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Research Report

CURCUMIN AND CAMELLIA: "NOVEL INDIGENOUS ARMOURS"-A PILOT STUDY TO EVALUATE THE EFFICACY OF 5% GREEN TEA MOUTHWASH IN COMPARISON WITH 0.1% TURMERIC MOUTH WASH AS AN ADJUNCT TO ORAL PROPHYLAXIS IN TREATMENT OF PLAQUE INDUCED GINGIVITIS

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ABSTRACT

Introduction: The current era of complementary medicine recommends supplementation of conventional therapy with other adjuncts, by diverse modes of delivery. Many chemical adjuncts to scaling and root planning, though proven to be effective have long-term limitations. The emergence of natural derivatives like green tea with its phenols, antioxidant properties and turmeric with its anti-inflammatory properties may prove to be better substituted to the synthetic derivatives.

Aim: The aim of the present study is to evaluate the efficacy of 5% green tea mouthwash in comparison with 0.1% turmeric mouthwash and their effect on plaque-induced gingivitis.

Method: This pilot study was conducted among 60 subjects aged between 15-40 years who were randomly allocated into two groups. Following oral prophylaxis, group- A subjects used 5% green tea mouthwash and group-B used 0.1% turmeric mouthwash twice daily for 1 week. The efficacy of the formulations was assessed based on clinical parameters like plaque index and gingival bleeding index which were evaluated at baseline and after 1 week.

Results: In this clinical study, all the clinical parameters showed a statistically significant reduction after 1 week with P value (<0.0001). On comparison between green tea and turmeric mouthwash the percentage reduction of the plaque index between 0 and 8th day were 69.73 and 52.49 respectively (P<0.0001), percentage reduction of gingival bleeding index between 0 and 8th day were 66.26 and 56.72 respectively (P< 0.0001).

Conclusion: Both the chemical adjuncts used in this study showed effective anti-plaque and anti-inflammatory properties against plaque-induced gingivitis, with green tea mouthwash showing better results than turmeric mouthwash.

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INTRODUCTION

Gingivitis and periodontitis are multifactorial diseases initiated primarily by interactions between microbial plaque and host immune response.^[1] Dental plaque comprising of more than 300 bacterial species is a proven etiologic factor in the pathogenesis of periodontal diseases.^[2] The most rational method to prevent and cure plaque-induced periodontal disease is by effective and regular plaque removal.^[3] Mechanical plaque control is the conventional method followed and yet it poses certain limitations like time consumption, patient motivation and manual dexterity.^[4] To overcome these limitations the quest for chemical plaque control agents as adjuncts to mechanical plaque control aids has begun. The chemical plaque control agents can be delivered in the form of

gels, mouthwashes, dentifrices, or chewing gums. The common adjunct prescribed is the mouthwash formulation which is a safe and effective delivery system. Many types of mouthwashes have been developed and are commercially available but encompass certain side effects like altered taste, mucosal erosion primarily due to the presence of synthetic derivatives or alcohol content. "Chlorhexidine" the gold standard for chemical plaque control is not without side effects.^[5] On long term use, it causes staining and supragingival calculus formation.^[6] Hence the present era, is focussing on natural substitutes as chemical plaque control agents. Both turmeric and green tea are widely cultivated in Asian subcontinent and established since ages for their extensive pharmacologic properties.^[7,8] Green tea (camellia sinensis), turmeric (curcuma longa) are marvel native defenses that

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embrace innumerable oral health benefits.^[9,10] Hence green tea and turmeric extracts were used in our study as mouthwash formulations to test their efficacy against plaque-induced gingivitis.

Aim

This randomized double-blind clinical trial aims to evaluate the efficacy of 5% green tea mouthwash as an adjunct to oral prophylaxis in comparison with 0.1% turmeric mouthwash in the treatment of plaque-induced gingivitis.

MATERIALS AND METHODS

This is a randomized controlled double-blind study conducted among 100 patients attending the Department of Periodontology, Drs. Sudha & Nageswara Rao Siddhartha Institute of Dental Sciences, Chinnaoutapalli, Gannavaram Mandal, Krishna district. Subjects meeting the following inclusion criteria were enrolled in the study 1) aged 20-40 years 2) presence of ≥ 20 permanent teeth 3) mild to moderate gingivitis as evaluated by Plaque index (Sillness & Loe, 1964)^[11] Gingival bleeding index (Carter and Barnes, 1974)^[12]. Exclusion criteria included 1) patients who used antibiotic therapy during the past 6 months 2) Tobacco users 3) Pregnant and lactating women 4) Subjects with orthodontic or prosthodontic appliances 5) Patients who underwent oral prophylaxis 6 months prior to the study. Preparation of the green tea and turmeric mouthwashes were carried out in a sequential approach at the Departments of Biochemistry & Pharmacology, Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Chinnaoutapalli.

