



Assessment of brushing techniques taught by dental students to children in mixed dentition stage - A retrospective study

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Article History:

Received on: 06 Sep 2020

Revised on: 03 Oct 2020

Accepted on: 06 Oct 2020

Keywords:

Brushing Technique,
Age,
Mixed Dentition,
Plaque Control

ABSTRACT

Dentists play an important role in the primary prevention of dental problems in young through preventive treatments, risk assessment and anticipatory guidance for parents regarding oval development, caries prevention and overall oral health, including brushing techniques, fluoride toothpaste, brushing twice a day. The aim of this study was to evaluate the commonly used brushing technique by dental students during the mixed dentition stage. Data were retrieved from the dental records. Data of brushing techniques used in pediatric dentistry was collected from the patient management records of the Department of Pediatric Dentistry. Patients of 6–12 years with mixed dentition were shortlisted. Data obtained was tabulated in excel and analyzed using statistical software. Age distribution of this study was 6 years (6.2%), 7 years (15%), 8 years (19%), 9 years (16.4%), 10 years (15.3%), 11 years (13.6%), 12 years (14.2%). Gender distribution of this study was males (57%) and females (43%). Most commonly taught brushing technique by dental students during the mixed dentition stage was Fones brushing technique (73.5%) followed by the Modified Bass technique (19.1%) ($p < 0.05$ - significant). We can conclude by saying that the Fones brushing technique was the most commonly taught brushing technique by dental students during the mixed dentition stage with male predominance, and it was statistically significant.



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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL3.3315>

Production and Hosted by

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INTRODUCTION

The maintenance of the primary dentition is important to guide the eruption of permanent teeth, and poor oral hygiene may affect this balance (Ravikumar *et al.*, 2017; Panchal *et al.*, 2019). Poor oral hygiene may also lead to the early loss of permanent loss due to caries and periodontal problems. Dental caries is a multi factorial disease resulting from a variety of etiological factors such as dental plaque retention due to poor oral hygiene, cariogenic bacterial colonization and ingestion of cariogenic substrate. Tooth brushing is the primary oral health activity for young children and a well-known tool in oral care (Petti *et al.*, 2000; Tsut-

sui et al., 2000). Effective tooth brushing helps in the management of dental caries and periodontal disease, which can cause pain, eating difficulties, malnutrition, esthetic problems, reducing self-estimation, and consequently reducing the quality of life. Bacterial plaque serves as a principal etiologic factor for dental caries and gingivitis. Plaque removal from dental surfaces using proper brushing technique may help in the management of both caries and periodontal problems (*Philip et al.*, 2018; *Weijden et al.*, 2011).

Oral health plays a vital role in the general well-being of individuals (*Gurunathan and Shanmugaavel*, 2016). The most efficient method in mechanical plaque control is tooth brushing that results in a significant decrease in plaque. Various studies conducted on teaching brushing in children have reported the use of the right technique to the age of the child is important (*Benadof et al.*, 2015). Effective plaque removal in young children depends on their level of motor skill development and learning sequences of coordinated muscular movement. It has been generally known that tooth brushing by young children is inefficient; this might be due to lack of motivation and poor manual dexterity at this age. Thus, oral hygiene education should be taught to children according to the development of a child's cognitive skills. Instructions should be given according to the child's readiness for tooth brushing and must also include proper training and regular reinforcement (*Unkel et al.*, 1995; *Williford et al.*, 1967).

Dental caries is a complex process of demineralisation and dissolution of teeth substance leading to cavitation (*Subramanyam et al.*, 2018). Dental plaque is one of the important etiological factors in the causation of dental caries. Effective removal of plaque can reduce the incidence of caries (*Govindaraju and Gurunathan*, 2017). Tooth brushing for effective plaque control depends on the technique used and ease of the performance. Many different tooth brushing techniques have been recommended over the past 20–30 years (*Robinson*, 1976). The various methods of tooth brushing which includes Fones brushing technique, Bass brushing technique, Scrub brushing technique, Charters brushing technique, Stillman brushing technique, Modified Bass brushing technique, Roll brushing technique which is effective in removing plaque bio film and debris, stimulate the gingiva and deliver fluoridated dentifrice to the tooth surfaces (*Wilkins*, 1216). Patients usually employ their own methods of teeth brushing like vigorous scrubbing is horizontal, vertical or circular direction. Such techniques can successfully remove plaque, but it is very detrimental to the oral hard tissues. Some patients are lethargic towards

teeth brushing and are inadequate for the removal of plaque, leading to dental problems (*Poyato-Ferrera et al.*, 2003). Therefore, proper brushing techniques with proper lecture should be delivered to the patients to obtain efficient plaque control and to decrease the incidence of caries and periodontal problems. The aim of this study is to evaluate the common brushing technique advised by dental students during the mixed dentition stage.

