International Journal of Medical Research Professionals

Original Article

Effectiveness of Herbal and Non-Herbal Fluoridated Toothpaste on Plaque and Gingivitis: A Clinical Comparative Study

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Article History
Received: 13 Aug 2015
Revised: 02 Sept 2015
Accepted: 22 Sept 2015

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ABSTRACT

Introduction: Ancient Egyptians, Greeks and Roman civilization were known to make their own tooth "powder" containing pumice, talcum, coral powder. *W.D. Miller* ushered a new revolution in the science of preventive dentistry in 1890 when he elaborated his chemico-parasitic theory of tooth decay. This new aetiological theory created an impact in the toothpaste industries so that every manufacturer started incorporating special agent/agents. The more modern aspect of dentifrice came after the second world war and with greater knowledge about the pathogenesis of periodontal disease. Chemicals like triclosan and chlorhexidine, have been added in mouth rinses and dentifrices known to prevent plaque and gingivitis. But some of these substances show adverse effects such as staining of the tooth and dysgeusia. This had led the path to pay increased attention towards naturally available ingredients in herbal dentifrices. The aim and objectives of this study are 1. Recording plaque and gingivitis scores of the study participants at baseline, 3 weeks and 6 weeks among 18–30-year-old women. 2. Comparing the efficacy of herbal and fluoridated toothpastes in controlling plaque and gingivitis.

Materials and Methodology: A double-blinded, randomized controlled clinical trial was carried out with 40 participants aged 18–30 years, The pilot study was conducted priorly among 10 participants to test the applicability and feasibility of the protocol. Willing participants with good general health, a regular user of toothbrush and toothpaste, baseline plaque score should be >1–1.9 were included in the study. The exclusion criteria include participants who had undergone any recent antibiotic therapy within a week, history of early onset of periodontitis, acute necrotizing ulcerative gingivitis (ANUG), gross oral pathology, those under antineoplastic therapy, participants who wore orthodontic appliances, fixed or removable prosthetic appliances. 40 participants were eligible to participate and then they were randomly divided into two groups that is, control group (fluoridated dentifrice [n = 20]) and experimental group (herbal dentifrice [n = 20]) by a coin toss method.

Results: All 40 study subjects (20 males and 20 females) completed the 30-day study period. Reduction of plaque and gingivitis from 0 to 30 days was statistically significant in both the groups. Statistically, there was no significant difference between the two groups. No adverse reactions to dentifrices products were observed during the trial. There was a reported significant reduction of dentifrice tube weights between days 0 and 30 in both the groups ($P < 0.001$), which showed that volunteers actually used the toothpastes.

Conclusion: It can be concluded that herbal dentifrices are as effective as non-herbal (conventional) dentifrices in the process of controlling plaque and gingivitis. Addition of certain chemical agents in dentifrices aids in plaque control and helps in improvement of oral health.

KEYWORDS: Dentifrice, Herbal, Non-Herbal, Gingivitis.

INTRODUCTION

It is a proven fact that dental caries and periodontal diseases are the two arch criminals of the oral cavity which are essentially caused by the microorganisms present enormously in the dental plaque.[1] The application of toothpaste has ancient and traditional roots. Ancient Egyptians, Greeks and Roman civilization were known to make their own tooth "powder" containing pumice, talcum, coral powder.[2] *W.D. Miller* ushered a new revolution in the science of preventive dentistry in 1890 when he elaborated his chemico-parasitic theory of tooth decay. This new aetiological theory created an impact in the toothpaste industries so that every manufacturer started incorporating special agent/agents. The more modern aspect of dentifrice came after the second world war and with greater knowledge about the pathogenesis of periodontal disease.[2] Dental plaque majorly composed of two main components such as bacterial aggregations and pellicle. It is well-established that the microorganisms in plaque produce numerous enzymes, toxins and lipopolysaccharides. And these are known to produce substantial changes in the periodontium.[2] There is increased evidence to implicate dental plaque as the primary etiological factor responsible for periodontal disease and caries.[3] There are various studies conducted globally which have proven the incidence and prevalence of periodontal disease are high and when dental plaque is virtually present.[4] Various clinical studies have been conducted related to the removal of plaque and remission of gingivitis had gained huge importance as support for a definite relationship between plaque and gingivitis and for the belief that it is a significant factor in the maintenance of gingival health.[5]

