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Original Research Article

AWARENESS OF ELECTRIC TOOTHBRUSHES AMONG PATIENTS ATTENDING A TERTIARY CARE HOSPITAL – A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Maintaining good oral health is vital for overall health and well-being. Toothbrushing, the most popular oral hygiene practice, plays a crucial role in reducing plaque and promoting dental health. Research suggests that electric toothbrushes are more effective than manual toothbrushes for plaque removal. However, there is limited research on awareness of electric toothbrushes among patients, particularly in Tamil Nadu. **Objective:** To assess the knowledge and awareness of electric toothbrushes among patients attending a tertiary care hospital in Chennai. **Materials and Methods:** A hospital-based cross-sectional study was conducted among 150 patients aged 18 years and above from an urban area attending a dental tertiary care hospital in Chennai. Participants were selected using convenience sampling over a period of three months from August to October 2022. **Result:** Most participants were aged 21–30 years (57, 38%), followed by 31–40 years (30, 20%), and under 20 years (26, 17.3%). Males constituted 60% (90) of participants. The majority were employed in private sectors (50, 33.3%), followed by students (38, 25.3%), and unemployed individuals (27, 18%). About 45.3% scored 0 on the knowledge scale, while only 2 participants (1.3%) scored 9. Participants under 30 years and students had significantly higher mean scores. Gender showed no significant association with knowledge scores. **Conclusion:** Overall knowledge and awareness scores were low (mean 1.85 ± 2.44), with nearly half scoring 0. The findings highlight the need to enhance awareness of oral hygiene and the advantages of electric toothbrushes over manual ones.

INTRODUCTION

Maintaining good oral health is vital for overall well-being. Brushing your teeth is crucial for maintaining good dental health and reducing plaque.[1] A toothbrush is the most common tool for oral hygiene, crucial for reducing plaque and preventing dental issues. The oral cavity harbors approximately 700 bacterial species, which can contribute to various illnesses if not properly managed. A healthy mouth is integral to general health1. Regular tooth cleaning, through manual or powered toothbrushes and dental floss, is key to removing dental biofilm, preventing cavities, and treating periodontal disease.[2,3] Manual toothbrushes are commonly used due to their affordability, with various designs aimed at improving plaque control. A number of strategies, including toothbrush flocking, head size, bristle length, hardness, shape, and angle, have been developed to enhance mechanical plaque control when using a toothbrush.[4] To further enhance plaque control, a variety of electric toothbrushes have been created recently, as many patients find that manual toothbrushes are insufficient for controlling plaque. In the early 1960s, electric toothbrushes were initially made available for purchase.[5,6] Initially featuring back-and-forth motion, they evolved into rotating and vibrating models, which research suggests are more effective at plaque removal than manual brushes. Numerous findings indicate that electric toothbrushes are superior to manual toothbrushes in terms of plaque removal, indicating their potential utility evolved.[7] Only few studies have been conducted on awareness on electric toothbrush among patients and no study done in Tamil Nadu on this topic.

Hence the present study was done to assess the knowledge and awareness about electric

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toothbrushes among patients attending tertiary care hospital in Chennai.

MATERIALS AND METHODS

This study is a hospital-based cross-sectional study conducted over a three-month period, from August to October 2022, at a tertiary care hospital in Chennai. The study population includes patients attending the dental unit of the hospital, specifically those above 18 years of age in the urban area, and in good general physical and mental health. Exclusion criteria comprise mentally challenged patients, those with extremely debilitating diseases, patients undergoing orthodontic therapy, patients wearing dentures, individuals who have undergone oral prophylaxis treatment within the last four months, and those who have been on antibiotic therapy in the past six months. A total of 150 patients will be selected through a convenience sampling method.

After obtaining permission from the institutional ethical committee, each participant was explained the study protocol. Informed consent was obtained once they expressed interest in participating. The questionnaire, which included demographic data and ten closed-ended questions from a single domain, was distributed in offline formats. Data collection followed thereafter. Awareness of electric toothbrushes was assessed using a semi-structured questionnaire, which consisted of two parts: demographic data and awareness of electric toothbrushes. Data was analyzed using SPSS version 23.

RESULTS

The demographic and knowledge characteristics of the study participants are summarized in Tables 1 to 9. [Table 1] reveals that the majority of participants were in the age group of 21–30 years (57, 38%), followed by 31–40 years (30, 20%) and those under 20 years (26, 17.3%). [Table 2] indicates that most participants were male (90, 60%). [Table 3] shows that the majority were Hindus (127, 84.6%), with Christians (12, 8%) and Muslims (11, 7.4%) making up smaller proportions. [Table 4] highlights that most participants were employed in private sectors (50, 33.3%), followed by students (38, 25.3%) and unemployed individuals (27, 18%).