MATERIALS AND METHODS

This retrospective study was conducted as a university setting which includes predominantly South Indian population. The approval for this study was obtained from the institutional ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). This study had advantages of large data availability, similar ethnicity, but it had disadvantages of smaller sample size, geographic limitation and no external validity. This was a convenience sampling conducted between June 2019 to March 2020 with patients of all age groups and gender. Data was collected from the dental records, patient management records of the Department of Pediatric Dentistry. The number of case sheets reviewed was 1000. Inclusion criteria were the patients with mixed dentition (6-12 years). Patients with only primary dentition (0-5 years) and only permanent dentition (≥ 13 years), including the incomplete and repeated data were excluded from the study. Cross verification was done using a photographic method to eliminate the errors made while recording. To eliminate bias, simple random sampling was done. Final sample size taken up for the study was 862 cases.

The data obtained were tabulated in excel, imported to SPSS software by IBM, a statistical software with variables defined. The significance of this study was obtained using the statistical test, Chi-Square and the results were interpreted.

RESULTS AND DISCUSSION

Age distribution of this study was 6 years(6.2%), 7 years(15%), 8 years (19%), 9 years(16.4%), 10 years(15.2%), 11 years(13.8%), 12 years(14.2%). The most common age group in this study was the patients with eight years of age (Figure 1) ($p < 0.05$ - significant). Among the participants of the study, there were 57% males ($n=490$) and 43% females ($n=372$) (Figure 2) ($p < 0.05$ - significant). Commonly taught brushing technique was Fones method (74.4%) followed Modified Bass method (18.8%), Bass method (3.4%), Roll method (1.6%),

Charter method (0.7%), Modified Fones method (0.6%), Scrub method (0.2%) and Modified Stillman's method (0.2%), Fones and Bass method (0.1%) (Figure 3) ($p < 0.05$ - significant). Prevalence of Fones brushing technique was seen in males, and the Modified Bass brushing technique had no preference (Figure 4) ($p < 0.05$ - significant). Prevalence of Fones brushing technique is seen in 8 years of age and Modified Bass brushing technique in 12 years of age (Figure 5) ($p < 0.05$ - significant).

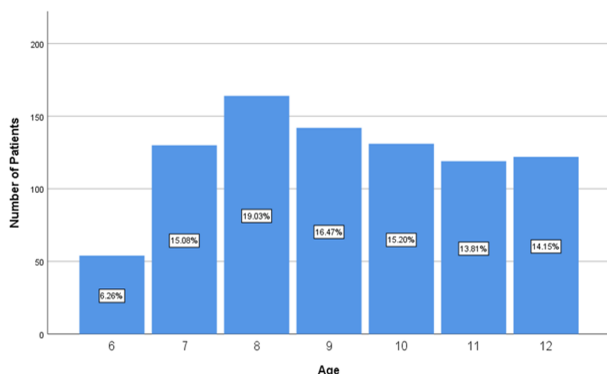


Figure 1: This graph shows the age distribution of children with mixed dentition.

Figure 1 shows that the X-axis represents the age of the child and Y-axis is the number of children in the mixed dentition stage. Children of age group 6-12 years with mixed dentition were taken for the study. Children at eight years of age were higher in the study population. (n=164, 19.03%).

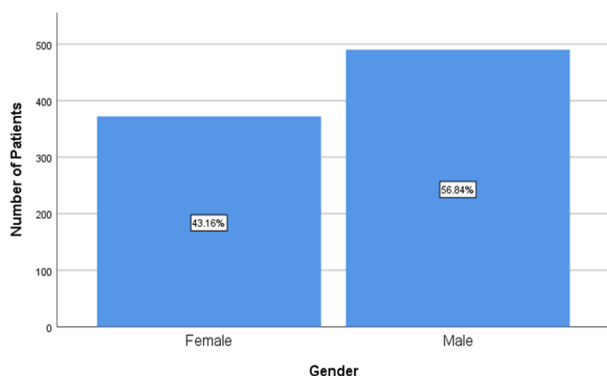


Figure 2: This graph shows the gender distribution of children with mixed dentition.