Chemicals like triclosan and chlorhexidine, have been added in mouth rinses and dentifrices known to prevent plaque and gingivitis. But some of these substances show adverse effects such as staining of the tooth and dysguesia.[6,7] This had led the path to pay increased attention towards naturally available ingredients in herbal dentifrices. Recently, it has been found that the chemical agents and metal ions have their own gross limitations. Thus, it may be seen that the alternative approach is undoubtedly essential for the control and understanding the virtue of plaque inhibition.[6] The studies designed for evaluating the efficacy of the herbal dentifrices and non-herbal dentifrices in plaque control and gingivitis prevention are few in number. Therefore, the aim of this study was to compare the efficacy of an herbal dentifrice with a fluoridated dentifrice in plaque control and gingivitis prevention. The aim and objectives of this study are 1. Recording plaque and gingivitis scores of the study participants at baseline, 3 weeks and 6 weeks among 18–30-year-old women. 2. Comparing the efficacy of herbal and fluoridated toothpastes in controlling plaque and gingivitis.

MATERIALS AND METHODOLOGY

A double-blinded, randomized controlled clinical trial was carried out with 40 participants aged 18–30 years, The pilot study was conducted priorly among 10 participants to test the applicability and feasibility of the protocol. Based on the results of the pilot study, some minor changes were made in the protocol which were meant to be used in the main study. Institutional Ethical approval was obtained. Written informed consent was received from all the study participants included in the study. Since it is a double blinded study. all the participants and the outcome assessor were blinded and the actual toothpaste received by the participants. Willing participants with good general health, a regular user of toothbrush and toothpaste, baseline plaque score should be >1–1.9 were included in the study. The exclusion criteria include participants who had undergone any recent antibiotic therapy within a week, history of early onset of periodontitis, acute necrotizing ulcerative gingivitis (ANUG), gross oral pathology, those under antineoplastic therapy, participants who wore orthodontic appliances, fixed or removable prosthetic appliances. Based on the inclusion and exclusion criteria, only 40 participants were eligible to participate and then they were randomly divided into two groups that is, control group (fluoridated dentifrice [n = 20]) and experimental group (herbal dentifrice [n = 20]) by a coin toss method. The allocation sequence was generated randomly and completely concealed from the main investigator. The investigator and the study participants were unaware of allocated groups of both toothpastes. Participants in control group received a Close-up Anticavity toothpaste in which each tube contains 100 g (water, sorbitol, calcium carbonate, hydrated silica, sodium lauryl sulfate, trisodium phosphate, benzyl alcohol, sodium monofluorophosphate, cellulose gum, PEG-32) and participants in experimental group received a Himalaya Dental Cream and each tube contains 100 g (Punica granatum - 2.57 mg, Zanthoxylum alatum - 1–0.8 mg, Acacia Arabica - 1.71 mg, Embelia ribes - 1.71 mg, Vitex negundo - 1.14 mg, Vaikranta bhasma - 2 mg, Azadirachta indica - 1.44 mg, Carum Copticum - 1 mg, Pilu, Irimeda, Saccharine sodium).

The data obtained from the study were compiled, analysed and subjected to statistical analysis. Data obtained were analysed using Statistical Package for the Social Sciences (SPSS) version 21 manufactured by IBM Corporation –Armonk, New York, US. Student t-test and unpaired t-test was applied to evaluate between inter-group differences. P value of less than or equal to 0.05 had been considered as statistically significant.

RESULTS

All 40 study subjects (20 males and 20 females) completed the 30-day study period. There was no

significant difference between both the groups for plaque and gingivitis at the baseline period. At baseline, the PI median score for herbal and non-herbal groups was 2.71 and 2.5, respectively. Baseline values for gingival index in herbal and non-herbal groups were 1.33 and 1.23, respectively. At 30 days, both test and control groups showed 18.8% and 17.4% reduction of plaque and 27.3% and 38.4% reduction of gingivitis respectively. Reduction of plaque and gingivitis from 0 to 30 days was statistically significant in both the groups which were tabulated in Tables 1 and 2.

Statistically, there was no significant difference between the two groups. No adverse reactions to dentifrices products were observed during the trial. There was a reported significant reduction of dentifrice tube weights between days 0 and 30 in both the groups ($P < 0.001$), which showed that volunteers actually used the toothpastes [Table 3]

Table 1: Comparison of Plaque Index between groups or inter-group comparison

Statistics [Mean ± SD Median]	Herbal (n=20)	Non – herbal (n=20)
Day 0	2.32±0.75 2.71	2.42±0.68 2.55
Day 30	2.3±0.45 2.5	2.24±0.48 2.4
P – value	0.92	0.65

Table 2: Comparison of GI between groups or inter-group comparison

Statistics [Mean ± SD Median]	Herbal (n=20)	Non – herbal (n=20)
Day 0	1.55±0.22 1.33	0.98±0.35 0.90
Day 30	1.33±0.20 1.23	1.35±0.20 0.04
P – value	0.008	0.001

