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COMPARATIVE EVALUATION OF HERBAL AND NON HERBAL TOOTHPASTE ON SCHOOL CHILDREN

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ABSTRACT

Aim: This study was done to evaluate the effect of herbal and non herbal toothpastes in reduction of plaque and gingivitis in children aged 8 – 15 years. *Materials & Methods***:** A total of 80 participants were selected for the study, who met both the inclusion and exclusion criteria and divided into 4 subgroups [Herbal toothpaste (Daubar red & Vicco Vajradanthi) and Non - Herbal toothpaste (Colgate kids & Pediflor)] with 20 samples in each group. The children were instructed to brush their teeth using Fone's and bass method of brushing technique. Evaluation of toothpastes was done based on plaque and gingivitis indices at follow up period. *Results:* The present study showed reduction of plaque and gingivitis in children in both the groups but no statistically significant difference was found on intra and inters group comparison. *Conclusion:* Present study indicated the effectiveness of both herbal and non herbal toothpastes in reducing plaque and gingivitis. It is well known that ingredients of

conventional toothpaste has adverse effects whereas herbal toothpastes has not have any reported side effects. Hence it can be safely advised in children for improving oral health.

KEYWORDS: Gingivitis, Herbal toothpaste, Non Herbal toothpaste, Plaque.

INTRODUCTION

Oral health is an integral to general health and relates to the quality of life that extends beyond the functions of the orofacial complex. The link between oral diseases and the activities of microbial species that form part of the microbiota of the oral cavity is well-established.[1]

Toothpastes are daily oral care products, the chemical composition of which is constantly changing due to manufacturer's competition. Toothpastes are recognized as the best source of fluoride, which effectively protects both deciduous and permanent teeth from caries.[2] However, fluorides are not only the active ingredients in toothpastes, but also important are the cleaning abilities of toothpaste provided by abrasives, the antibacterial qualities, which, in turn, are provided by a variety of substances with different abilities to inhibit the growth of germs in the oral cavity, as well as a number of ingredients with specific purposes to solve specific problems. The wide selection of toothpastes and the various ingredients make it difficult for patients to choose the proper toothpaste and complicate the acquisition of dental products by professionals.[3]

Daily use of an anti-plaque compound, especially a formulated form in toothpaste, can be very beneficial in plaque control. The most important of these compounds are herbal extracts, metallic salts and phenolic compounds. All of these groups has demonstrated positive results in clinical and laboratory studies. Herbal extracts have received special attention because of being non-chemical and non-synthetic, and they have been long used in traditional medicine.[4]

Because of increased risk of toxicity and sensitivity of non – herbal tooth pastes which make the new generation to think for alternative herbal toothpastes. But there is lack of research on herbal toothpastes. Very limited data are available on efficacy of herbal over non herbal toothpaste on children. Hence the present study was undertaken to evaluate and compare the antiplaque efficacy of herbal over non herbal toothpaste in school children.

MATERIALS AND METHODOLOGY

A single blind clinical comparative study on children to evaluate the efficacy of herbal and non-herbal toothpastes was conducted in Vanitha Vidyalaya School, Shimoga, Karnataka. Evaluation of efficacy of toothpastes was done based on plaque and gingivitis scores. Ethical clearance for the study was obtained from the Institutional ethical committee of Sharavathi dental college and hospital, Shimoga. Informed consent was obtained from the participating children's parent / guardian.

A total of 80 healthy children aged 8 – 15 years were selected for the study, who met both the inclusion and exclusion criteria and divided into 4 subgroups with 20 samples in each group. Inclusion criteria were; gingivitis less than stage II in their base line data, free from dental caries and absence of any other abnormalities like, fluorosis, enamel hypoplasia, fractured tooth. Exclusion criteria were; individuals with stains and calculus with overt periodontitis, any faulty restoration in the gingival third of the tooth**,** oral infections and sensitive teeth, long term drug therapy or known allergic to any medications and mouth breathing children.

The participants were randomly allocated with either herbal or non-herbal by a non – investigator and toothpaste and toothbrush were distributed accordingly to all the participating children and were instructed to brush their teeth using Fone's and bass method of brushing technique as per age group. The toothpaste grouping were done as follows: Group I =Vicco Vajradanthi (Herbal toothpaste), Group II= Daubar red (Herbal toothpaste), Group III = Colgate kids (Non - Herbal toothpaste) and Group IV = Pediflor (Non - Herbal toothpaste).

