

Comparative Evaluation of 0.2% Chlorhexidine and 0.5% Green Tea Mouthwashes As An Antiplaque agents in the treatment of Chronic Gingivitis Patients

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ABSTRACT

Background: Recently, Various herbal and natural products used for the prevention and treatment of oral and periodontal conditions. Green tea with active chemical ingredient possesses anti-inflammatory, anti-cariogenic, antioxidant and antibacterial properties.

Aim: To compare the antiplaque efficacy of chlorhexidine and Green tea mouth rinses in the treatment of gingivitis.

Material and Methods: A total of 60 subjects with generalized chronic gingivitis were selected for the study. The study was randomized clinical trial. The study was double blinded with examiner and patients. They were randomly divided into two groups: group A (0.5% green tea mouthwash; n=30) and group B (0.2% chlorhexidine gluconate mouthwash; n=30). Plaque index, gingival index and modified sulcular bleeding index recorded at baseline 14th and 21st day. Phase I therapy have been done, followed by both mouthwashes distributed to patients. **Statistical analysis:** Student 't' test was used for comparative analysis. The P value was considered significant at (P < 0.005) level.

Results: The results of the study showed statistically significant reduction in plaque index, gingival index and modified sulcular bleeding index but on inter group comparison there was no statistically significant difference among the groups at different time interval.

Conclusion: Green tea mouthwash has comparable antiplaque efficacy with 0.2% chlorhexidine gluconate and can be considered as an alternative for the treatment of chronic gingivitis.

Keywords: Dental Plaque, Gingivitis, Green tea, Chlorhexidine, Antiplaque Efficacy.

INTRODUCTION

Dental plaque is the primary etiologic factor in gingival and periodontal disease. Gingivitis starts with inflammatory lesions of the gingiva, which, if left untreated, may progress to periodontitis in

which the entire periodontal apparatus of the teeth eventually involve and get compromised.^[1]

The onset or progression of gingival disease can be controlled by regular plaque control practices. Mechanical plaque control is the most effective

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measure for oral hygiene maintenance, but mechanical oral hygiene methods of plaque removal require time, motivation, and manual dexterity. Hence, the use of the antimicrobial agent is required to limit the growth of periodontopathogenic microorganisms and prevent gingivitis and periodontitis. [2]

The antiplaque agents can be delivered in the form of mouthwashes, dentifrices, chewing gums, gels, and chips. Mouthwashes can play an important role in plaque reduction. Among all the antiplaque agents, chlorhexidine is considered the gold standard agent for its clinical efficacy in chemical plaque control. It has broad antimicrobial spectrum and strong affinity for epithelial tissue and mucous membranes. Besides its antiplaque effect, chlorhexidine is substantive, thus reducing levels of microorganisms in saliva up to 90% for several hours. [3]

The long-term use of chlorhexidine is burdened by some side-effects that could affect patient which includes brown discoloration of dentition and restorative material, dorsum of the tongue, taste perturbation, oral mucosal ulceration, unilateral/bilateral parotid swelling, and enhanced supragingival calculus formation. Now a day, most of the people are turning to the nature by using the natural herbal products in both prophylaxis and treatment of different diseases. [4, 5]

Green tea is one of the most popularly consumed beverage worldwide. It contains flavonoids which include catechins such as epicatechin (EC), epicatechin-3-gallate (ECG), epigallocatechin (EGC), and epigallocatechin-3-gallate (EGCG). It also contains carotenoids, tocopherols, ascorbic acid, minerals such as chromium, magnesium, selenium, zinc and some phytochemical compounds. The most abundant polyphenolic compound epigallocatechin gallate (EGCG) is thought to contribute to the beneficial effects of green tea. [6, 7]

The catechins have antioxidant, antimutagenic, antidiabetic, anti-inflammatory, antiviral, antibacterial and anticarcinogenic properties. Green tea catechin showed a bactericidal effect against black pigmented, Gram-negative anaerobic rods, *Porphyromonas gingivalis* and *Prevotella* species. It inhibits the adherence of *P. gingivalis* on to human buccal epithelial cells. [8]

Though the literature shows various activities of green tea, much research has not been cited regarding its use as an antiplaque agent and its comparative efficacy to chlorhexidine gluconate. Thus, the aim of present study was to compare the antiplaque effectiveness of 0.5% green tea catechin mouthwash with 0.2% of chlorhexidine gluconate mouthwash in the treatment of chronic gingivitis.

