



Original Research Article

AWARENESS OFF TOOTHBRUSHING TECHNIQUES IN DENTAL UNDERGRADUATE STUDENTS: A CROSS SECTIONAL STUDY

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Abstract: Background: Dental students, the future leaders in oral health care, have a significant role to play in public oral health education and its promotion; but their own oral-health behavior must be adequate if they are to serve as positive models. To accomplish this goal, it is important to assess the dental students' brushing habits and their knowledge towards oral care resources. Furthermore, understanding disease progression and prevention is essential.

METHODS: A cross-sectional study was carried out on 300 dental students of DELHI NCR region. Ethical approval to conduct the study was obtained from the Ethical Committee of the Institution.

RESULT: The results of this present study advocates that awareness of oral health practices should be stressed upon by the use of various awareness programs, seminars and campaigns for students at different levels of education. Dental students should be motivated to practice standard oral hygiene measures so they can further educate and motivate their patients. **CONCLUSION:** The results of this present study advocates that awareness of oral health practices should be stressed upon by the use of various awareness programs, seminars and campaigns for students at different levels of education. Dental students should be motivated to practice standard oral hygiene measures so they can further educate and motivate their patients.

Keywords: Dental students, undergraduate, toothbrushing techniques, survey, oral hygiene.

INTRODUCTION

Oral hygiene is a critical component of maintaining oral and systemic health, involving the mechanical removal of dental biofilm through methods such as

toothbrushing and interdental cleaning (e.g., flossing or use of interdental brushes). Oral hygiene, particularly the proper execution of toothbrushing, is a cornerstone of preventive dentistry. Despite

advancements in dental treatment and technologies, inadequate oral hygiene practices continue to be a primary contributing factor to dental caries, periodontal disease, and various other oral health disorders^{1,2}. Undergraduate dental students, as future healthcare providers, play a pivotal role in imparting oral health education to patients. Therefore, it is crucial that these students acquire not only theoretical knowledge but also the practical expertise necessary to ensure effective oral hygiene practices, particularly regarding toothbrushing techniques. The efficacy of toothbrushing depends not only on frequency but also on the precision of the technique employed, underscoring the necessity for heightened awareness among dental students³.

The global burden of oral diseases is significant, with having over 3.5 billion individuals affected. Dental caries and periodontal disease are the most prevalent conditions⁴. Both are largely preventable through appropriate oral hygiene measures, with toothbrushing serving as the primary preventive intervention. Toothbrushing effectively removes dental plaque, the principal etiological factor in the development of caries and periodontal diseases⁵. However, improper brushing techniques can result in suboptimal plaque removal and contribute to a range of oral health issues, including gingivitis, periodontitis and dental abrasion^{6,7}. Furthermore, aggressive or incorrect brushing methods can cause irreversible damage, such as gingival recession and tooth surface loss due to abrasion^{8,9,10}.

Despite receiving formal education in both theoretical and clinical aspects of dentistry, undergraduate dental students frequently exhibit inconsistent toothbrushing practices¹¹. Research has demonstrated that many dental students continue to adhere to personal habits rather than evidence-based guidelines, even after receiving formal training^{12,13}. This discrepancy between knowledge and practice is concerning, as these students will eventually assume responsibility for educating patients on proper oral hygiene techniques. It has been observed that the efficacy of oral hygiene education provided to patients may be compromised if dental students themselves are not adhering to optimal toothbrushing methods¹⁴.

Several toothbrushing techniques have been developed over time, but the modified Bass technique remains the most widely recommended for its efficacy in plaque removal and promotion of gingival health¹⁵. This technique involves positioning the toothbrush bristles at a 45-degree angle to the gingival margin and employing gentle, back and forth with sweeping motions to clean the teeth and the gingival sulcus¹⁶. Other commonly used methods, such as horizontal and vertical brushing, are generally less effective in plaque control

and may lead to soft tissue damage^{17,18}. Therefore, it is imperative that dental students not only understand the distinction between these methods but also become proficient in demonstrating the modified Bass technique to patients.

