included the level of education and e-mail id of students. The second part included an assessment of knowledge, attitude, and practice regarding toothbrush maintenance. The responses were collected after checking the correctness and completion of the form.

Study Size

The sample size was calculated using a power of 80% ($\alpha = 0.05$) and a standard deviation of 0.47 mm. Convenient sampling was done and a total of 400 individuals were enrolled in the study between November 2019 and April 2020.

A Google Form was prepared for the questionnaire. The First-year students of all faculties were selected. Their e-mail ids were collected from the respective colleges, after which, the Google Form was sent to them. Out of 400, 320 students of dental and other health professions submitted their responses.

Knowledge, Attitude, and Practice regarding Toothbrush Maintenance

The questionnaire was close-ended with 15 questions divided into the following three sections:

Section A - Level of information about the knowledge of toothbrush maintenance
Section B - Level of information about the attitude of toothbrush maintenance

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Section C - Level of information about the practice of toothbrush maintenance

The questionnaire was developed from previous literature and was validated by an expert faculty (Table 1).

Statistical Analysis

Data were collected from MS Excel sheets provided by Google Forms. Descriptive and inferential statistics were computed with the Statistical Package of Social Sciences (SPSS) version 17 software. The chi-square test was used to find the difference between the groups. A p value of less than 0.05 was considered statistically significant.

Result

Of a total of 400 subjects, 320 participants (121 from dental, 100 from medical, and 99 from nursing health profession) responded to the questionnaire. The distribution of data was made according to the type of questions (knowledge, attitude and practice-based) and statistical analysis was done accordingly.

When the analysis was done on the basis of knowledge, it was seen that the dental participants were more aware of the toothbrush and oral hygiene as compared to the medical and nursing participants. The total number of positive responses was higher in dental participants than in medical groups of participants, but the difference was not statistically significant. Dental participants were more aware of brushing frequency (p value = 0.373), duration (p value = 0.387), dental checkup (p value = 0.519), type of toothbrush (p value = 0.263), importance of cleaning the toothbrush (p value = 0.107), and use of mouthwash for cleaning (p value = 0.562). The same results were found when dental participants were compared with nursing participants but statistically significant results were obtained in the question of whether mouthwash was more beneficial than using a toothbrush for cleaning teeth, with a p value of 0.040 (Table 2).

When the analysis was done on the basis of attitude, it was observed that dental participants were more aware of the attitude towards toothbrush maintenance as compared to medical and nursing participants. When dental participants were compared with medical participants, a statistically significant difference was found for questions related to the factors affecting toothbrush wear and the role of toothbrush in the removal of plaque with p values of 0.016 and 0.019 respectively. It was seen that the awareness of dental participants regarding the protection of toothbrushes and factors affecting toothbrush wear was more as compared to nursing participants but the results were not statistically significant (Table 3).

When the analysis was done on the basis of maintenance, it was seen that dental participants were more aware of the practice of toothbrush maintenance as compared to medical and nursing participants. When the responses to questions like, “Where do you place your toothbrush?” and “How do you clean your toothbrush?” were compared between the dental and medical participants, a statistically significant result was found with p values of 0.002 and 0.02 respectively. Regarding the question “How often do you replace your toothbrush?”, a significant difference was not found between the dental and medical participants with a p value of 0.334, but when the same questions were compared between the dental and nursing participants, dental participants were found to be more aware of toothbrush maintenance, but the results obtained were not statistically significant (Table 4).

Table 1.Questions to Assess the Knowledge, Attitude, and Practice regarding Toothbrush Maintenance

S. No.	Questions	Options
1.	Frequency of brushing in a day	Never Once a day Twice a day Thrice a day
2.	A duration of 1-2 minutes is sufficient for brushing, do you agree?	Agree Disagree Neutral Strongly agree Strongly disagree
3.	Frequency of dental checkups	Never Once a month Once every three months Once a year
4.	Type of toothbrush	Hard Medium Soft

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5.	Cleaning your toothbrush is important for oral hygiene, do you agree?	Agree Disagree Neutral Strongly agree Strongly disagree
6.	Mouthwash is more beneficial than using a toothbrush for cleaning teeth, do you agree?	Agree Disagree Neutral Strongly agree Strongly disagree
7.	Source of knowledge	Lectures Pamphlet Seminars TV, and internet None of the above
8	Does a toothbrush protect from the presence of bacteria?	Yes No Maybe Don't know
9.	Factors affecting toothbrush wear	Duration of brushing Frequency of brushing Pressure you apply while brushing All of the above
10.	Does a toothbrush help in the removal of plaque?	Yes No Maybe Don't know
11.	What makes the toothbrush get contaminated?	Keeping it in bathroom Sharing a toothbrush Storing toothbrushes together All of the above None of the above
12.	Is toothbrush disinfection necessary?	Yes No Maybe Don't know
13.	Where do you place your toothbrush?	Anywhere Bathroom Cupboard Open space
14.	How do you clean your toothbrush?	Placing it in mouthwash Rinsing it with tap water Rinsing it with warm water None of the above
15.	How often do you replace your toothbrush?	After 1 month After 1 year After 3-4 months After fraying of bristles