Awareness and usage of electric toothbrushes are detailed in [Table 5]. Nearly half of the participants (74, 49.3%) were aware of the availability of electric toothbrushes, but only 26 (17.3%) had seen one, and just 10 (6.7%) were using one. Among the participants, 21 (14%) understood how electric toothbrushes function, and 31 (20.7%) believed they are comfortable and easy to use. Additionally, 37 (24.7%) were aware that electric toothbrushes are more effective than manual brushes, 15 (10%) knew the brush tip could be replaced, and 27 (18%) recognized the need for more maintenance. Only 18 (12%) considered investing in an electric toothbrush a wise decision, and 19 (12.7%) recommended them to others.

Table 6 shows that 45.3% of participants had a knowledge score of 0, while 27 (18%) scored 1, 12 (8%) scored 2, and only 2 (1.3%) achieved a score of 9. [Table 7] highlights a statistically significant association between age and knowledge scores, with participants under 30 years scoring higher than those over 30 years. [Table 8] indicates a statistically significant relationship between occupation and knowledge scores, as students had the highest mean scores compared to other groups. However, [Table 9] shows no significant association between gender and knowledge scores.

Table 1: Age wise distribution of study participants

Age group	Frequency (N=150)	Percentage (%)
<20 Years	26	17.3
21 – 30 Years	57	38
31 – 40 Years	30	20
41 – 50 Years	23	15
51 – 60 Years	9	6
>60 Years	5	3.3
Total	150	100

Table 2: Gender wise distribution of study participants

Gender	Frequency (N=150)	Percentage (%)
Female	60	40
Male	90	60
Total	150	100

Table 3: Religion wise distribution of study participants

Religion	Frequency (N=150)	Percentage (%)
Hindu	127	84.6
Christian	12	8
Muslim	11	7.4
Total	150	100

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Table 4: Occupation wise distribution of study participants

Occupation	Frequency (N=150)	Percentage (%)
Un-employed	27	18
Housewife	6	4
Student	38	25.3
Self-employed	19	12.7
Private	50	33.3
Government	10	6.7
Total	150	100

Table 5: Frequency distribution of knowledge on electric toothbrush among study participants

Knowledge/Awareness	No (%)	Yes (%)
1.Are you aware that electric toothbrush is available in the market	76(50.7)	74(49.3)
2. Have you seen an electric toothbrush	124(82.7)	26(17.3)
3. Have you used an electric toothbrush	140(93.3)	10(6.7)
4. Do you know how it works	129(86)	21(14)
5. If used, is it more comfortable and easier to use than manual brush	119(79.3)	31(20.7)
6.Is electric toothbrush more effective than manual toothbrush	113(75.3)	37(24.7)
7. Are you aware that the brush tip can be changed	135(90)	15(10)
8. Do you feel that more care required in maintenance of electric toothbrush	123(82)	27(18)
10.Is investing in electric toothbrush a wise idea	132(88)	18(12)
11.Would you recommend it to others	131(87.3)	19(12.7)

Table 6: Knowledge/awareness score wise distribution of study participants

Total knowledge score	Frequency	Percentage
0	68	45.3
1	27	18
2	12	8
3	9	6
4	7	4.7
5	8	5.3
6	8	5.3
7	6	4
8	3	2
9	2	1.3
Total	150	100

Table 7: Comparison of age group with awareness on electric toothbrush

Age group	Mean ± SD	95% CI	Sum of squares	df	Mean square	F value	P Value
<20 Years	2.54 ±2.7	1.43 – 3.65	119.21	5	23.84	4.46	0.001
21 – 30 Years	2.65 ± 2.6	1.96 – 3.34					
31 – 40 Years	1.00 ± 2.0	0.25 – 1.75					
41 – 50 Years	1.26 ± 2.0	0.39 – 2.13					
51 – 60 Years	0.11 ± 0.3	-0.15 – 0.37					
>60 Years	0.20 ± 0.4	-0.36 – 0.76					

Table 8: Comparison of occupation with awareness on electric toothbrush

Occupation	Mean ± SD	95% CI	Sum of squares	df	Mean square	F value	P Value
Un-employed	1.37 ±2.2	0.48 – 2.26	74.82	5	14.96	2.64	0.02
Housewife	1.83 ± 2.7	-1.02 – 4.68					
Student	3.00 ± 2.9	2.04 – 3.96					
Self-employed	0.95 ± 1.3	0.28 – 1.62					
Private	1.62 ± 2.1	1.01 – 2.23					
Government	1.70 ± 2.8	10.32 – 3.72					

