ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 7, Issue – 1, February – 2024, Page No. : 01 - 08

Comparative evaluation of green tea mouthwash and chlorhexidine gluconate mouthwash as an adjunct to scaling and root planing in subjects with chronic periodontitis –A double blinded randomized clinical trial

[1]Dr. Gokulan Manimaran, Post graduate student, Department of Periodontology, Yenepoya Dental College, Yenepoya (Deemed to be) University, Mangalore – 575018.

[2]Dr. Rajesh K S, MDS, Professor & Head, Department of Periodontology, Yenepoya Dental College, Yenepoya (Deemed to be) University, Mangalore – 575018.

[3]Dr. Shashikanth Hegde, MDS, Professor, Department of Periodontology, Yenepoya Dental College, Yenepoya (Deemed to be) University, Mangalore – 575018.

[4]Dr. Vinita Ashutosh Boloor, MDS, Additional Professor, Department of Periodontology, Yenepoya Dental College, Yenepoya (Deemed to be) University, Mangalore – 575018.

Corresponding Author: Dr. Gokulan Manimaran, Post graduate student, Department of Periodontology, Yenepoya Dental College, Yenepoya (Deemed to be) University, Mangalore – 575018.

Citation of this Article: Dr. Gokulan Manimaran, Dr. Rajesh K S, Dr. Shashikanth Hegde, Dr. Vinita Ashutosh Boloor, "Comparative evaluation of green tea mouthwash and chlorhexidine gluconate mouthwash as an adjunct to scaling and root planing in subjects with chronic periodontitis – A double blinded randomized clinical trial", IJDSIR- February – 2024, Volume –7, Issue - 1, P. No. 01 – 08.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To evaluate and compare green tea mouthwash and chlorhexidine gluconate mouthwash as an adjunct to scaling and root planing in subjects with chronic periodontitis.

Materials and Methods: A total of 68 systemically healthy subjects aged 25-64 years of both gender suffering from chronic periodontitis were included in the study. Informed consent was obtained from each subject. All the subjects were randomly divided into Group A, SRP with Chlorhexidine gluconate mouthwash (0.2%) and group B, SRP with green tea mouthwash (0.25%). Plaque index (PI), Gingival index (GI), Probing Pocket Depth (PPD), Clinical Attachment Level (CAL), Lobene's Modified staining index (MSI) were assessed. All the subjects underwent scaling and root planing at baseline. Subjects were evaluated at the end of 2 weeks and 4 weeks.

Results: Usage of green tea mouthwash showed significant reduction in MSI when compared with chlorhexidine gluconate mouthwash at 2 weeks and 4 weeks interval. PPD and CAL reduced significantly

from baseline to 4 weeks for both the groups, but no statistically significant difference on intergroup comparison of Chlorhexidine gluconate mouthwash and green tea mouthwash at all the visits.

Conclusion: The study concluded that 0.25% green tea mouthwash is as effective as 0.2% Chlorhexidine gluconate mouthwash with beneficial property of causing reduced or no stains. It can be used as an adjunct to scaling and root planing in the treatment of chronic periodontitis subjects.

Clinical Significance: Green tea mouthwash has been shown to be effective in reducing clinical parameters like plaque index, gingival index, probing pocket depth and clinical attachment loss. It also has additional property of causing reduced or no stains during the usage.

Keywords: Green tea mouthwash, Chlorhexidine gluconate mouthwash, Scaling and root planing.

Introduction

Periodontitis is an infection-driven inflammatory disease involving tooth-supporting tissues (i.e., the periodontium). Moreover, genetics and environmental and behavioral factors are involved in the development of the disease, the exposure of susceptible individuals to its initiation, and the speed of progression. Periodontal disease, especially its mild and moderate forms, is highly prevalent in adult-aged populations all over the world, with prevalence rates around 50% [1], while its severe form increases especially between the third and fourth decades of life, with the global prevalence being around 10%[2].

Chlorhexidine still remains the gold standard against which the efficacy of newer antiplaque agents is compared because of its superior antiplaque effect and its substantivity for a period of 10–12 h. However, the side effects of Chlorhexidine such as tooth and tongue staining, taste alterations, and mucosal erosions limit patient compliance. [3,4]

Green tea is one such substance and has gained attention based on promising scientific reports that show its health benefits, especially in beverages [5]. The active ingredients of green tea are polyphenols. Most of them are catechins (flavan-3-ols), which can be categorized into four main groups: Epigallocatechin-3-gallate (EGCG) being the most common type (59%), followed by epigallocatechin (EGC, 19%), epicatechin 3 gallate (ECG, 13.6%), and epicatechin (EC, 6.4%)[6]. In addition, whole green tea contains other antioxidants in the form of vitamins, such as carotinoids (A), as corbate (C), and tocopherols (E) [5].Polyphenols act as antioxidants through the induction of antioxidant enzymes such as glutathione S-transferase and superoxide dismutase. Other mechanisms by which catechins have an influence on the oxidation levels are through binding to iron and copper ions, thus reducing the impact of these ions on oxidation reactions. In addition, they prevent the activation of redox-sensitive transcription factors, which are mediators of inflammatory reactions. Catechins can also suppress other oxidation substances, such as nitric oxidesynthase, cyclooxygenase 2 (COX-2), lipoxygenase 2 (LOX-2), and xanthine oxidase. [7]

Kushiyama showed that green tea can prevent the onset of periodontitis when taken regularly.