Table 3: Comparison of weights of dentifrices tubes (in grams) between groups or inter-group comparison using Student's t-test

Statistics [Mean ± SD Median]	Herbal (n=20)	Non – herbal (n=20)
Day 0	87.4	36.2
Day 30	126.4	70.3
P – value	<0.001	<0.001

DISCUSSION

As the literature stated that the dental plaque is the main culprit for initiation of gingival inflammation and dental caries. Chronic gingivitis may lead to tissue destruction and if it left untreated, may progress into the more destructive stages of periodontitis.[6] Hence, plaque and gingivitis control measures help in the proper maintenance of healthy oral cavity. This can be achieved greatly effectively by mechanical plaque control methods such as toothbrush and medicated toothpastes. The prime purpose of this study was to evaluate the efficacy of herbal dentifrice and non-herbal fluoridated in the control of plaque and gingivitis. Therefore, the content of the products was not our main focus; rather it was the preventive effect of dentifrices. All 40 study subjects (20 males and 20 females) completed the 30-day study period. There was no significant difference between both the groups for plaque and gingivitis at baseline period. At baseline, the PI median score for herbal and non-herbal groups was 2.71 and 2.5, respectively. At 30 days, both test and control groups showed 18.8% and 17.4% reported a significant reduction in the levels of plaque, respectively. Plaque reduction was statistically significant in both the groups at baseline as well as at 30 days (for herbal group $P = 0.016$ and for non-herbal group = 0.002) [Table 1].

Herbal dentifrice was equally effective with the conventional one in plaque reduction. This is in concordance with the reports of *Ozaki* et al (19.9% and 18.3% reduction for herbal and non-herbal dentifrices) and Sushma et al (60.36% and 59.89% reduction for herbal and non-herbal dentifrices).[9,10] Similar results were observed by *de Oliveira* et al with the herbal product Aloe vera reported well in plaque reduction.[7] Various other studies concluded the effectiveness of herbal dentifrices in plaque control, compared to the conventional one.[11-13] At 30 days, both test and control groups showed 27.3% and 38.4% reduction of gingivitis, respectively. There was no statistically significant difference between the groups. Reduction of gingivitis was statistically significant in both the groups from baseline to 30 days (for herbal 0.008 and for non-herbal < 0.001), which shows that the volunteers had actually used the toothpastes provided to them [Table 3]. This is in concordance with the report of *de Oliveira* et al.[7]

Rubido et al found in their study that the use of medicated toothpaste significantly reduces salivary bacterial count to a greater extent.[14] *George* et al. found out no significant difference between the effects of herbal and conventional toothpastes on salivary pH values.[15] *Saxena* et al found in an in vitro study that herbal dentifrices showed the maximum inhibition zone.[16] The control group composed of fluoride and triclosan ingredients in toothpaste. An antimicrobial agent such as Triclosan has a well-established safety and efficacy. Fluoride has anti-carious effect since some of the ingredients of the conventional toothpastes have undesirable side effects like staining and taste alterations. Hence, natural products have added benefits which are very much are advised for routine usage.[7] Several studies have proven the anti-plaque and anti-gingival effects of herbal toothpaste, which were comparable to those of conventional fluoridated toothpastes.[9-13,15] The present study has made its point clear that herbal dentifrices do not cause any adverse effects on the oral cavity and are equally effective in reduction of plaque and gingivitis, as that of fluoridated non-herbal dentifrice. Several studies have proven the medicinal values of herbal products.[13,15] Hence, medicated herbal toothpastes can be safely used to control plaque and gingivitis. Further long-term studies are needed to substantiate their effectiveness. Limitations of the study were as follows: The sample size followed in this study was relatively small and a clinical trial with longer duration on subjects in the age range of 18–65 years might be required to prove the effectiveness of herbal dentifrice in reduction of plaque and gingivitis in the near future.

CONCLUSION

After 30 days of clinical trial, both the test and control groups showed effective reduction of plaque and gingivitis and the data obtained were statistically significant. No adverse reactions to the ingredients present in the dentifrices were observed during the trial. Therefore, it can be concluded that herbal dentifrices are as effective as non-herbal (conventional) dentifrices in the process of controlling plaque and gingivitis. Addition of certain chemical agents in dentifrices aids in plaque control and helps in improvement of oral health.

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How to cite the article: Gurinder Singh Sodhi, Nishesh Batra. Effectiveness of Herbal and Non-Herbal Fluoridated Toothpaste on Plaque and Gingivitis: A Clinical Comparative Study. Int J Med Res Prof. 2015, 1(2); 171-74.