A single calibrated evaluator examined all the study subjects for oral health status using gingival index (Loe and Sillness 1963) and plaque index (Sillness and Loe1967). All the study subjects were asked to rinse their oral cavity with Alpha Plac (two tone plaque detecting dye) during base line, 1st and 2 months for examination. The index teeth were selected as described by Gujjar K R *et al* in their study.[5] The plaque index, used to assess the plaque thickness at the tooth's gingival area and recorded for each tooth in 4 possible surface areas: the (1) distofacial; (2) facial; (3) mesiofacial; and (4) lingual. A mouth mirror and explorer were used after rinsing their oral cavity with Alpha Plac dye, to assess plaque in the plaque index. All the teeth in each subject of the control and experimental groups were assessed. The criteria for the plaque index of Silness and Löe was used.[6]

The plaque and gingival index score for the area was obtained by totaling the 4 plaque or gingival scores per tooth. The sum of the index per tooth was divided by 4 to obtain the index score for the tooth. The index score per person was obtained by adding the index scores per tooth and dividing by the number of teeth examined.

RESULTS

Results were tabulated and statistically analysed using statistical software SPSS statistical software version 21 by IBM Corporation and using Friedman's test, Wilcoxon signed –rank tests, Mann Whitney U-test and Kruskal –Walli's Anova tests.

Friedman's test was used to evaluate gingival and plaque index at baseline, 1st month and 2nd month for all the tested toothpaste groups at significance of $p<0.001$. Further it was evaluated with post hoc analysis with Wilcoxon signed –rank test with a Bonferroni correction resulting in a significance level set at $p<0.017$.Intra group comparisons were done using Mann Whitney U-test and inter group comparison of all the toothpaste was done with Kruskal – Walli's Anova and further analyzed with Mann Whitney U-test with significance level of $p>0.001$.

In group I (Vicco), gingival score form baseline, 1st month and 2nd month were 0.75(0.60 to 1.045), 0.50(0.50 to 0.7375), 0.30(0.04 to 0.60) respectively. Plaque score for baseline, 1st month and 2nd month were 0.75(0.50 to 0.90), 0.50(0.40 to 0.7875), 0.40(0.2425 to 0.50) respectively. [TABLE 1].

In group-II (Dabur red), gingival score form baseline, 1st month and 2nd month were 0.815(0.7375to 1.00), 0.70(0.5225 to 0.80), 0.50(0.375 to 0.5925) respectively. Plaque score for baseline, 1st month and 2nd month were 0.65(0.50 to 0.80), 0.675(0.575 to 0.80), 0.40(0.30 to 0.60) respectively. [TABLE 2].

In group-III (Colgate kids), gingival score for baseline, 1st month and 2nd month were 1.00(0.80 to 1.065), 0.75(0.60 to 0.90), 0.45(0.08 to 0.725) respectively. Plaque score for baseline, 1st month and 2nd month were 0.90(0.80 to 1.005), 0.60(0.50 to 0.70), 0.50(0.215 to 0.70) respectively. [TABLE 3].

In group-IV (Pediflor), gingival score for baseline, 1st month and 2nd month were 0.80(0.75 to 1.06), 0.70(0.50 to 0.79), 0.50(0.25 to 0.70) respectively. Plaque score for baseline, 1st month

and 2nd month were 0.90(0.70 to 1.07), 0.60(0.50 to 0.75), 0.40(0.40 to 0.60) respectively.[TABLE 4].

A Kruskal- Walli's ANOVA have been performed for Gingival and Plaque scores of baseline, 1st month and 2nd month to check for overall difference in the effect of all the four tooth pastes. Statistically there was no significant difference between the groups except for Gingival at 1stmonth (χ^2 (3) =8.25 & p-value<0.05) and plaque during baseline (χ^2 (3) =14.82 & p-value<0.01) [TABLE 5].

Post hoc analysis with Mann-Whitney "U" tests was conducted with a Bonferroni correction applied, resulting in a significance level set at p<0.0083. Even though there was an overall difference in Gingival at 1st month score and Plaque during baseline score between the tooth pastes, but in Post hoc analysis the significant difference can be seen only in Plaque baseline values between Colgate Kids and Dabur Red and also Pediflor and Dabur Red(p<0.0083).

