

Effectiveness of Chewable Toothbrush In Plaque Removal: A Comparative Study

Rohini Dua^{1*} Ripin Garewal² Gulsheen Kocchar³ Annupriya Sikri⁴ Vishu Midha⁵ Vasu Midha⁶

¹Professor and Head, Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

²Reader, Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

³Reader, Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

⁴Assistant Professor, Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

⁵Post Graduate Student, Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

⁶Post Graduate Student, Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

ABSTRACT

Aim: The aim of this study was to compare and evaluate the plaque removal efficiency of a chewable toothbrush (CB), manual toothbrush (MB) and powered toothbrush (PB) in children.

Materials and Method: A total of 30 patients aged 6-8 years were enrolled in the study. This was a single-blinded crossover study which examined plaque removal efficiency of a CB compared to a manual (MB) and powered toothbrush (PB). DAY 1 & DAY 4 Supragingival plaque was examined using the Turesky modification of the Quigley-Hein Index (TQHI). For statistical comparison, the difference (prebrushing minus postbrushing) in average scores was calculated. Data were evaluated by paired T-test and tukey HSD with a $P < 0.05$ considered to be statistically significant.

Results: The mean plaque reduction score at DAY 1 with TQHI for CB, MB, PB were 0.463 ± 0.295 , 0.622 ± 0.221 and 1.034 ± 0.203 respectively and at DAY 4 the mean plaque reduction score was 0.727 ± 0.349 , 0.823 ± 0.277 , 1.265 ± 0.190 respectively. Differences in scores between the three brushes were statistically significant ($P > 0.05$).

Conclusion: Chewable toothbrush showed great results on lingual surfaces of teeth which are usually inaccessible for other toothbrushes. It cannot substitute regular brushing but definitely can be used as an adjunct to escalate oral hygiene.

Keywords: Chewable, manual, powered, toothbrush, plaque.

INTRODUCTION

We live in an age of luminescence where all domains including medicine are in paramount countenance. Despite that, addressing patients with dental plaque appears as more distressing along with their concomitant diseases. In the mouth, however, teeth provide hard, non-shedding surfaces for the development of extensive bacterial deposits. The accumulation and metabolism of bacteria on

hard oral surfaces is considered the primary cause of dental caries, gingivitis, periodontitis.¹ Regular personal and professional plaque removal measures are important in maintaining oral health. Personal oral hygiene includes toothbrush, dentifrices, interdental cleaning devices, mouthrinses, etc. of which toothbrushing has been quoted as the most commonly used effective and safest method.² From hog bristles to nylon filaments there have been tremendous advances in toothbrushes to enhance

Received: Jan. 19, 2017; Accepted: Feb. 27, 2017

*Correspondence Dr. Rohini Dua.

Department of Pedodontics and Preventive Dentistry, National Dental College and Hospital, Dera Bassi, Mohali, India.

Email: Not Disclosed

mechanical removal of dental plaque. For people who are not highly motivated to personal oral hygiene, disabled people with less manual dexterity, orthodontic patients or those who have difficulties in performing the hand brushing technique may benefit from using an electric toothbrush in both motivation and plaque removal.³ The ideal brushing technique is the one that allows complete plaque removal in the least possible time, without causing any damage to the tissues.⁴

In spite of brushing being the most accepted method of plaque removal, still its efficacy depends on the various factors such as type of brush, method of brushing, ideal time to brush and technique of brushing.⁵ For an effective toothbrushing which is the most accepted method of plaque removal; adequate brushing technique, its portability, patient acceptability and compliance is of great importance.⁶

Considering the numerous drawbacks of manual and powered toothbrush such as the portability of toothbrush, technique sensitivity and the patient's non-acceptability especially by children led to the development of recent invention – Chewable Toothbrush. The chewable toothbrush (CB) (Fuzzy brush, Fuzzy Brush Ltd, London, UK) is a recent modernism in oral hygiene. This disposable, all-in-one brush is comprised of xylitol, flavoring, aqua, and polydextrose.

Fuzzy Brush contains a very high concentration of Xylitol (95%) – a natural sweetener which is highly effective at killing bacteria in the mouth, protecting tooth enamel and fighting tooth decay.⁷ Due to its myriad advantages such as high patient acceptability, ease of portability, no technique sensitivity, ability to clean inaccessible areas of the mouth etc it is widely used these days. The purpose of this study is to determine and compare the cleaning efficiency of chewable toothbrush with manual and powered toothbrush which is quite captivating through the way of its approach, evolution and frequency.

MATERIAL AND METHODS

Study Population: The study was conducted on randomly selected randomly 30 healthy children, 6-8 years old, visiting the Department of Pedodontics, National Dental College, Dera Bassi, Mohali.