Numerous studies have explored the toothbrushing habits and knowledge levels of dental students in various regions. For instance, in a study conducted in Saudi Arabia, more than half of the students reported using a horizontal brushing technique, which is less effective than the recommended modified Bass technique¹⁹. Similarly, research among Turkish dental students revealed that many brushed for less than the suggested two minutes, and there was inconsistency in the adoption of correct techniques²⁰. A study of dental students in India highlighted that while most were aware of appropriate brushing methods, less than half practiced them regularly²¹. These findings underscore the need for a more rigorous approach to the education and reinforcement of evidence-based toothbrushing techniques within dental curricula. Awareness and proficiency in correct toothbrushing techniques among undergraduate dental students are critical to their role in preventing oral diseases. As future dental professionals, they are tasked with educating patients and promoting lifelong oral health practices. Ensuring that dental students possess comprehensive knowledge and practical skills in toothbrushing is essential for enhancing patient care outcomes. Thus, the integration of continuous education and regular assessment of toothbrushing techniques within the dental curriculum is vital to bridging the gap between theoretical knowledge and clinical practice.

MATERIALS AND METHODS

➤ SOURCE OF DATA

Undergraduate students pursuing BDS (III year , IV year and interns) from dental colleges of Delhi NCR. The data was collected till 3 months from the start of study.

➤ STUDY DESIGN

A cross-sectional study.

➤ SAMPLE SIZE

300 undergraduate dental students.

SELECTION CRITERIA FOR THE PATIENTS IN THE STUDY

Inclusion Criteria

- Undergraduate students (III year , IV year and interns)
- Willing to fill informed consent

QUESTIONNAIRE DESIGN

The demographic information of the participants was recorded at first. The questionnaire consisted of 22 questions, which was designed to evaluate oral health behavior, knowledge, and status of dental students and was divided into two parts. The first part focused on questions related to oral health behaviour survey, oral health knowledge and second part included questions related to brushing techniques.

PART A: ORAL HEALTH BEHAVIOUR

- (1) How many times do you brush your teeth per day? (a. Once, b. Twice, c. Thrice, d. Once in two days)
- (2) How many times do you change your brush? (a. After 01month, b. After 03 months ,c. After 06 months, d. After 01 year)
- (3) What do you use for cleaning your teeth? (a. Manual toothbrush b.Electrical toothbrush, c.Neem stick, d. Ginger)
- (4) What is the duration of your brushing? (a.30 seconds, b. 1 minutes, c. 2 minutes, d. more than 2 minutes)
- (5) Why do you brush your teeth? (a. To reduce pain, b.To maintain oral hygiene, c.For aesthetic purpose,d. To remove caries)
- (6) What tufted brush do you use to brush your teeth? (a. Extra soft, b.Soft, c.Medium, d.Hard)
- (7) What do you understand by term "calculus"? (a.Soft deposition on teeth, b.Hard deposition on teeth, c. Discoloration on teeth, d. Don't know)
- (8) What do you understand by term "plaque"? (a.Soft deposition on teeth, b.Hard deposition on teeth, c.Discoloration on teeth,d.Don't know)
- (9) Does your toothpaste contains fluoride? (a.Yes, b.No ,c.Maybe, d.Don't know)
- (10) What is the importance of flouride in toothpaste? (a.Prevents discoloration, b. Prevents bad breath, c. Have antiplaque and anticaries properties, d.Don't Know)

METHODS-

- Students were initially screened for the study, based on the above mentioned inclusion criteria.
- Informed written consent was obtained after explaining the nature of the study.
- A hard copy of questionnaire was distributed to all the participants.
- The questionnaire was collected back from the students in the same day.

- (11) Do you think sugar diet affect your teeth? (a.Yes, b.No, c. Maybe, d.Don't know)
- (12) Which aids do you prefer other than brush? (a.Mouthwash, b. Tongue scraper, c. Floss, d.All of above)