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Table 2.Responses of Study Subjects regarding their Knowledge of Toothbrushes

Questions and Options	Dental Partici-pants	Medical Partici-pants	Total	Chi-square Value	p Value	Nursing Participants	Total	Chi-square Value	p Value
Frequency of brushing in a day									
Never	0	1	1	3.124*	0.373**	53	102	3.823	0.148**
Once a day	49	35	84			1	2		
Twice a day	1	3	4			45	116		
Thrice a day	71	61	132			0	0		
Total	121	100	221			99	220		
A duration of 1-2 minutes is sufficient for brushing, do you agree?									
Agree	55	55	110	4.14	0.387**	49	104	3.16	0.531**
Disagree	19	17	36			18	37		
Neutral	28	13	41			15	43		
Strongly agree	18	14	32			17	35		
Strongly disagree	1	1	2			0	1		
Total	121	100	221			99	220		
Frequency of dental checkups									
Never	38	34	72	2.266	0.519**	31	69	1.296	0.730**
Once a month	11	4	15			9	20		
Once every three months	19	16	35			21	40		
Once a year	53	46	99			38	91		
Total	121	100	221			99	220		
Type of toothbrush									
Hard	3	0	3	2.67	0.263**				0.716**
Medium	61	49	110						
Soft	57	51	108						
Total	121	100	221						
Cleaning your toothbrush is important for oral hygiene, do you agree?									
Agree	54	40	94	7.606	0.107**				0.713**
Disagree	2	1	3						
Neutral	16	5	21						
Strongly agree	48	54	102						
Strongly disagree	1	0	1						
Total	121	100	221						

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Mouthwash is more beneficial than using a toothbrush for cleaning teeth, do you agree?								
Agree	44	28	72	2.977	0.562 **			0.040*
Disagree	26	22	48					
Neutral	39	38	77					
Strongly agree	12	11	23					
Strongly Disagree	0	1	1					
Total	121	100	221					

*Significant at 95% CI

**Non-significant at 95% CI

Table 3.Responses of Study Subjects regarding their Attitude towards Toothbrush Maintenance

Questions and Options	Dental Partici-pants	Medical Participants	Total	Chi-square Value	p Value	Nursing Participants	Total	Chi-square Value	p Value
Source of knowledge									
Lecturers	14	5	19	4.78	0.310**	10	24	0.898	0.925**
Pamphlet	1	1	2			2	3		
Seminars	18	10	28			17	35		
TV and internet	61	60	121			48	109		
None of the above	27	24	51			22	49		
Total	121	100	221			99	220		
Does a toothbrush protect from the presence of bacteria?									
Yes	45	49	94	7.59	0.06**	50	95	6.585	0.086**
No	12	3	15			3	15		
May be	57	46	103			40	97		
Dont' know	7	2	9			6	13		
Total	121	100	221			99	220		
Factors affecting toothbrush wear									
Duration of brushing	20	12	32			15	35		
Frequency of brushing	8	15	23			9	17		
Pressure you apply while brushing	24	8	32			23	47		
All of the above	69	65	134			52	121		
Total	121	100	221			99	220		
Does a toothbrush help in the removal of plaque?									
Yes	53	42	95	9.89	0.019*	44	97	2.177	0.537**
No	26	6	26			18	38		
May be	43	40	83			29	72		
Dont' know	5	12	17			8	13		
Total	121	100	221			99	220		

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What makes a toothbrush get contaminated?									
Keeping it in the bathroom	25	7	32			15	40		
Sharing a toothbrush	13	14	27			15	28		
Storing toothbrushes together	14	12	26			11	25		
All of the above	67	65	132			52	119		
None of the above	2	2	4			6	8		
Total	121	100	221			99	220		
Is toothbrush disinfection necessary?									
Yes	80	68	1489			50	130		
No	21	15	36			18	30		
May be	43	40	83	0.410	0.938**	22	43	6.066	0.108**
Dont' know	8	8	16			9	17		
Total	121	100	221			99	220		

* Significant at 95% CI

** Non-significant at 95% CI

Table 4.Responses of Study Subjects regarding Toothbrush Practice

Questions and Options	Dental Participants	Medical Participants	Total	Chi-square Value	p Value	Nursing Participants	Total	Chi-square Value	p Value
Where do you place your toothbrush?									
Anywhere	11	6	17			9	20		
Bathroom	31	42	73			31	62		
Cupboard	42	41	83	15.367*	0.002*	34	76	1.176	0.759**
Open space	37	11	48			25	62		
Total	121	100	221			99	220		
How do you clean your toothbrush?									
Placing it in mouthwash	13	4	17			11	24		
Rinsing it with tap water	61	68	129			57	118		
Rinsing it with warm water	44	28	72	9.79	0.02*	28	72	1.675	0.643**
None of the above	3	0	3			3	6		
Total	121	100	221			99	220		