INCLUSION CRITERIA

good general and oral health and the presence of at least 20 teeth.

EXCLUSION CRITERIA

1. Subjects who regularly used antibiotics or other drugs as well as those with oral soft-tissue lesions,
2. 3 or more carious lesions requiring treatment,
3. Severe malocclusion or those on orthodontic therapy were excluded from the study.

MATERIAL USED

1. Chewable toothbrush(Fuzzy brush, Fuzzy Brush Ltd, London, UK)
2. Manual toothbrush(Colgate kids)
3. Powered toothbrush(Gixmo kids)
4. Xylitol toothpaste(Chicco)
5. Plaque disclosing agent (Alphapla two tone)



Fig 1: Materials used in the study.

Sample was divided into three groups containing 10 children each. First group consists of Manual tooth brushing. Group B consists of powered tooth brushing and group C consists of chewable toothbrush. Prior to enrollment in the study, proper informed consent was obtained from parents of all participants. Children and their parents were introduced to the Chewable toothbrush, powered toothbrush and manual toothbrush and tooth brushing instructions were given.

All appointments were scheduled between 8:30 am and 10:30 am. xylitol based toothpaste (chicco, Italy) was used with manual and powered

toothbrushing groups. Disclosing solution (AlphaPlac two tone DPI) was used to aid in identifying plaque. The Turesky modification of the Quigley-Hein Index (TQHI) was used to assess supragingival plaque. TQHI scores were obtained for the buccal and lingual surfaces of all gradable teeth, and the average score was used for each subject.

Turesky modification of the Quigley-Hein Index (TQHI)

SCORES	CRITERIA
0	No plaque
1	Isolated areas of plaque at gingival margin
2	Thin band on plaque at gingival margin (≤ 1 mm)
3	Plaque covering up to 1/3 of the tooth surface
4	Plaque covering between 1/3 and 2/3 of the tooth surface
5	Plaque covering $\geq 2/3$ of the tooth surface

At visit 1- tooth brushing instructions that is brushing time- 2 minutes, brushing technique- fones method and frequency of tooth brushing – two times a day were given



Fig 2: Tooth brushing instructions given to the subjects.



Fig 3: Pre Brushing Plaque Scoring Using Tqhi.

Plaque disclosing agent was applied and Plaque scoring using TQHI (pre-brushing scoring) was done. Brushing technique according to allotted groups was performed.



Fig 4: Subject with manual tooth brushing.



Fig 5: Subject with powered tooth brushing.



Fig 6: Subject with chewable tooth brushing.

Plaque scoring using TQHI (post brushing scoring) was again performed after the application of plaque disclosing agent.



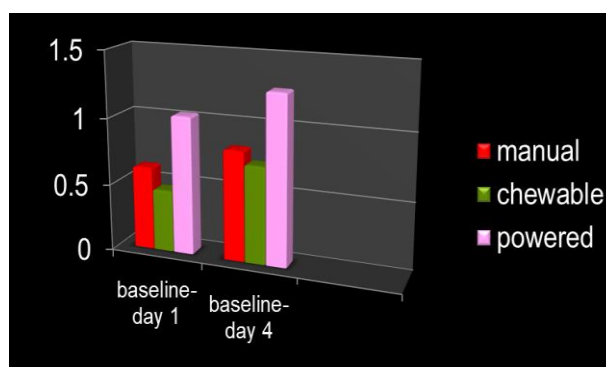
Fig 7: Post Brushing Plaque Scoring Using TQHI.

At visit 2(after 4 days)- Toothbrushing was performed for 4 days and after 4 days plaque disclosing agent was applied & Plaque scoring using TQHI

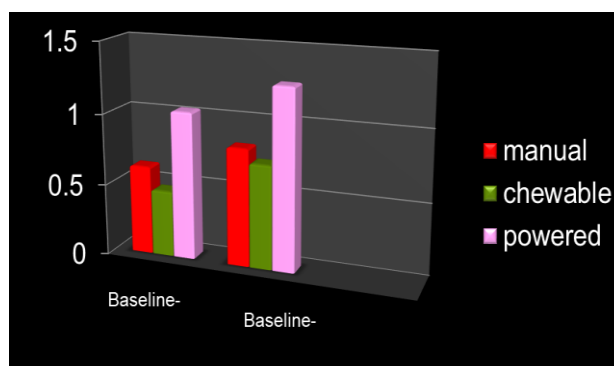
STATISTICAL ANALYSIS

Average pre, post brushing and after four days plaque scores was calculated for statistical comparison. Data were evaluated using T test, with a $P < 0.05$ considered to be statistically significant.