PART B: BRUSHING TECHNIQUE

- (1) Are you aware about various brushing techniques? (a. Yes, b.No, c.May be, d.Only few)
- (2) Which brushing technique do you use? (a. Horizontal, b. Vertical, c. Random , d. Any other technique)
- (3) Which brushing technique should be used to maintain optimal oral hygiene in daily practice ? (a.Stillman technique, b.Charter technique, c.Modified bass technique, d.Fone's technique)
- (4) In modified bass technique 45degree angle of bristles is with? (a. Gingiva, b.Cervical portion of teeth, c. Midline of teeth, d. Both gingiva and teeth)
- (5) In modified bass motions employed are? (a.Circulatory, vibratory, vertical, b.Vibratory, vertical, sweeping, c.Vibratory, horizontal, circulatory, d.Vibratory, circulatory, sweeping)
- (6) Intrasulcular method of brushing is? (a.Bass technique, b.Chater technique, c.Fone's technique, d.Stillman's technique)
- (7) Motion employed in stillman's technique (a.Vibratory, b.Vertical sweeping, c. Horizontal reciprocatory, d.Rotary motion)
- (8) Motion employed in fone's technique? (a.Vertical, b. Horizontal, c.Random, d.Circular)
- (9) Which technique will you advice in patients with recession? (a.Stillman's brushing technique, b.Modified bass technique, c.Fone's technique, d.Charter technique);
- (10) Which technique will you advice to patients after surgical therapy ? (a.Stillman's brushing technique, b.Modified bass technique, c.Bass technique, d.Charter technique)

RESULTS

PART A: ORAL HEALTH BEHAVIOUR			
Question	Most Common Response	Percentage (%)	Other Notable Responses
1.Brushing frequency	Twice a day	61.7	Once (33), Once in 2 days (2.9), Thrice (2.4)
2.Brush replacement frequency	Within 3 months	56	6 months (24.4), 1 month (12), 1 year (7.7)
3.Cleaning tool	Manual toothbrush	87.1	Electric (9.1), Neem stick (1.9), Ginger (1.9)
4.Brushing duration	2 minutes	45.5	1 min (31.6), >2 mins (17.2), 30 sec (5.7)
5.Brushing purpose	Maintain oral hygiene	91.4	Remove caries (4.3), Reduce pain (2.4), Aesthetic (1.9)
6.Bristle type	Soft	49.8	Medium (24.4), Extra soft (22), Hard (3.8)
7.Understanding of "calculus"	Hard deposition	71.3	Soft (13.4), Don't know (9.1), Discoloration (6.2)
8.Understanding of "plaque"	Soft deposition	68.4	Hard (12.4), Discoloration (11.5), Don't know (7.7)
9.Fluoride in toothpaste?	Yes	66.5	Maybe (15.8), No (9.1), Don't know (8.6)
10.Fluoride importance	Antiplaque/anticaries	67.9	Don't know (14.8), Discoloration (12), Bad breath (5.3)
11.Sugar diet effect?	Yes	84.7	Maybe (7.7), Don't know (4.8), No (2.9)
12. Aids other than brush	Tongue scraper	37.3	All aids (33.5), Mouthwash (22), Floss (7.2)

TABLE 1: Oral Health Behaviour Among Dental Undergraduate Students in Delhi NCR

PART B: BRUSHING TECHNIQUE

Question	Most Common Response	Percentage (%)	Other Notable Responses
1. Awareness of techniques	Yes	62.7	No (15.3), Only few (11), Maybe (10.5)
2. Brushing direction	Specific technique	45.5	Random (21.1), Horizontal (17.7), Vertical (15.8)
3. Best technique for daily use	Modified Bass	48.8	Stillman (33.5), Charter (12.4), Fones (5.3)
4. 45° angle in Modified Bass	Midline & Gingiva	33.5 each	Gingiva (19.6), Cervical (13.4)
5. Motions in Modified Bass	Circulatory, vibratory, vertical	30.6	Horizontal–circular (28.2), Vertical–sweeping (23), Circular–sweeping (18.2)
6. Intrасulcular method	Bass technique	45.4	Charter (21.1), Fones (18.7), Stillman (14.8)
7. Motion in Stillman's technique	Vertical sweeping	34.9	Vibratory (24.4), Horizontal (23.9), Rotary (16.7)
8. Motion in Fone's technique	Circular	47.4	Horizontal (26.8), Vertical (13.4), Random (12.4)
9. Advice for recession	Modified Bass	46.4	Stillman (27.3), Charter (17.7), Fones (8.6)
10. Advice after surgery	Charter technique	31.1	Stillman (28.2), Modified Bass (27.3), Bass (13.4)