Legends for Illustration

Tables

TABLE 1: GINGIVAL HEALTH STATUS AND PLAQUE SCORE FROM BASELINE TO 2ND MONTH IN VICCO VAJARADANTHI

Friedman's Test

Vicco	N	Quartiles			Interquartile range	Test Statistic	p-value
		Q1	Median	Q3			
Gingival baseline	28	0.60	0.75	1.045	0.445	$\chi^2(2)=45.72$	p<0.001
Gingival 1st month	28	0.50	0.50	0.7375	0.238		
Gingival 2nd month	28	0.04	0.30	0.60	0.56		
Plaque baseline	28	0.50	0.75	0.90	0.40		
Plaque 1st month	28	0.40	0.50	0.7875	0.39		
Plaque 2nd month	28	0.2425	0.40	0.50	0.26		

Note:P<0.001, N- number.

TABLE 2: GINGIVAL HEALTH STATUS AND PLAQUE SCORE FROM BASELINE TO 2ND MONTH IN DABUR RED

Friedman Test

Dabur red	N	Quartiles			Interquartile range	Test Statistic	p-value
		Q1	Median	Q3			
Gingival baseline	26	0.7375	0.8150	1.00	0.26	$\chi^2(2)=28.0$	p<0.001
Gingival 1month	26	0.5225	0.70	0.80	0.28		
Gingival 2month	26	0.3750	0.50	0.5925	0.22		
Plaque baseline	26	0.50	0.65	0.80	0.30		

Plaque 1month	26	0.575	0.675	0.80	0.23		
Plaque 2month	26	0.30	0.40	0.60	0.30		

Note: N-number, p<0.01.

TABLE: 3 GINGIVAL HEALTH STATUS AND PLAQUE SCORE FROM BASELINE TO 2ND MONTH IN COLGATE KIDS

Friedman's Test

Colgate Kids	N	Quartiles			Interquartile range	Test Statistic	p-value
		Q1	Median	Q3			
Gingival baseline	21	0.80	1.00	1.065	0.27	$\chi^2(2)=35.73$	p<0.001
Gingival 1month	21	0.60	0.75	0.90	0.30		
Gingival 2month	21	0.08	0.45	0.725	0.65		
Plaque baseline	21	0.80	0.90	1.005	0.21		
Plaque 1month	21	0.50	0.60	0.70	0.20		
Plaque 2month	21	0.215	0.50	0.70	0.49		

TABLE 4: GINGIVAL HEALTH STATUS AND PLAQUE SCORE FROM BASELINE TO 2ND MONTH IN PEDIFLOR

Friedman's Test

Pediflor	N	Quartiles			Interquartile range	Test Statistic	p-value
		Q1	Median	Q3			
Gingival baseline	27	0.75	0.80	1.06	0.31	$\chi^2(2)=34.81$	p<0.001
Gingival 1month	27	0.50	0.70	0.79	0.29		
Gingival 2month	27	0.25	0.50	0.70	0.45		
Plaque baseline	27	0.70	0.90	1.07	0.37		
Plaque 1month	27	0.50	0.60	0.75	0.25		
Plaque 2month	27	0.40	0.40	0.60	0.20		

TABLE 5: INTER GROUP COMPARISION BETWEEN ALL THE TOOTHPASTE

Comparison between all the groups (Kruskal –Walli'sAnova)

	paste	N	Q1	Median	Q3	Interquartile Range	$\chi^2(3)$	p-value
Gingival baseline	Colgate kids	21	0.80	1.00	1.065	0.27	3.957	0.266
	Pediflor	27	0.75	0.80	1.06	0.31		
	Vicco	28	0.60	0.75	1.045	0.445		
	Dabur red	26	0.7375	0.8150	1.00	0.26		
Gingival 1month	Colgate kids	21	0.60	0.75	0.90	0.30	8.252	0.041*
	Pediflor	27	0.50	0.70	0.79	0.29		
	Vicco	28	0.50	0.50	0.7375	0.238		
	Dabur red	26	0.5225	0.70	0.80	0.28		
Gingival 2month	Colgate kids	21	0.08	0.45	0.725	0.65	2.151	0.542
	Pediflor	27	0.25	0.50	0.70	0.45		
	Vicco	28	0.04	0.30	0.60	0.56		
	Dabur red	26	0.3750	0.50	0.5925	0.22		