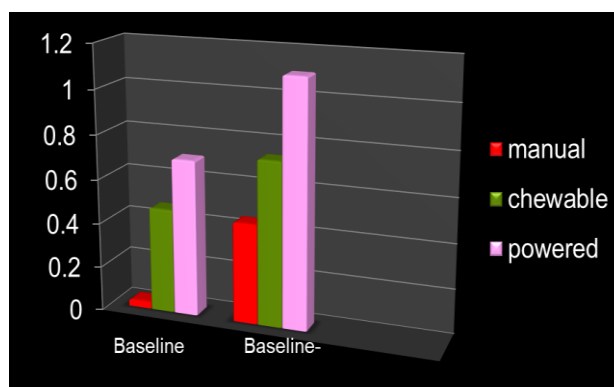
RESULT



Graph 1: Mean Reduction In Total Plaque Scores.



Graph 2: Mean Reduction In Buccal Plaque Scores.



Graph 3: Mean Reduction In Lingual Plaque Scores.

Table 1: Intergroup comparison of mean difference in plaque score at different time intervals.

Plaque score	Manual toothbrush	Chewable toothbrush	Powered toothbrush	F-value	P-value
Baseline - day 1	0.622±0.22	0.463±0.29	1.034±0.20	14.684	<0.001
Baseline - day 4	0.823±0.27	0.727±0.34	1.265±0.19	10.522	<0.001
Baseline B-day 1 B	0.923±0.39	0.416±0.17	1.321±0.25	24.355	<0.001
Baseline B-day 4 B	1.147±0.45	0.654±0.30	1.390±0.26	11.475	<0.001
Baseline L-day 1 L	0.030±0.18	0.470±0.26	0.702±0.18	8.543	0.001
Baseline L-day 4 L	0.249±0.24	0.738±0.36	1.103±0.10	15.790	<0.01

DISCUSSION

Presently, there has been numerous studies regarding the evaluation of powered and manual toothbrush. On the other hand, almost negligible studies have been undertaken to compare and evaluate the efficacy of chewable, powered and manual toothbrush. The present study confirms the hypothesis that All the three brushes significantly reduced the plaque accumulation, though to different degrees. According to Axeleson and Lindhe et al. (1981), meticulous plaque removal by patient under regular supervision results in a major reduction in dental diseases.

Tuğba Bezgin*, Canan Dağ, Nurhan Özalp 2015 conducted a study to evaluate the plaque removal efficiency of a chewable toothbrush (CB) in children. The experimental chewable brush was found to be as effective as a manual brush in removing plaque. The chewable brush may be an appropriate oral hygiene adjunct for school children, including children with disabilities.⁷ In the present study, the overall plaque scores were **Significantly Reduced** with the powered, chewable and manual brushes and Total mean plaque reduction was seen highest in PB followed by MB and CB. Mean plaque reduction on buccal surfaces was seen highest in PB followed by MB and CB. Mean plaque reduction on lingual surfaces was seen highest in PB followed by CB and MB.

However, the experimental CB was more efficient in removing plaque on lingual surfaces as compared to MB. These results are consistent with those of a previous study by **Myoken** et al who also found the CB capable of removing a significant amount of plaque, particularly on the lingual surfaces.⁸ One possible explanation for the differences in plaque removal between surfaces may be that children spend less time on manual brushing of lingual surfaces than buccal surfaces, whereas children chewing the experimental brush may unconsciously spend more time on brushing lingual surfaces.⁷

The chewable brush used in this study contains xylitol. It has been suggested that daily exposure to xylitol may be beneficial to child dental health by reducing caries and assisting remineralization.⁹⁻¹⁰

CONCLUSION

All the three brushes significantly reduced the plaque accumulation, though to different degrees. The powered group showed significantly more plaque reduction as compared to the manual and chewable group. Manual toothbrush showed good results on buccal surfaces as compared to lingual surfaces and Chewable toothbrush showed great results on lingual surfaces of teeth which are usually inaccessible for other toothbrushes. Chewable toothbrush cannot substitute regular brushing but definitely can be use as an adjunct to escalate oral hygiene. The similarities in plaque removal found between the all the brushes suggest the chewable brush may be an appropriate oral hygiene adjunct for school children, including children with disabilities. However, in order to definitively determine the suitability of the CB for disabled children and children under age 10, additional long-term studies are required.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Viorica CHETRUȘ, I.R. Ion. -dental plaque classification, formation, and identification International Journal of Medical Dentistry