TABLE 2: Knowledge and Practice of Toothbrushing Techniques Among Dental Undergraduate Students in

Delhi NCR

A total of 300 undergraduate dental students participated in the study. The assessment of oral health behaviour (Table 1) revealed that the majority (61.7%) reported brushing their teeth twice daily, while 33% brushed once daily. Only 2.4% brushed thrice, and 2.9% brushed once in two days. Regarding toothbrush replacement, 56% of students changed their brush within three months, 24.4% every six months, 12% monthly, and 7.7% annually. Manual toothbrushes were used by 87.1% of participants, while only 9.1% used electric toothbrushes. Neem stick and ginger were rarely used (1.9% each).

In terms of brushing duration, 45.5% brushed for two minutes, 31.6% for one minute, 17.2% for more than two minutes, and 5.7% for only 30 seconds. The primary reason for brushing was to maintain oral hygiene (91.4%), while others cited removal of caries (4.3%), pain reduction (2.4%), and aesthetics (1.9%). Soft-bristled brushes were preferred by 49.8% of students, followed by medium (24.4%), extra-soft (22%), and hard (3.8%) types. When asked about dental deposits, 71.3% correctly identified calculus as a hard deposit, and 68.4% recognized plaque as a soft deposit.

A total of 66.5% of participants confirmed the presence of fluoride in their toothpaste, and 67.9% understood its antiplaque and anticaries properties. Furthermore, 84.7% acknowledged the negative effects of a sugar-rich diet on oral health. Among oral hygiene aids, tongue scrapers were used by 37.3%, all aids (mouthwash, floss, tongue scraper) by 33.5%, mouthwash alone by 22%, and floss alone by 7.2%.

The evaluation of knowledge and practice regarding brushing techniques (Table 2) showed that 62.7% of students were aware of various brushing techniques, while 15.3% were unaware. Only 45.5% followed a specific brushing technique, with others employing random (21.1%), horizontal (17.7%), or vertical (15.8%) methods. The modified Bass technique was considered the most suitable for daily oral hygiene by 48.8% of students, followed by Stillman's (33.5%), Charter (12.4%), and Fone's (5.3%).

When questioned about the correct 45-degree bristle angulation in the modified Bass technique, 33.5% each responded "midline of teeth" and "both gingiva and teeth", while 19.6% chose gingiva and 13.4% cervical portion of teeth. Regarding brushing motions, 30.6% selected circulatory, vibratory, and vertical movements; 28.2% chose vibratory, horizontal, and circulatory; 23% selected vibratory, vertical, and sweeping; and 18.2% picked vibratory, circulatory, and sweeping.

The Bass technique was correctly identified as an intrasulcular method by 45.4% of students. In Stillman's technique, vertical sweeping (34.9%) was the most identified motion, followed by vibratory (24.4%), horizontal reciprocatory (23.9%), and rotary (16.7%). For Fone's technique, circular motion (47.4%) was most common, followed by horizontal (26.8%), vertical (13.4%), and random (12.4%).

In terms of clinical recommendations, 46.4% of students advised the modified Bass technique for patients with gingival recession, while 27.3% chose Stillman's, 17.7% Charter, and 8.6% Fone's technique. For post-surgical cases, the Charter technique was most frequently recommended (31.1%), followed by Stillman's (28.2%), modified Bass (27.3%), and Bass technique (13.4%).

These findings highlight both awareness and gaps in knowledge among undergraduate dental students, emphasizing the need for enhanced training in evidence-based toothbrushing techniques.

DISCUSSION

This study "Awareness of Toothbrushing Techniques in Dental Undergraduate Students: A Cross Sectional Study" provides critical insights into the oral hygiene practices and knowledge levels of future dental professionals in colleges of Delhi NCR region. This is particularly pertinent given the acknowledged global burden of oral diseases, with over 3.5 billion individuals affected by conditions largely preventable through effective oral hygiene measures, most notably, correct toothbrushing techniques as stated by GBD 2017 Oral Disorders Collaborators²². This study's findings reveal a concerning gap between the

students' theoretical understanding of oral hygiene and their practical application of evidence-based toothbrushing methods, raising questions about their preparedness to effectively educate patients on proper oral care.