Plaque baseline	Colgate kids	21	0.80	0.90	1.005	0.21	14.821	0.002*
	Pediflor	27	0.70	0.90	1.07	0.37		
	Vicco	28	0.50	0.75	0.90	0.40		
	Dabur red	26	0.50	0.65	0.80	0.30		
Plaque 1month	Colgate kids	21	0.50	0.60	0.70	0.20	6.163	0.104
	Pediflor	27	0.50	0.60	0.75	0.25		
	Vicco	28	0.40	0.50	0.7875	0.39		
	Dabur red	26	0.575	0.675	0.80	0.23		
Plaque 2month	Colgate kids	21	0.215	0.50	0.70	0.49	3..490	0.322
	Pediflor	27	0.40	0.40	0.60	0.20		
	Vicco	28	0.2425	0.40	0.50	0.26		
	Dabur red	26	0.30	0.40	0.60	0.30		

DISCUSSION

In the present study we have compared herbal toothpaste; (Dabur Red and Vicco Vajaradanthi) with non herbal toothpastes (Pediflor and Colgate kids) based on gingival and plaque score at baseline, 1st month and 2nd month follow up visits.

Various herbal medicines used in herbal toothpastes known to have several advantageous in improving oral health. Several herbal medicaments (In Dubar red tooth paste) such as Black pepper (*Piper nigrum*) and Clove oil (*Syzygium aromaticum*) which are effective against toothache, pyorrhea and gum bleeding. Ginger (*Zingiber officinale*) - as a sialogogue, to promote salivation[7], Suterberry (*Zanthoxylum armatum*), Spearmint (*Mentha spicata*)[8] and Garlic powder *(Allium sativum)* is known to have antibacterial, antifungal and antiproteolytic activity.[9,10]

Walnut (*Juglansregia*), jambul (*Eugenia jambolana*) and lavang (*caryophyllus aromaticus*) – helps in control of plaque and halitosis, cinnamon (*Cinnamomum cassia*)-is found to have astringent and haemostatic properties which prevents and minimize bleeding of gums. Porcupine (*Barleriaprionitis*), Beleric Myrobalans (*Terminalia belerica*), Chebulic Myrobalan (*Terminalia chebula*), Sweet wood (*Glycyrrhiza glabra*), Sappan Wood (*Caesalpinia sappan*)-strengthens gums. Indian Medlar (*Mimusopselengi*) and Blackberry (*Syzigium Jambolanum*) -reduces gingival inflammation. Mayweed plant (*Anacylus pyrethrum*) -has analgesic and antiseptic property. Cubeb (*Zanthoxylum rhetsa*) -reduces pain and inflammation of gums. Carom seeds (*Trachyspermum copticum*) and Indian Gooseberry (*Emblica officinalis*) -is enriched with vitamin C, which gives firmness to the gums and teeth.[11]

In the present study herbal toothpastes (Vicco Vajaradanthi and Dabur Red) showed significant reduction in plaque and gingivitis but it was not statistically significant between the herbal groups (Table-1 & 2). Several researchers similar to our study observed reduction in gingivitis and plaque with herbal toothpaste at follow up visits.[12,13]

Birgit Arweiler N *et al* concluded from their study that, subjects of the fluoride group developed gingivitis[14], while in the herbal group it was significantly reduced at all follow-up appointments. Abdulwahab I *et al*[15] and Pannuti C *et al*[16] who observed no difference between the dentifrices in the reduction of plaque and gingivitis.

In our study, the plaque and gingival index were significantly reduced in conventional fluoride containing toothpaste but no statistically significant difference was found on intergroup comparison (Table-3&4). Similar to our study many researchers observed reduction of plaque and gingivitis with use of non herbal toothpaste containing fluoride, triclosan and chlorhexidine.[17,18]

Colgate toothpaste has sodium fluoride as the active ingredients. They are anti-caries agents and prevent the formation of cavities in teeth. Silica has abrasive quality. Toothpastes must have abrasive to remove plaque, stains and debris. It doesn't scrape tooth enamel nor damages gums.[12]

A Kruskal- Walli's ANOVA test when performed for all four groups indicated statistically no significant difference between the groups except for Gingivitis at 1st month (χ^2 (3) =8.25 & p-value<0.05) and plaque during baseline (χ^2 (3) =14.82 & p-value<0.01) (Table-5).