Table 9: Comparison of gender with awareness on electric toothbrush

Gender	Mean ± SD	95% CI	Sum of squares	df	Mean square	F value	P Value
Male	1.91 ± 2.4	1.41 – 2.42	0.75	1	0.75	0.12	0.72
Female	1.77 ± 2.5	1.12 – 2.41					

DISCUSSION

In the present study, the highest mean knowledge score of 2.65 ± 2.6 was found in participants aged 21–30 years, followed by 2.54 ± 2.7 in those under 20 years. Similar findings were reported by Haque et al,[2] and Kattan et al.[8] A statistically significant association was observed between age and knowledge score, with participants under 30 years showing higher mean scores compared to those over 30. Additionally, a significant association was found between occupation and knowledge score. Participants who were students had the highest mean score of 3.00 ± 2.9, compared to other occupational groups.

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Few studies have focused on awareness of electric toothbrushes among patients, and no study has been conducted on this topic in Tamil Nadu. A study by Haque et al,[2] on knowledge, awareness, and practices related to powered toothbrush use as dental plaque aids in the Eastern Indian population found that the age group of 26-39 years had the highest mean score (13.79 ± 2.53) in the attitude domain. Most participants were aged 15–25, with the lowest mean knowledge score (3.11 ± 1.19) found in this group. The highest mean attitude score was 3.43 ± 0.62 in the 26-35 age group, with a practice score of 1 ± 1.41. Significant differences across age groups were observed (p = 0.032). Most participants were female, and they had the highest mean knowledge score of 3.21 ± 1.19, with females also showing the highest mean attitude score of 2.65 ± 1.31.

A study by Kattan et al,[8] on knowledge and attitude towards electric toothbrush use among dental professionals in Saudi Arabia found that among the total participants 60 (14.4%) were graduate dentists, 23 (5.6%) were postgraduate students, 163 (39.0%) were specialists, and 171 (41.0%) were general practitioners. According to the study, 271 (65%) respondents considered better patient compliance as the primary advantage of electric toothbrushes, and 325 (77.9%) thought inadequate plaque control was due to patient non-cooperation. 76.5% of dentists recommended electric toothbrushes to patients with manual dexterity issues, particularly for those with health problems. Additionally, 55.1% of female dentists and 22.4% of male dentists identified insufficient awareness as a contributing factor to poor plaque control.

A randomized controlled study done by Yoshinaga et al,[7] examined the effectiveness of plaque removal and user experience with an electric toothbrush equipped with a built-in image sensor in its head, enabling real-time monitoring of the tooth surface. The results showed that the electric toothbrush with the integrated image sensor achieved better plaque removal compared to its use without the monitoring feature. The pre-brushing PCR scores were high in both groups, with the non-monitor group scoring 74.6±11.6% and the monitor group scoring 67.0±16.4%. The difference between the groups was not statistically significant (p=0.173). After brushing, the PCR scores dropped significantly in both groups, with the non-monitor group recording 29.3±9.8% and the monitor group showing 14.8±8.6% (p=0.002 and p<0.001, respectively). Brushing for plaque removal was notably more frequent in the monitor group (77.8 ± 11.1%) compared to the non-monitor group (61.2 ± 10.5%) (p = 0.004). The monitor group also had a significantly longer brushing time (344.8 ± 110.6 s) compared to the non-monitor group (235.2 ± 38.1 s) (p = 0.014).

A study by Humm et al,[9] on treatment success and user-friendliness of an electric toothbrush app found that, in the test group, the average improvement in the plaque index was 8.5%, while the control group showed a 4.7% improvement. In the test group, 50% of participants felt they had improved their cleaning results and would recommend the app to others.

The purpose of our study was to raise patient knowledge and awareness of electric toothbrushes and assess any differences in oral hygiene between those who used electric toothbrushes and those who used manual toothbrushes daily. Our results indicate that young patients aged 20–30 years demonstrated adequate knowledge of electric toothbrushes, while elderly patients were less aware of them, suggesting a decline in knowledge with age. This may be due to limited exposure to electric toothbrushes. Furthermore, patients from rural areas exhibited lower awareness of electric toothbrushes compared to those from urban areas.

Many survey respondents reported that the primary benefit of using an electric toothbrush over a manual one was its greater efficiency. Educating patients about electric toothbrushes could improve oral hygiene care.

As a limitation of this research, a qualitative study involving electric toothbrush users could help better understand the factors that influence the transition from manual to electric toothbrushes at the patient level.

CONCLUSION

Overall knowledge and awareness scores were low (mean 1.85 ± 2.44), with nearly half scoring 0. The findings highlight the need to enhance awareness of oral hygiene and the advantages of electric toothbrushes over manual ones.

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