MATERIALS AND METHODS

A total of 60 patients for the proposed study were selected from the Out Patient Department of Periodontology. A brief case history & informed consent was taken for all 60 patients who are taking part in this study.

Inclusion criteria: i) The patients with chronic gingivitis ii) plaque index and gingival index score ≥ 1 , iii) Age in between 18-40 years were included in study.

Exclusion criteria: i) Patients with fixed or removable prosthesis ii) having any type of restorations iii) on medication or prescribed antibiotics & anti inflammatory drugs from last 6 month and iv) taken periodontal treatment within 6 months were excluded from study.

All the subjects were informed about the nature of the study and probable side effects of the drugs being administered. The ethical committee approval obtained from the institution. The study was double blinded with examiner and patients were blinded.

Study Design:

The screening and diagnosis of patients with chronic gingivitis were made by performing intraoral examination. All the selected 60 subjects were randomly divided into 2 groups. The study was randomized clinical trial. Randomization was done using chit system in which patient were ask to pick a chit which allotted them to that particular group. Group A (n=30): Patients were distributed 0.5% green tea catechin mouthwash. Group B (n=30): Patients were distributed 0.2% chlorhexidine gluconate mouthwash [(Hexidine®) ICPA Laboratories Ltd.]. **Fig.3**

Preparation of green tea mouthwash:



Fig 1: Green Tea Extract.



Fig 2: 0.5 % Green tea mouthwash.



Fig 3: 0.2 % Chlorhexidine mouthwash

Materials: All the chemicals used in present study were of analytical grade. Green tea extract [Figure 1] were procured from Lipra Nutriscience, Umargaon (Gujarat). The 0.5% green tea mouthwash [Figure 2] was prepared from Sanjivini College of Pharmaceutical Education and Research,

Kopargoan (Maharashtra). Composition of Green tea mouthwash: Green tea mouthwash contains green tea extract (0.5%), Polysorbate 80, Sodium methyl paraben, Sodium Saccharin, Menthol and Camphor. The clinical parameters, Plaque Index, Gingival Index and Modified sulcus bleeding Index were evaluated at baseline, 14th day and 21st day.

Procedure:

Each patient was instructed to use 10 ml dose of mouthwash. They were instructed to swish for 1 min and expectorate twice daily and were refrained from any other plaque control measures. The patients were instructed not to drink coffee, tea or wine one hr before or after using the mouthwash. Patients were recalled after 14th and 21st day for evaluation of clinical parameters recording. Clinical examination was done by the same Periodontist. After recording the clinical parameters at baseline, thorough scaling and polishing was carried out using ultrasonic scaler in both the groups. Detailed instructions regarding self performed plaque control measures were given.

Statistical Analysis:

Statistical analysis of evaluation of effectiveness and comparing the anti plaque effects of 0.5% Green tea, 0.2% chlorhexidine mouthwash was carried out to find the significant difference between those values. Clinical changes were expressed using the mean difference from initial recording of parameter at baseline to the final outcome after 14th and 21st day. Student paired 't' test was used for statistical analysis. $p < 0.05$ is considered as level of significance and SPSS 17.0 software was used.

RESULTS

Mean Plaque index in group A at baseline was 1.73 at post operative 14th day it was 0.89 ± 0.17 and at 21st day it was 1.06 ± 0.12 . In group B at baseline was 1.72, at post operative 14th day it was 1.09 ± 0.23 and at 21st day it was 1.12 ± 0.24 . Statistically significant difference was found in mean plaque index at 14th day and at 21st day ($p = 0.0001$) [Table I and Graph I]. But on intergroup comparison there was no statistical significant reduction in plaque index were observed at different time interval.