Radafshar G *et al* stated from their study that herbal toothpastes were more effective against plaque regrowth compared to a conventional (fluoride containing) dentifrice.[19] Ralston D *et al* conducted a study to evaluate efficacy of a dental gel containing 2.6% Edathamil (metal chelator) in controlling dental plaque to that of a commercially available dentifrice containing 0.3% triclosan, 2.0% PVM/MA copolymer, and 0.243% sodium fluoride. They stated that gel containing 2.6% Edathamil provides a greater level of efficacy for the control of dental plaque biofilm than does a dentifrice containing 0.3% triclosan/2.0% PVM/MA copolymer/0.243% sodium fluoride.[20]

In accordance to our study Estafan D *et al* found no statistically significant difference between Herbal Toothpaste, Gum Therapy and Colgate Total for gingivitis and gingival

bleeding. Herbal Toothpaste and Gum Therapy produced statistically significant differences in reducing plaque and stain relative to Colgate total. The results obtained in their study support the clinical efficacy of both products in reducing gingivitis and plaque, and demonstrate the efficacy of Herbal Toothpaste and Gum Therapy in maintaining reductions of plaque.[21] Similar results were observed by Mullaly[22] *et al* and George J[23] *et al* who have found a significant reduction in both plaque and gingival index within the group but no significant difference was found between the groups when compared with herbal toothpastes and conventional toothpaste. Ganavadiya *et al* found that both low and high cast dentifrices were equally effective in reduction of plaque and gingivitis.[24] Smolarek P C *et al* evaluated the antimicrobial effects of commercial toothpastes containing natural compounds. They observed no difference with tooth paste containing propolis, sorbitol and mint/açai compared to mint/guarana ($P > 0.05$) positive control.[25]

Many studies have proven effectiveness of herbal toothpaste in prevention of oral diseases similar to our study but most of the studies are done for short duration and are *in-vitro* studies.[26-28] Plaque formation takes place in 14 days and we have evaluated over a period of 2 months. To avoid bias, we have not used other oral hygiene aids during the study period.

Herbal toothpaste contains many medicaments which help in prevention of oral diseases. Walnut, Jambul, Lavang, catechu, jujube fruit and Bengal madder have the potential of prevention of plaque and gingivitis. These ingredients have medicinal value which has no side effects and cross reactions. Which in combination would have synergism effect on improving oral health.[29, 30]

Several ingredients of non herbal toothpaste have advantages and disadvantages. It has been observed that addition of triclosan to toothpaste leads to cardiovascular diseases, formation of hepatic lesion when administered in dose of 125mg/kg for 13 weeks,[31,32] and excess consumption of fluoride can lead to development of fluorosis of teeth[33]. Fluoride containing toothpaste is effective only in areas where fluoride is depleted and not where there is fluoride is in excess. Allergic reactions are also seen in some conventional toothpaste.

A thorough exploration of available literature revealed very few studies in which different herbal dentifrices were compared with fluoride-containing dentifrice on children. In our study we have found reduction of plaque and gingivitis using herbal and non herbal toothpaste at

baseline and 2nd month of follow up. But on inter group comparison it was statistically not significant (Table 5). Similar observations were found in many studies.[12,13,34]

Preventive procedure started at early age in children can be carried throughout the once life time. It helps to achieve caries free generation and to reduce financial burden on patient from expensive dental procedures. Hence present study was undertaken to evaluate the efficacy of both herbal and non herbal toothpaste on reduction of gingivitis and plaque on children. Effective reduction of plaque and gingivitis was seen in both the tested groups. Hence herbal toothpaste can be advised in children for improving oral health.

In the present study the lesser sample size was the drawback. Further long term clinical studies are required to evaluate the efficacy of herbal toothpaste on oral health on larger sample size along with microbiological evaluation.

CONCLUSION

Following conclusion were drawn from this study; a) both non herbal and herbal toothpaste were effective in reduction of plaque and gingivitis in children, b) herbal toothpastes with its medicinal values can be advised to children safely as an alternative to non herbal toothpaste. However the results of the present study should be corroborated with further investigation to reach a definitive conclusion.

Conflict of interest: NIL.

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