ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 14, Issue, 08, pp.22105-22108, August, 2022
DOI: https://doi.org/10.24941/ijcr.43919.08.2022

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

COMPARISON OF THE THREE COMMERCIALLY AVAILABLE TOOTHBRUSHES - A CLINICAL TRIAL

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ARTICLE INFO

Article History:
Received 29th May, 2022
Received in revised form
17th June, 2022
Accepted 14th July, 2022
Published online 30th August, 2022

Key words:
Toothbrush,
Brushing Technique,
OHI-S.

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ABSTRACT

Background: The present study was conducted to assess the efficacy of three types of toothbrushes on oral hygiene. Plaque and debris is intimately related to the production and progress of dental caries and inflammatory gingival and periodontal diseases. Good plaque and debris control facilitates the return to health for patients with gingival and periodontal diseases. Daily use of a toothbrush and other oral hygiene aids is the most dependable way to achieve oral health benefits for all patients. ***Methodology:*** A randomized clinical trial was conducted to compare the efficacies of commercially available toothbrush in controlling plaque and debris over a 1-week period. The sample consisted of 45 dental students of both sexes, with ages ranging from 18 to 23 years. The samples were randomly divided into three groups of 10 by a second examiner using the coin toss method; group A used a toothbrush of the brand colgate , group B used the brand VIP and the group c used a toothbrush of the brand AJAY. Each participant's oral hygiene index were assessed on the seventh day on the basis of the assigned toothbrush after brushing using modified bass technique. Collected data were analyzed and different subgroups were compared using Student's *t*-test. ***Result:*** The participants who used tooth brushes of the brand colgate have a mean OHI-S value of 1.7 with standard deviation of 0.45. the mean OHI-S value and standard deviation of the participants who used the brand VIP are 1.8 and 0.88 respectively, whereas AJAY users have a mean OHI-S value of 2.1 with a standard deviation of 0.75.Study showed no statistical difference between the three different type tooth brushes in controlling oral Debris or calculus. ***Conclusion:*** The tooth brushes are equally efficacious in controlling OHI-scoresno significant difference observed in the study.

Citation: ***Dr. Abin V Kumbattu and Dr. Abdul Saheer.*** **2022.** "Comparison of the three commercially available toothbrushes - a clinical trial". *International Journal of Current Research*, 14, (08), xxxx-xxxx.

INTRODUCTION

Plaque is intimately related to the production and progress of dental caries and inflammatory gingival and periodontal disease.[1]In 1965, Loeet al[2]conducted the classic study demonstrating the cause-and-effect relationship between plaque accumulation and development of gingivitis in humans. Good plaque control preserves oral health for a lifetime. Many clinical studies[3–9] clearly indicate that the major deposits of plaque form in stagnation areas, such as the proximal areas, gingival margins, and defects in the teeth. These areas are protected from the natural cleansing mechanisms of oral tissues. Thus, emphasis must be placed on the effectiveness and efficacy of plaque-removing devices used to facilitate oral hygiene in these elusive areas.[1,3] The mechanical method is the most widely accepted method of plaque control. Unfortunately, effective mechanical methods of plaque control are relatively tedious, time-consuming and, for many individuals, difficult to master. A study has suggested[10]that an average person removes only about 50% of the plaque present on teeth. The first motor-driven toothbrush was displayed at the American Dental Association Convention in St Louis, MO, in 1968. It was in the 1960s that widespread use and testing of electric brushes to control plaque, gingivitis, and staining were initiated. Several well-controlled clinical trials[3,11]have compared the effectiveness of various manual toothbrushes alone and of electrical and manual toothbrushes. The results of these trials have been inconclusive, but there is a strong indication that all brushes are least effective on the lingual aspects of lower molars. The correct preset angulation of the brush head, design of the brush, bristle length and material, brush diameter and, lastly, patient skill can improve plaque control in such areas.[12–14] Failure to meet these parameters in manual toothbrushes has resulted in development of powered toothbrushes. These brushes work on the principle of acoustic microstreaming in which hydrodynamic forces are generated by rapid vibration of the bristles in a liquid medium, helping to disrupt plaque from the tooth surface.[15–17]Electrically powered toothbrushes were first designed to mimic back-and-forth brushing techniques. Early models featured circular or elliptic motions. Currently, powered toothbrushes have oscillating and rotating motions. Since the development of the electric toothbrush, there has been a continuing controversy about whether it is more effective than a manual toothbrush. A report seemed to indicate that electric toothbrushes are superior to manual brushes in terms of removing plaque and improving gingival health.[4]However, other studies conclude that conventional and electric brushes are equally effective.[18–20]The aim of this study is to compare the efficacies of the commercially available manual toothbrush in controlling debris and calculus.