Mean gingival index in group A at baseline was 1.74, at post operative 14th day it was 0.86 ± 0.15 and at

21st day it was 1.01 ± 0.12 . In group B at baseline was 1.70, at post operative 14th day it was 0.97 ± 0.10 and

Table 1: The mean reduction of Plaque Index in two groups at various intervals.

Group	Mean	SD	Mean Difference	Paired t test	p-value
Group A					
Baseline	1.73	0.23			
14 Day	0.82	0.14	0.89 ± 0.17	20.46	0.0001,S
21 Day	0.63	0.13	1.06 ± 0.12	33.24	0.0001,S
Group B					
Baseline	1.72	0.23			
14 Day	0.69	0.11	1.09 ± 0.23	16.98	0.0001,S
21 Day	0.57	0.10	1.12 ± 0.24	17.90	0.0001,S

Table 2: The mean reduction of gingival index in two groups at various intervals.

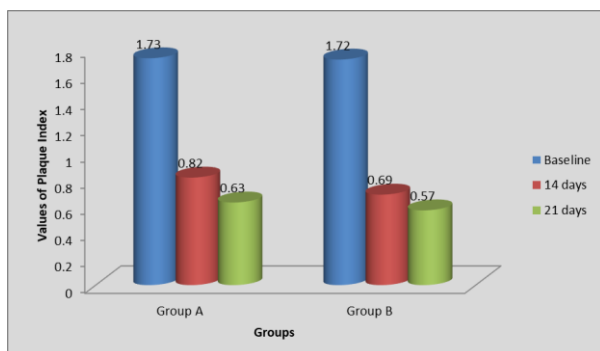
Group	Mean	SD	Mean Difference	Paired t test	p-value
Group A					
Baseline	1.74	0.20			
14 Day	0.86	0.08	0.86 ± 0.15	20.63	0.0001,S
21 Day	0.68	0.08	1.01 ± 0.12	32.58	0.0001,S
Group B					
Baseline	1.70	0.16			
14 Day	0.72	0.09	0.97 ± 0.10	36.23	0.0001,S
21 Day	0.59	0.08	1.10 ± 0.09	45.06	0.0001,S

Table 3: The mean reduction of modified sulcular bleeding index in two groups at various intervals.

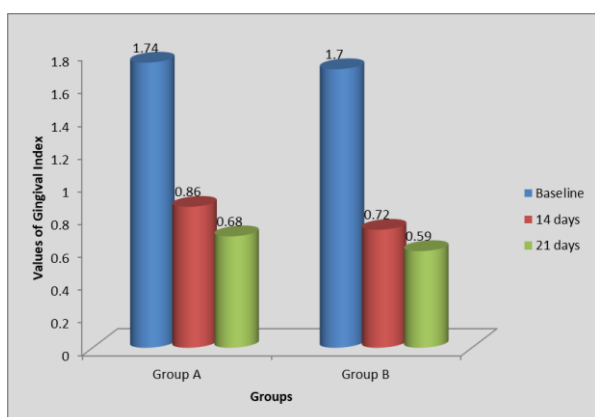
Group	Mean	SD	Mean Difference	Paired t test	p-value
Group A					
Baseline	4.00	0.70			
14 Day	1.94	0.35	2.00 ± 0.64	11.99	0.0001,S
21 Day	1.54	0.26	2.41 ± 0.59	15.62	0.0001,S
Group B					
Baseline	3.98	0.62			
14 Day	1.88	0.21	2.09 ± 0.47	17.10	0.0001,S