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How often do you replace your toothbrush?									
After 1 month	25	26	51	3.398	0.334**	14	39	4.311	0.230**
After 1 year	2	3	5			5	7		
After 3-4 months	62	54	116			47	109		
After fraying of bristles	32	17	49			33	65		
TOTAL	121	100	121			99	220		

* Significant at 95% CI
**Non-significant at 95% CI

Discussion

In the current study, we have assessed the knowledge, attitude and practice of toothbrush disinfection and maintenance among first-year dental students and have compared it with first-year medical and nursing students. The results were in favour of dental students. Dental participants were more aware of the toothbrush and oral hygiene as compared to medical and nursing students. It was seen that the awareness of dental participants towards brushing frequency and duration of brushing was more as compared to other participants. Their attitude toward toothbrush maintenance was also better as compared to other health professionals. This was because they had attended regular CDE programmes and seminars about toothbrush maintenance and oral hygiene and it is also included in their curriculum.

Our results are in accordance with a study done by Soumya et al. They assessed the knowledge of only dental undergraduates and postgraduates regarding toothbrush contamination and disinfection and concluded that their awareness might be attributed to their higher academic knowledge and clinical experience, but they didn't compare it with other health professionals. Adding to this, in the present study, many medical and nursing participants reported that they washed their toothbrush with normal tap water and stored it inside the bathroom in an open environment, while dental participants washed their toothbrush with warm water and kept it inside the cupboard. Similar findings from the study done by Soumya et al. showed a practice of rinsing a toothbrush in plain water and storing it in bathrooms or toilets often after brushing. This practice 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.[8] Also, while travelling if a wet toothbrush is packed in a bag, it causes anchoring of many microorganisms which subsequently results in toothbrush contamination.

Dental practitioners considered a toothbrush as the most common oral hygiene tool.[1] It may get contaminated by various microorganisms present inside and outside the oral cavity. So proper disinfection of the toothbrush is necessary for bacterial growth prevention.[9,10] 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.[11] There is a lack of understanding of the need of maintaining good oral health and focusing on preventative health. In 2016, Anand et al. tested the performance of herbal disinfectants with chlorhexidine mouthwash on toothbrush decontamination and found that neem, garlic, and green tea have a similar effect as chlorhexidine and can be utilised as potent alternatives to chlorhexidine as a toothbrush disinfectant.[12]

In the present study, more dental students used soft toothbrushes with the proper toothbrushing technique to make access to all areas possible. When toothbrush cleaning was discussed, dental students were found to be cleaning their toothbrushes properly as compared to others. When the questions related to frequency and duration of brushing were asked, it was seen that majority of dental students preferred brushing thrice a day. In the case of duration, dental students considered 1-2 minutes as a sufficient time for brushing which was significant. This was in accordance with Peker et al. where 87% of the dentists brushed their teeth twice a day or more.[13]

When asked about the sufficiency of mouthwash for cleaning toothbrushes, 44% of dental students agreed with its usage, while 39% of them were neutral. When seen in other groups, 28% of medical and 40% of nursing students agreed with the usage of mouthwash, while 38% of medical and 33% of nursing students were neutral about the thought.

Almost all of the participants in the survey were aware of the causative microorganisms for toothbrush contamination,

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and the majority of them said bacteria was the culprit. When the factors for toothbrush wear were discussed, majority of participants thought that all the options mentioned in the question were responsible for toothbrush wear.

According to Peker et al.,[13] study participants stored their toothbrushes in closed containers to avoid external contamination. In the present study, majority of them felt that it was necessary to change toothbrushes after a usage of 3-4 months. The same was found in a study by Peker et al. which showed that dentists replaced their toothbrushes once in 3 months.[13] As dental students, more attention should be paid by them to practising appropriate toothbrush maintenance methods and proper oral hygiene practices. They should also advise their patients regarding oral hygiene.

In a study by Folayan et al., a significant association was found between the dentist's credentials and knowledge about toothbrush disinfection. It may be because dentists with a higher educational background have a great awareness of toothbrush disinfection.[14]

The strength of the study was that all the participants belonged to the same academic year of dental, medical and nursing faculties. The limitation of the study was that it was an online questionnaire. Additionally, there were more dropouts.

Conclusion

Within the limitations of the study, statistically significant difference regarding the knowledge, attitude and practice regarding toothbrush maintenance was observed among dental students and medical and nursing students which might be attributed to the difference in their academic knowledge, exposure to a wide range of information, and clinical experience among the groups.

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Conflict of Interest: None

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