5% Green tea mouthwash and 0.1% turmeric mouthwash formulations were prepared by a sequential approach. Initially, 250 grams of green tea (camellia sinensis) leaves and 50 grams of turmeric (curcuma longa) rhizomes were soaked in 500 ml of methanol for 2 days (48 hrs). The extracts of Green tea leaves and turmeric rhizomes were dried for 2- 3 days (48-72 hrs). The dried extracts were blended, filtered and the fine precipitate was suspended in 5 litres of distilled water to which 0.1% peppermint oil, 10% sucralose, 1% glycerol and 0.2% of sodium benzoate were added as a flavouring agent, sweetener, binding agent and preservative respectively. The prepared mouthwash was mixed homogeneously using a stirring rod and transferred into 100ml bottles dispensed with a measuring cup.

A single examiner evaluated the study population and selected 60 subjects meeting the study criteria. All the clinical parameters (plaque and gingival bleeding indices) were evaluated at baseline by the same examiner and oral prophylaxis (SRP) was rendered to all the 60 subjects. A Second examiner who was blinded about the mouthwash formulations allocated these 60 subjects randomly into two groups. Group A – 30 subjects were advised to use 5% green tea mouthwash, Group-B 30 subjects who were instructed to use 0.1% of turmeric mouthwash twice daily for 1 week. Subjects were evaluated for all the clinical parameters after 1 week by the second examiner.

Statistical Analysis

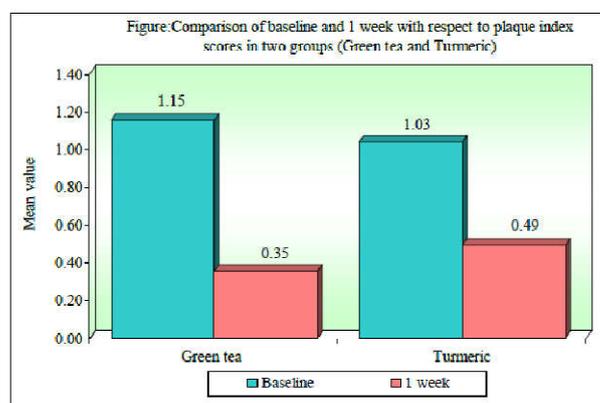
The results were statistically analysed using Wilcoxon matched pair test for intragroup comparisons. Intergroup comparisons were analyzed by the Mann Whitney U Test. The outcome

measured was considered to be statistically significant if the P value is ($P < 0.0001$).

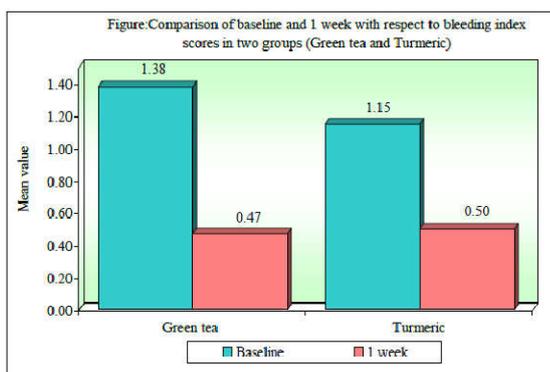
RESULTS

There was a statistically significant difference within the two groups with regard to plaque index and bleeding index between the two visits. [Graph 1&2]. Plaque index showed a reduction in both groups, yet it was not statistically significant between the groups. [Table 1, Graph 1] Among the Green tea mouthwash (Group A) the mean Plaque index was 1.15 ± 0.29 at day 0 and after 1 week 0.35 ± 0.27 . The difference of mean plaque index between baseline and after 1 week was 0.80 ± 0.35 (statistically significant $P < 0.0001$) [Table 1, Graph 1] Among the turmeric mouthwash group (Group B) the mean plaque index value was 1.03 ± 0.29 at day 0 and after 1 week 0.49 ± 0.43 . The difference of mean plaque index between baseline and after 1 week was 0.54 ± 0.46 (statistically significant with P value < 0.0001). On comparing green tea and turmeric mouthwashes, the percentage reduction of PI between baseline and after 1 week was 69.73% and 52.49% respectively. ($P < 0.0001$) [Table 1, Graph 1] Gingival Bleeding Index was reduced during the study in both the groups but no statistically significant difference was found between the groups. [Graph 2] Among Group A: Green tea mouthwash group mean Gingival bleeding index value was 1.38 ± 0.51 at baseline and after 1 week 0.47 ± 0.42 . [Table 2, Graph 2]. The difference of mean gingival bleeding index between baseline and 1 week was 0.91 ± 0.45 ($P = 0.0690$). Among the turmeric mouthwash group, the mean gingival bleeding index value was 1.15 ± 0.17 at baseline and 0.50 ± 0.41 after 1 week. The difference of mean gingival bleeding index between baseline and 1 week was 0.65 ± 0.40 . On comparison between green tea and turmeric mouthwash groups, the reduction in bleeding index scores between baseline/day 0 and after 1 week were 0.91 ± 0.45 and 0.65 ± 0.40 respectively. [Table 2, graph 2] The percentage reduction of the bleeding index between baseline and 1 week in green tea and turmeric mouthwash groups were 66.26% and 56.72% respectively. ($P < 0.0001$) [Graph 2]. There was no statistically significant difference between the groups for gingival bleeding and plaque indices. However, the patients under green tea group showed an extra reduction in plaque and bleeding indices compared to turmeric group which were not statistically significant.