21 Day	1.43	0.25	2.55±0.45	21.70	0.0001,S
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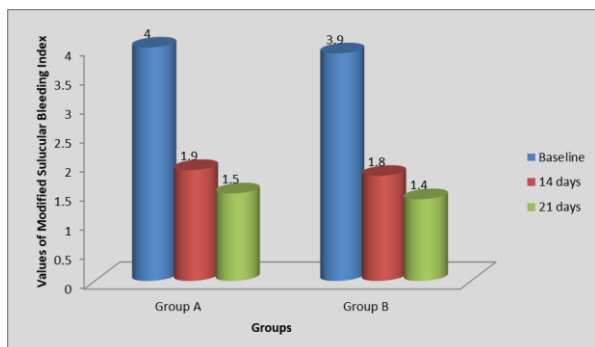
at 21st day it was 1.10±0.09. Statistically significant difference was found in mean gingival index at 14th day and at 21st day (p=0.0001) [Table II and Graph II]. But on intergroup comparison there was no statistical significant reduction in gingival index were observed at different time interval.



Graph 1: The mean reduction of Plaque Index in two groups at various intervals.



Graph 2: The mean reduction of gingival index in two groups at various intervals.



Graph 3: The mean reduction of modified sulcular bleeding index in two groups at various intervals.

Mean sulcular bleeding index in group A at baseline was 4.0, at post operative 14th day it was 2.0±0.64 and at 21st day it was 2.41±0.59. In group B at baseline was 3.98, at post operative 14th day it was 2.09±0.47 and at 21st day it was 2.55±0.45. Statistically significant difference was found in mean modified sulcular bleeding index at 14th day and at 21st day (p-value=0.0001) [Table III and Graph III]. But on intergroup comparison there was no statistical significant reduction in modified sulcular bleeding index were observed at different time interval.

DISCUSSION

The present study was carried out to assess the antiplaque efficacy of 0.2% Chlorhexidine gluconate mouthwash and Green tea mouthwash, as an adjunctive to scaling and polishing. Chlorhexidine remains the gold standard antiplaque agent due to its superior substantivity and antiplaque effect.^[4] The major side effects of chlorhexidine include brownish discoloration of teeth and tongue, formation of supragingival calculus, taste alteration and oral desquamation in children.

The practice of alternate medicine with the use of herbs and herbal products has evolved widely in the form of mouth rinses and toothpastes. They have been shown to possess beneficial effects in the control of plaque and gingival inflammation. ^[9] Green tea was used so that the concentration should not change the taste but should have maximum inhibition of variables. In the present study, 0.5% Green tea had the maximum desired effect. This may be due to the catechins, tannins and astringent effect present in the green tea which can create wonders to gingival health.

Tea catechins containing the galloyl radicals possess the ability to inhibit both eukaryotic and prokaryotic cell derived collagenase, an enzyme that plays an important role in the disruption of the collagen component in the gingival tissues of patients with periodontal disease. Catechin derivatives have been reported to inhibit certain proteases of *P. Gingivalis* and may reduce periodontal breakdown.

Green tea catechins have also been shown to inhibit protein tyrosine phosphatase in *Prevotella intermedia*. EGCG has been reported to inhibit production of toxic metabolites of *P. Gingivalis*. The study done by **Tsuchiya H et al. (1997)** ^[10] showed that the plaque index decreases significantly after green tea extract was used. The study conducted by **Kushiyama et al (2009)** ^[11] showed that the application of concentrated green tea components such as catechin may be expected to have more beneficial effects on periodontal conditions. **Jenabian et al (2012)** ^[12] conducted a study to assess the efficacy of green tea mouthwash on plaque induced gingivitis and showed that green tea mouthwash is safe and feasible adjunct treatment for inflammatory periodontal diseases. **Awadalla et al (2011)**. ^[13] who found that 0.25% green tea reduces plaque index as compared with 0.2% chlorhexidine.