Aim: To find out the efficacy of three types of toothbrushes on oral hygiene

Objectives

- To assess the efficacy of three types of toothbrushes on oral hygiene
- To compare the oral hygiene among dental students

MATERIALS AND METHODS

- ***Study design****:* cross sectional study
- ***Study setting:*** Al Azhar dental college, Thodupuzha
- ***Study populations/participants****:* final year students
- ***Study period*** *:*JULY2022
- ***Inclusion criteria*** Final year Dental students
- ***Exclusion criteria*** Students with orthodontic braces on tooth
- ***Study design:*** Single centre, Double blind, Parallel, Randomized controlled trial
- ***Sampling method:*** Simple random sampling
- ***Sample size estimation:***

Estimated sample size- $\frac{(Z\alpha + Z\beta)^2 \times 2 \times S^2}{d^2}$

$Z\alpha/2$ = 1.96 (95% confidence, 5 % alpha error, two tailed test)

$Z\beta$ = 1.28 (10 % beta error, power 90%)

S= Standard deviation=0.4 (pilot study)

Expected difference (d)=0.5

Sample size=

$$\frac{(1.96+1.28)^2 \times 2 \times 0.4^2}{0.5^2} = \frac{10.5 \times 0.16}{0.25} = 6.86 \approx 10$$

Estimated sample- 30 (10 each group)

Informed consent: All participants were explained about the purpose and design of the study. Participant assent was taken before the study. The permission to carry out the study in college was obtained from the Head of the college

Pilot study

Method Of Collection Of Data: Study subjects were selected based on inclusion and exclusion criteria. A total of 48 participants from Al Azhar Dental College were selected.

Randomization: The procedure of randomization was as follows. Selected participants were assembled and asked to select folded card from the box where 48 cards were kept in which names of the group were written (Group A, Group B and Group C). Each participant took one folded card from the box and handed over to the investigator. Thus participants were allocated to 3 groups

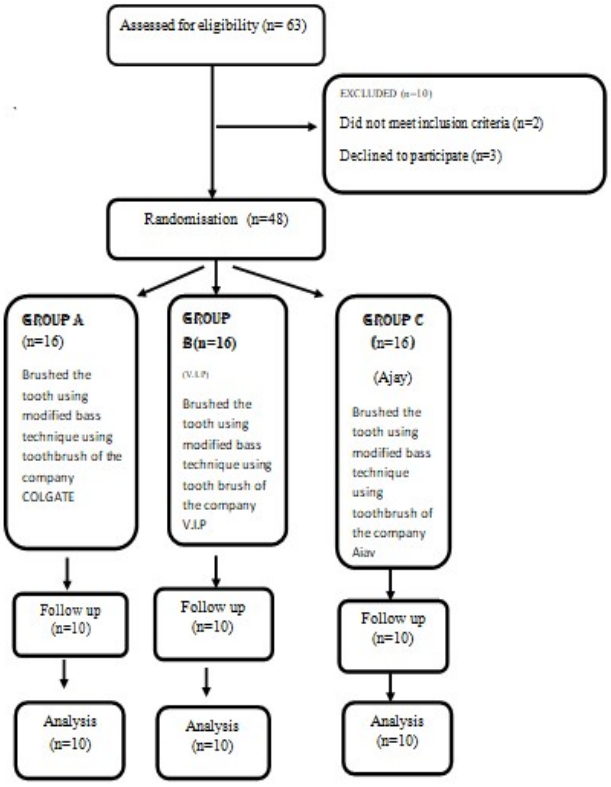
Blinding: First investigator allocated the students into three groups and distributed toothbrushes of three different companies to the participants, name of which is not revealed to the participants. Second investigator who was trained and calibrated and who was blind to group allocation did the assessment of clinical measures at baseline and after intervention.