Figure 2 shows that the X-axis represents the gender of the patient and Y-axis represents the number of children with mixed dentition. Majority of the study population in the mixed dentition stage was males (56.84%) (n=490). Figure 3 shows that the X-axis represents the different brushing techniques and Y-axis represents the number of children with mixed dentition. Fones brushing technique (74.36%) is the most commonly used brushing technique followed by Modified Bass brushing technique (18.79%).

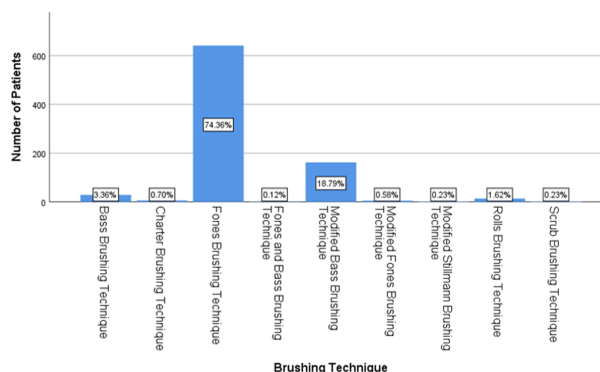


Figure 3: A bar graph showing the prevalence of brushing technique advised in children with mixed dentition.

Figure 4 shows that the X-axis represents the different brushing techniques advised and Y-axis represents the number of children with mixed dentition. The red color indicates males and blue color indicates females. Fones brushing technique was commonly taught in males (chi-square test; $p = 0.000$ - statistically significant).

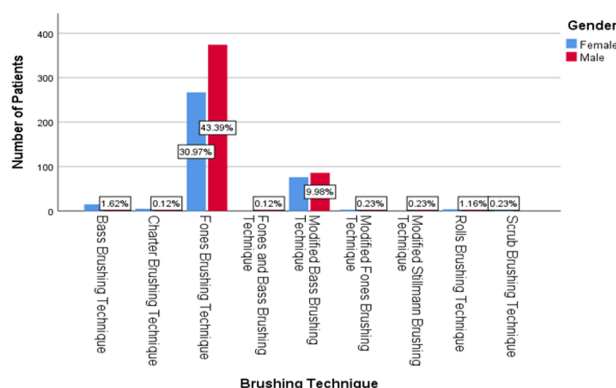


Figure 4: This graph shows the comparison of brushing techniques advised in children with mixed dentition based on gender.

Figure 5 shows that the X-axis represents the brushing techniques advised and Y-axis represents the number of children. The colors represent the age of the children. Blue represents age 6; red represents age 7, green represents age 8, orange represents age 9, yellow represents age 10, light blue represents age 11, pink represents age 12. Fones brushing technique was commonly taught in children of 8 years of age and Modified Bass brushing technique in 12 years of age. (chi-square test; $p = 0.000$ - statistically significant).

Tooth brushing is a very important plaque control measure. The relationship between incomplete plaque removal, sequelae of gingivitis and periodontitis and also the occurrence of dental caries has been proven (Ganavadiya et al., 2014). There was a

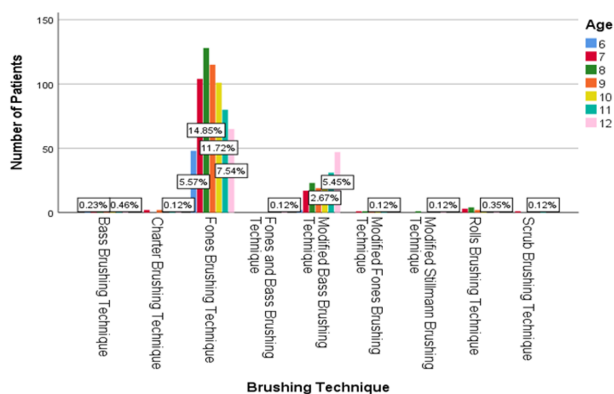


Figure 5: This graph shows the comparison of brushing techniques advised in children with mixed dentition based on age.

wide diversity between recommendations on tooth brushing methods. Tooth brushing is the cornerstone of dental health education to prevent caries and periodontal disease. More high quality and long term studies are required to investigate the effectiveness of brushing techniques in the prevention of gingivitis, periodontitis and caries. Patients pay poor attention to the lingual sites during their regular tooth brushing practices; this may be because these sites do not affect the aesthetics and have more difficult access (Pihlstrom *et al.*, 2005).

So, special attention should be given to brushing techniques in lingual sites. Certain factors may influence the effectiveness of the tooth brushing technique like the dexterity of the patient, level of comprehension of the patient after demonstrating the technique, the features of the toothbrush including filament arrangement, orientation, size, shape and flexibility (Mccambridge *et al.*, 2014). In pediatric dentistry, the most important concern is the loss of primary molars due to caries or periodontal problems leading to space loss (Jeevanandan, 2017; Govindaraju *et al.*, 2017b; Govindaraju and Jeevanandan, 2017).