Hattarki et al (2013) ^[14] conducted a study to assess the effects of green tea catechin on the red complex organism using polymerase chain reaction for microbiological analysis and found that green tea can be used as an effective local drug delivery along with scaling and root planing in treatment of chronic periodontitis. Similar study conducted by Kaur et al (2013) ^[15] who also found that the green tea mouthwash has a comparable antiplaque effect over a 7 day period with gold standard chlorhexidine mouthwash.

The results of above studies were in accordance with our study where statistical significant reduction in plaque index at different time intervals.

The reduction in plaque is attributed to inhibitory effects of catechin can remove dental plaque bacteria from teeth. Green and black tea was reported to prevent accumulation of bacteria and thereby preventing plaque formation on teeth

The research study conducted by **Ardakani et al. (2011)** ^[16] where green tea catechin mouthwash (0.25%) and chlorhexidine mouthwash (0.12%) showed comparable results in plaque reduction, and also study conducted by **Hirasawa M et al (2002)** ^[17] found that green tea catechin showed a bactericidal effect against black-pigmented gram negative anaerobic rods and combined use of mechanical treatment and the application of green tea catechin using slow release local drug delivery

system was effective in improving periodontal status.

The results of above studies were in similar with our study where green tea and chlorhexidine showed individually reduction in plaque index which was statistically significant at different time intervals, but on comparison between the groups there is no statistical significant results were observed.

Balappanavar et al (2013) ^[18] carried out a study to evaluate the effectiveness of 0.5% green tea compared with 2% neem and 0.2% Chlorhexidine and showed that green tea reduces more plaque compared to 2% neem and 0.2% chlorhexidine mouthrinse, which was not in accordance with our present study.

The reduction in gingival index was observed in the study conducted by Moghbel et al (2010) ^[19] where green tea mouthwash had therapeutic effects and could improve gingival status of patients suffering from gingivitis.

The study done by **Krahwinkel and Willershausen** (2000) ^[20] showed that a distinct improvement in gingival index by 0.2% chlorhexidine mouthwash.

The results of above studies were in accordance with our study where statistical significant reduction in gingival index at different time intervals.

The studies conducted by **Tsuchiya H et al (1997)** ^[10] green tea catechin (0.25%) and chlorhexidine mouthwash (0.12%) showed comparable results in gingival index reduction.

Biswas S et al (2014) ^[21] conducted a study to evaluate the efficacy of green tea and chlorhexidine mouthwash as an antiplaque agent and showed that green tea mouthwash comparably reduces plaque and gingival index.

The results of above studies were in similar with our study where Green tea and chlorhexidine showed individually reduction in gingival index which was statistically significant at different time intervals, but on comparison between the groups there is no statistical significant results were observed.

Balappanavar et al (2013) [18] carried out a study to evaluate the effectiveness of 0.5% green tea compared with 2% neem and 0.2% Chlorhexidine and showed that green tea reduced sulcular bleeding index compared to 2% neem and 0.2% chlorhexidine mouthrinse, but in our study individually, statistically significant reduction in sulcular bleeding index at different time intervals, but on comparison between the groups there is no statistical significant results were observed.

Clinically chlorhexidine mouthwash showed greater reduction in the plaque index, gingival index, sulcular bleeding index as compared to Green tea mouthwash at different time intervals, but there was no statistical significant difference observed among the groups. **Limitations of the study:**

1. We selected less number of patients for the study. To Substantiate the finding of the study, large sample size should be taken.
2. Long term follow up should be there to evaluate the anti plaque efficacy of Green tea.

CONCLUSION

This study demonstrated that there is reduction in the plaque and gingival score in the subjects using a green tea and chlorhexidine mouthwash. It was found that the green tea mouthwash has a comparable antiplaque efficacy to chlorhexidine gluconate. A habit of green tea consumption at meals and breaks is relatively easy to establish, which could help to maintain a healthy oral environment. Therefore, dental professionals should consider the use of green tea mouthwash as an adjunct to mechanical plaque control measures for maintenance of gingival and periodontal health.

CONFLICT OF INTEREST

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

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