Study procedure: A randomized double-blind clinical trial was conducted to compare the efficacies of manual toothbrushes in controlling debris and calculus over a 3 days period. The sample consisted of 45 dentalstudents of both sexes, with ages ranging from 18 to 28 years. The samples were stratified and randomized to one of the three tooth brush brands ,using the coin toss method by a second examiner who was not involved in the recording of clinical parameters. Among 45 participants, 15 were excluded and the remaining 30 underwent randomization.Group A comprised 10 individuals who were assigned to use the toothbrush of the brand colgate and were instructed to use the Modified Bass method of brushing.Group B comprised 10 individuals who were assigned to use VIP brand toothbrush and group 3 comprised 10 individuals who were assigned to use the tooth brush of the brand AJAY and all were instructed to use modified bass technique for brushing.

Test groups: The members of the each group were instructed to brush using modified bass technique gor 1 minute.

Recording of Clinical parameters: The study was conducted using the oral hygiene index- simplified put forward by John C Greene & Jack R Vermillion in the year 1964. The participants were examined and scored with the index , and interpretation was done accordingly.

FLOW CHART



Statistical Analysis: Data will be analyzed using the statistical package SPSS 22.0 (SPSS Inc., Chicago, IL) and level of significance will be set at $p<0.05$. Descriptive statistics will be performed to assess the mean and standard deviation of the respective groups. Normality of the data will be assessed using Shapiro Wilkinson test. Inferential statistics to find out the difference between the groups will be done using One way ANOVA test and followed by TUKEY'S POST HOC analysis. Proportion will be analysed using chi square test.

Table 1. Mean age of the study participants

Brand names	Mean	SD
Colgate(n=10)	20.24	1.84
VIP(n=10)	21.67	1.78
AJAY(n=10)	21.93	1.23

Table 1 explains the mean age of the study participants. The mean age group of the participants who used colgate is 20.24 with a standard deviation of 1.84. The mean value and standard deviation of the participants who used VIP are 21.67 and 1.78 respectively , whereas AJAY users have a mean age value of 21.93 with a standard deviation of 1.23.

Table 2. Gender distribution of the study participants

Brand names	Male(n=8)	Female(n=22)
Colgate(n=10)	2(20%)	8(80%)
VIP(n=10)	1(10%)	9(90%)
AJAY(n=10)	5(50%)	5(50%)

Table 2 gives the data about the gender distribution of the study participants. 80 % of the participants who used colgate were female and 20% were male. Those who used VIP were 90 % female and 10 % male while the gender distribution in the participants who used AJAY were equal.

Table 3. Mean OHIS of the study participants

Brand names	Mean	SD
Colgate(n=10)	1.7	0.45
VIP(n=10)	1.8	0.88
AJAY(n=10)	2.1	0.75
P VALUE(ANOVA)	0.467	

P<0.05 is statistically significant

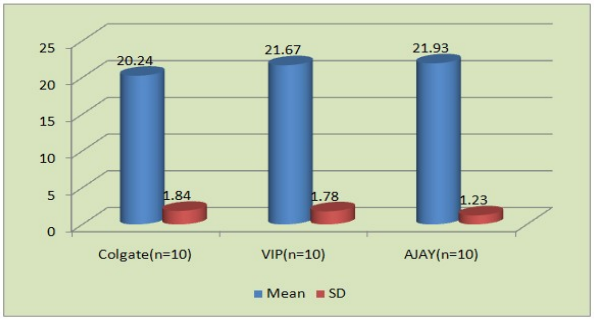
Table 3 summarises the mean OHI-S of the study participants. The participants who used tooth brushes of the brand colgate have a mean OHI-S value of 1.7 with a standard deviation of 0.45. the mean OHI-S value and standard deviation of the participants who used the brand VIP are 1.8 and 0.88 respectively,whereas AJAY users have a mean OHI-S value of 2.1 with a standard deviation of 0.75.