So more concern should be given on instructing the patients with suitable brushing technique in the posterior region. Literature suggests that preserving the integrity of primary dentition aids in mastication, prevent speech problems (Packiri *et al.*, 2017), prevents psychological effects associated with tooth loss, prevent aberrant tongue movement, maintains aesthetics and maintains the normal eruption of the succedaneous teeth (Govindaraju *et al.*, 2017a; Jeevanandan and Govindaraju, 2018; Lakshmanan *et al.*, 2020). So it is very much important to preserve the primary tooth, and preventive measures should be taken accordingly.

Dental education has been asserted as one of the

challenging fields of study as they are expected to acquire diverse competencies and interpersonal skills. In this study, we had analyzed the brushing techniques advised by dental students in pediatric patients. Direct communication through dental practitioner is one of the most effective and essential ways of improving the status of oral health. Demonstration of oral hygiene measures using a child as a model was found to be the most effective motivational tool in improving the oral hygiene and gingival health status (McCauley *et al.*, 1955; Christabel and Gurunathan, 2015).

Toothbrush with soft, rounded bristles is the best for children. The head of the brush preferred to be small to adapt properly with the size of their mouth. The handle should be shorter with a large diameter. Parents must supervise the tooth brushing of children until age 7 to 8 years. Tooth brushing twice daily was found as an effective and low-cost protocol for caries in children. Recommended time for toothbrush replacement is after three months. If the bristles splay sooner, the toothbrush replacement must be done to improve cleaning efficacy and avoid gum damage (Mcwhorter and Townsend, 2014). India has less than the optimal level of fluoride in drinking water (Somasundaram, 2015; Ramakrishnan and Shukri, 2018). They are, therefore increasing the caries susceptibility. In order to counteract, awareness of brushing methods should be created.

According to the present study, Fones brushing technique is the most commonly taught brushing technique in children. This study is in concordance with the study by T Arai *et al.*, who reported that the average percentage of plaque removal from the labial and lingual tooth surface was higher in Fones method with 75.2% plaque removal compared to other techniques (Arai, 1976). Srivastava *et al.*, who also did a study on brushing technique, recommended Fones technique for children with mixed dentition (Srivastava, 2013). Fazele Atarbashi *et al.*, who's review revealed that Fones technique was recommended for children commonly (Patil *et al.*, 2014).

This is because it is easy to learn; plaque removal is fast and wide with circular motion extending from the marginal gingiva of the maxilla to the marginal gingiva of the mandible using light pressure. It has adverse effects for gingiva and tooth structure (gingival recession and tooth abrasion), so it is not recommended in some patients. There is a male predominance in Fones technique, but there are no supporting articles that prove the same. Fones technique is prevalent in the age of 8 years in this study. This is in accordance with T Arai *et al.*, who pre-

ferred the Fones technique for the age group of 7 to 9 years. This may be due to its shorter time requirement and easy learning as the child transforms from pre-operational to the concrete operational stage (Arai, 1976).

The second highest prevalence of brushing technique was Modified Bass in this study. This is in concordance with Poyato Ferrera et al., who stated Modified Bass as the most effective brushing technique (Poyato-Ferrera et al., 2003). Study of Smita et al. shows that Modified Bass is the most effective technique (Patil et al., 2014). According to Zhang et al., Smutkeeree et al., T Arai et al., Modified Bass is the most commonly used and preferred and has better effect of removing plaque and reduces gingival inflammation (Arai, 1976; Zhang et al., 2005; Smutkeeree et al., 2011). This technique had no gender preference, according to this study. It was most preferred in the age group of 12 years since it requires the dexterity of wrist, and the child enters formal operational Stage (Smutkeeree et al., 2011).

Advantage of this study was that it had easy access, the large availability of data and similar ethnicity. It was also used to identify any mistakes in the brushing techniques advised. Limitation of this study was that it had no external validity. The sample size was small and inadequate. It was a uni centered study with a geographic limitation. The future scope was that it should be conducted as a multi centered study with extension in the geographic limitation. And also to attain effective brushing technique to decrease the caries incidence and periodontal problems.

CONCLUSION

Within the limitation of this study, it showed that Fones brushing technique was the most preferred brushing technique followed by Modified Bass brushing technique taught by the dental students to the patients between the age group of 6 to 12 years (mixed dentition stage).

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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