volume 3 • issue 2 April / June 2013 • pp. 139-143

2. Deery C, Heanue M, Deacon S, Robinson PG, Walmsley AD, Worthington H, et al. The effectiveness of manual versus powered toothbrushes for dental health: A systematic review. *J Dent* 2004;32:197-211.
3. A review of mechanical dental plaque control ByJoo H. Kim, DDS
4. Hansen F, Gjermo P. The plaque-removal effect of four toothbrushing methods. *Scandinavian Journal of Dental Research*, 1971; 79:502-506.
5. Lazarescu D, Boccanalea S, Illiescu A, De Boever JA. Efficacy of plaque removal and learning effect of a powered and a manual toothbrush. *J Clin Periodontol* 2003;30:726-31.
6. UM Das, P Singhal. Tooth brushing skills for the children aged 3-11 years. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, Vol. 27, No. 2, April-June, 2009, pp. 104-107
7. Tuğba Bezgin*, Canan Dağ, Nurhan Özalp. 7.Ten Berge M. Dental fear in children: prevalence, etiology a How effective is a chewable brush in removing plaque in children? A pilot study. *Journal of Pediatric Dentistry / May-Aug 2015 / Vol 3 | Issue 2*
8. Myoken Y, Yamane Y, Myoken Y, Nishida T. Plaque removal with an experimental chewable toothbrush and a control manual toothbrush in a care-dependent elderly population: A pilot study. *J Clin Dent* 2005;16:83-6.
9. Maguire A, Rugg-Gunn AJ. Xylitol and caries prevention — Is it a magic bullet? *Br Dent J* 2003;194:429-36.
10. American Academy on Pediatric Dentistry Council on Clinical Affairs. Policy on the use of xylitol in caries prevention. *Pediatr Dent* 2008-2009;30
11. Dale JW. Toothbrushing frequency and its relationship to dental caries and periodontal disease. *Aust Dent J*. 1969;14:120-3.
12. Claydon NC. Current concepts in toothbrushing and interdental cleaning. *Periodontol* 2000 2008;48:10-22.
13. Kallar S, Pandit IK, Srivastava N, Gugnani N . Plaque removal efficacy of powered and manual toothbrushes under supervised and unsupervised conditions: A comparative clinical study. *Journal of Indian Society of Pedodontics and Preventive Dentistry | Jul - Sept 2011 | Issue 3 | Vol 29 |*
14. Akshay Vibhute, K. L. Vandana. The effectiveness of manual versus powered toothbrushes for plaque removal and gingival health:A meta-analysis. *Journal of Indian Society of Periodontology - Vol 16, Issue 2, Apr-Jun 2012.*
15. Yashika Jain. A comparison of the efficacy of powered and manual toothbrushes in controlling plaque and gingivitis: a clinical study. *Clinical, Cosmetic and Investigational Dentistry* 2013:
16. Sheikh-Al-Eslamian SM et al1 Comparison of Manual and Electric Toothbrush in Dental Plaque Removal: A Clinical Trial. *Avicenna J Dent Res*. 2014 June; 6(1): e21046.
17. Heanue M, Deacon SA, Deery C, Robinson PG, Walmsley AD, Worthington HV, Shaw WC. Manual versus powered toothbrushing for oral health(Cochrane Review). In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.
18. Turksel Dulgergil, Arzu Civelek, Mubin Soyman, Emre Ozel, Oya Dari. Istanbul, Turkey .Dental plaque removal efficacy of a battery powered and manual toothbrush.. *OHDMBSC - Vol. III - No. 1 - March, 2004*
19. Silverman et al. Comparison of Powered and Manual Toothbrushes for Plaque Removal by 4- to 5-year-old Children. *Pediatric Dentistry - 26:3, 2004*
20. Malgorzata Klukowska, DDS, PHD,Juliem.Grender, PHD & Hanstimm, PHD. A Single-Brushing Study To Compare Plaque Removal Efficacy Of A New Power Brush To An Ada Reference Manual Toothbrush. *American*

Journal Of Dentistry, Vol. 25, Special Issue A,
September, 2012

21. Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chloromethyl analogue of vitamin C. J Periodontol 1970;41:41-3.
22. Deery C, Heanue M, Deacon S, Robinson PG, Walmsley AD, Worthington H, et al. The effectiveness of manual versus powered toothbrushes for dental health: A systematic review. J Dent 2004;32:197-211.
23. Montes A, Atukeren J. A study of manual toothbrushing skills in children aged 3 to 11 years. J Clin Pediatr Dent 2002;27:91-4.
24. McCracken GI, Steen N, Preshaw PM, Heasman L, Stacey F, Heasman PA. The crossover design to evaluate the efficacy of plaque removal in toothbrushing studies. J Clin Periodontol 2005;32:1157-62.
25. Weyant RJ. Powered toothbrushes and manual toothbrushes are generally equally effective in plaque removal. J Evid Based Dent Pract 2005;5:24-5.