Figures and Tables



Graph 1



Graph 2

Table 1

Table: Comparison of baseline and 1 week with respect to plaque index scores in two groups (Green tea and Turmeric) by Wilcoxon matched pairs test

Groups	Time	Mean	Std.Dv.	Mean Diff.	SD Diff.	% of change	Z-value	p-value
Green tea	Baseline	1.15	0.29	0.80	0.35	69.73	4.7821	0.0001*
	1 week	0.35	0.27					
Turmeric	Baseline	1.03	0.29	0.54	0.46	52.49	4.0417	0.0001*
	1 week	0.49	0.43					

*p<0.05

Table 2

Table: Comparison of baseline and 1 week with respect to bleeding index scores in two groups (Green tea and Turmeric) by Wilcoxon matched pairs test

Groups	Time	Mean	Std.Dv.	Mean Diff.	SD Diff.	% of change	Z-value	p-value
Green tea	Baseline	1.38	0.51	0.91	0.45	66.26	4.6229	0.0001*
	1 week	0.47	0.42					
Turmeric	Baseline	1.15	0.17	0.65	0.40	56.72	4.6226	0.0001*
	1 week	0.50	0.41					

*p<0.05

DISCUSSION

Chemical plaque control agents act as effective adjuncts to mechanical plaque control aids in preventing plaque formation and gingival inflammation. The practice of using herbal products in the form of dentifrices has proved to possess antiplaque, anti-inflammatory, antibacterial properties. Green tea comprises of many bioactive compounds. The most important of these are polyphenols such as flavonoids. The main flavonoids present in green tea are catechins like EGCG [Epigallocatechingallate] (59%), EGC [Epigallocatechin] (19%), ECG [Epicatechingallate] (13.6%), EC [Epicatechin] (6.4%).^[13] Green tea found to have antiplaque, antibacterial properties, antioxidant, anti-inflammatory properties.

Green tea and turmeric have been reported to be useful for maintenance of oral health. In our present study, there was a significant decrease in plaque and bleeding indices within both the groups at the subsequent visits. The antiplaque effect of green tea is due to the catechins ability to eliminate the plaque bacteria by perturbing the phospholipid bilayer^[14] catechins convert the acidic plaque to a normal P^H range of saliva(7.2-7.4).^[15] Green tea polyphenols adhere to hydroxyapatite on the tooth surface and reduce multispecies biofilm.^[16] Catechins of green tea deodorize volatile sulphur compounds responsible for halitosis and scavenge reactive oxygen species.^[17,18,19] Green tea also proved to decrease plaque formation.^[20,21,22]

The phenolic compounds in turmeric are curcuminoids. They bind to plaque biofilm, inhibit maturation of S.mutans, induce apoptosis thereby significantly reducing metabolic activity of bacterial biofilms.^[23] Antiplaque effect of turmeric mouthwash was proved by Amita M.Mali *et al.*^[24] Behal Roobal *et al* (2011) and Ruchika jaswal *et al* (2014) proved the efficacy of 2% turmeric gel as an adjunct to oral prophylaxis in improving the periodontal parameters.^[25,26]

There is a decrease in bleeding index values among both the groups in the present study. In the green tea group this effect could be attributed to the capability of green tea catechins to reduce inflammation. Green tea has shown inhibitory effect on collagenolytic enzymes thereby preventing periodontal inflammation. Catechins reduce oxidative stress, proinflammatory cytokines and markers of gingivitis.^[27, 28]

Among turmeric group the decrease in bleeding index values could be accredited to curcuminoids that possess potential to inhibit the synthesis of metabolites of arachidonic acid pathway thus altering neutrophil aggregation associated with inflammation. Curcuminoids exhibit antioxidant property by down regulating free radical activated transcription factors.^[29,30] Therefore, our study is indicative of beneficial effects of green tea, turmeric containing mouthwashes in reducing plaque-associated gingivitis. Further longitudinal studies are prudent for a better understanding of these natural adjuncts in the treatment of plaque-induced gingival inflammation.

CONCLUSION

Based on the observations of our study 5%green tea and 0.1%turmeric mouthwash could be used as adjuncts to mechanical plaque control in treating plaque-induced gingivitis. Both the mouth washes have comparable antiplaque, anti-inflammatory properties when used for a period of 1 week and showed good biocompatibility and acceptability by the subjects.

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