Table 4. OHI-S categories

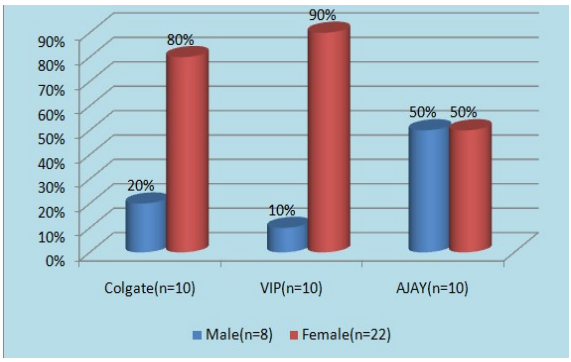
Brand names	GOOD	FAIR	POOR
Colgate(n=10)	3(30%)	4(40%)	3(30%)
VIP(n=10)	4(40%)	2(20%)	4(40%)
AJAY(n=10)	3(30%)	3(30%)	4(40%)
P value (chi square)	0.67		

P<0.05 is statistically significant

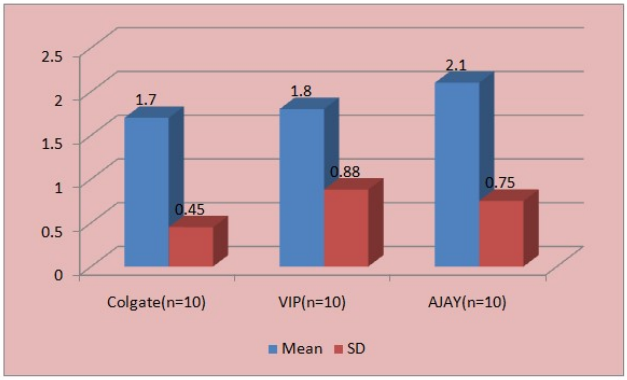
Table 4 explains the interpretation of the OHI-S values by categorising the values into good , fair and poor. The oral hygiene status of 30 % of the colgate brand users were good , 40 % were fair and 30 % were poor .40% of the VIP users have a good oral hygiene status and 20 % have a fair status and 40 % were poor .the oral hygiene status of 30% of the AJAY brand users were good , 30 % were fair and 40 % were poor.



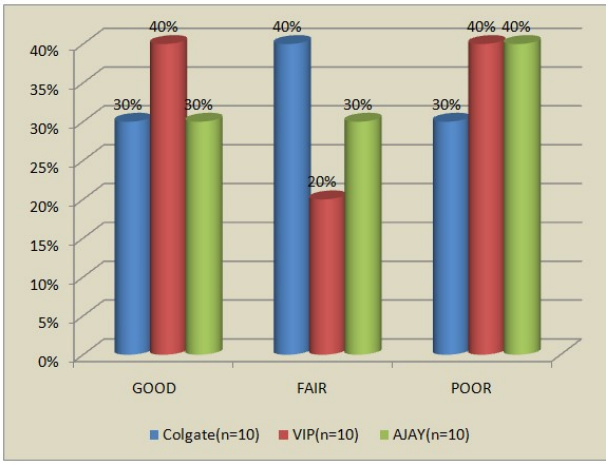
Graph 1. Mean age of the study participants



Graph 2. Gender distribution of the study participants



Graph 3. Mean OHIS comparison



Graph 4. OHIS categories

Limitations

- Small sample size and short duration of the trial
- The study is a single centre trial where the participants lack heterogenicity

RECOMMENDATIONS

- A longer duration trial where the full effect of plaque could be tested
- Across over design would be better to understand the efficacy of the toothbrushes.
- A large sample would give a better understanding of the causal relationship.

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