A significant 61.7% of participants reported brushing twice daily, aligning with recommended guidelines for optimal oral health, which is a similar proportion to findings by Kumar et al. (2017)²³ in a study of Indian dental students. However, a substantial 33% brushed only once daily, indicating a need for reinforcement of the importance of frequent plaque removal, given that dental caries and periodontal

disease, both biofilm-mediated, affect billions globally, as noted by GBD 2017 Oral Disorders Collaborators²².

Most (87.1%) used a manual toothbrush, and nearly half (45.5%) brushed for the recommended 2 minutes; though 31.6% brushed for only 1 minute, a duration Creeth et al. (2009) ²⁴ found to be inadequate for optimal plaque control. Encouragingly, 56% replaced their toothbrush every 3 months, adhering to recommendations from the American Dental Association²⁵. The primary reason for brushing was to maintain oral hygiene (91.4%), underlining awareness of its importance.

Regarding tongue cleaning, 55% of students reported using a tongue cleaner, which is an essential practice for maintaining oral hygiene and preventing halitosis. Furthermore, 85% of participants acknowledged the role of sugary foods in causing tooth decay, emphasizing their awareness of diet's impact on oral health.

When selecting a toothbrush, almost half (49.8%) preferred a soft-bristled brush, consistent with expert recommendations to minimize gingival trauma (Addy & Hunter, 2003)²⁶. In addition to brushing, tongue scrapers were the most preferred aid (37.3%), recognizing the importance of overall oral cleanliness.

Regular replacement of toothbrushes is vital for maintaining brushing efficacy. The American Dental Association recommends replacing toothbrushes approximately every three to four months or sooner if the bristles become matted or frayed²⁵. The present study observed that most students adhered to this guideline, changing their toothbrushes every three months. This behavior is consistent with findings from other studies; for instance, research conducted among Iranian students reported that 33.9% replaced their toothbrushes every three months, while 43.8% did so every three to six months²⁷.

Most students correctly identified calculus (71.3%) and plaque (68.4%), and confirmed their toothpaste contained fluoride (66.5%), understanding its antiplaque and anticaries properties (67.9%). which reflects awareness of dietary impacts on oral health. However, while many were aware of various brushing techniques (62.7%), only 0.5% specifically mentioned the modified Bass technique, the gold standard for plaque removal. This technique, widely endorsed for its effectiveness in plaque removal and gingival health promotion by Harnacke (2012)²⁸ and Poyato-Ferrera (2003)²⁹, involves angling toothbrush bristles at 45 degrees to the gingival margin and using gentle back and forth, sweeping motions. In contrast, a significant 45% of students

favoured the horizontal brushing method, a technique that Abid et al. (2024) associated with potential complications such as gingival recession and dental abrasion , corroborating the disconnect between knowledge and practice³⁰.

This study echoes the importance of appropriate educational interventions in dental curricula to address these disparities. Such interventions should focus on practical training and skill development. The systemic implications of inadequate oral hygiene, where conditions like gingivitis and periodontitis are linked to systemic diseases like cardiovascular disease and diabetes, underscore the urgency of improving toothbrushing practices among dental students.

The need for improved educational strategies is further reinforced by research in Tamil Nadu, which revealed that students' oral hygiene behavior improved with advanced academic years and clinical exposure³¹. Similarly, research from Kerala demonstrated significant improvements in oral health knowledge, attitude, and behavior among clinical students compared to preclinical counterparts.³¹ These findings underscore the importance of continuous education and reinforcement of evidence-based toothbrushing techniques throughout the dental curriculum to ensure that students are well-equipped to educate patients effectively.

In conclusion, the study's findings emphasize the necessity for a renewed focus on practical skills and consistent reinforcement of evidence-based toothbrushing techniques within dental education. By addressing the gap between theoretical knowledge and practical application, dental curricula can better prepare future oral health professionals to promote optimal oral hygiene practices and contribute to improved patient outcomes. This, in turn, can lead to a reduction in the global burden of preventable oral diseases.

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