It may also even reduce the progression of an existing periodontitis. Overall, green tea catechins have an anti-oxidant and anti-bacterial effect on pathogens such as Porphyromon as gingival is and Prevotella intermedia. The mechanism of action is through the inhibiting effect of EGCG and EGC on cysteine proteases of P. gingival is. In vitro research also suggests an anti-inflammatory

effect for other inflammatory processes, such as cardiovascular diseases. [8, 9, 10]

Based on the literature, green tea polyphenols inhibit the growth and adhesion of oral pathogens and could improve periodontal status due to their antibacterial properties. Tannin components derived from tea have been reported to have bacteriostatic and bactericidal activity against Streptococcus mutans, Staphylococcus aureus and its methicillin resistant strains, as well as multidrug resistant Pseudomonas aeruginosa. It is believed that green tea flavanols disrupt the cell membrane and prevent DNA supercoiling, which ultimately leads to bacterial cell destruction. Green tea polyphenols are also well known for their antioxidative activity, providing protection against degenerative diseases and acting as antitumorigenic agents.

There is emerging evidence implicating the role of oxidative stress in the pathogenesis of gingivitis and chronic periodontitis [11]. Therefore, the purpose of this study was to evaluate and compare green tea mouthwash and chlorhexidine gluconate mouthwash as an adjunct to scaling and root planing in subjects with chronic periodontitis.

Materials and Methods

This was a double blinded, randomized controlled clinical trial with duration of 4 weeks, conducted in the Department of Periodontology, Yenepoya Dental College, Karnataka, India.

This trial is registered in CTRI- CTRI/2020/03/024178.

Study population included

- Subjects in the age group of 25 to 64 years of both gender suffering from chronic periodontitis.
- Systemically healthy subjects.
- Subjects having periodontal pockets of ≥ 4mm.
- Subjects with a minimum of 16 teeth present.
- Subjects who give an informed consent to participate in the study.

Subjects who have a habit of smoking and using tobacco products, pregnant and lactating women and subjects who are known to be allergic or hypersensitive to chlorhexidine gluconate or green tea related compounds were excluded from the study.

Patient selection

68 systemically healthy subjects aged 25-54 years of both gender suffering from chronic periodontitis were included in the study. The purpose of the study was explained and an informed consent obtained.

Randomization

All 68 subjects were randomly divided into 2 equal groups (34 subjects each) depending on the treatment provided.

Method of grouping: The randomization was done using lottery method

Group A (Control): scaling and root planing along with Chlorhexidine gluconate mouthwash (0.2%)

Group B (Test): scaling and root planing along with green tea mouthwash (0.25%)

Green tea mouthwash (0.25%) was prepared in collaboration with Yenepoya pharmacy college, Mangalore.

Composition of Green tea mouth wash (0.25% w/v) [12]

Name of the ingredient	Quantity	Purpose
Catechin	250 mg	Medicament
Sodium chloride	100 mg	Antiseptic
Sodium benzoate	50 mg	Sodium ion provider with preservative action
Sodium bi carbonate	50 mg	Alkaliser
Amaranth solution	0.012 ml	Coloring agent
Distilled water q.s	100 ml	Vehicle

In Phase I therapy, all the overhanging restorations, carious lesions and open contacts were appropriately managed. The recruitment of the subjects for the study was done by the principal investigator.

Following clinical parameters were assessed at the baseline,

- Plaque index – Silness and Loe (1964)
- Gingival index – Loe and Silness (1963)
- Probing pocket depth – Measured from gingival margin to base of pocket
- Clinical attachment level – Measured from cemento-enamel junction to base of pocket
- Modified Staining index – Lobene (1968).

All the subjects in group A and group B were subjected to scaling and root planing.

Standardized oral hygiene instructions were explained to all the subjects by the principal investigator. Allocation of the subjects to the groups and the concealment was coded by the second examiner. Dispensing of two separate mouthwashes in standardized bottles to the subjects in the respective groups was done by the second examiner. Subjects in group Awere instructed to use 10ml of chlorhexidine gluconate mouthwash (0.2%) twice daily. Subjects in group B were instructed to use 10ml of green tea mouthwash (0.25%) twice daily.

Instructions regarding the usage of mouthwashes and brushing techniques were given by prinicipal investigator. Subjects were advised to report back to the principal investigator in case of any discomforts after the usage of the mouthwashes. All the subjects involved in the study were evaluated at the end of 2 weeks and 4 weeks interval by the principle investigator.

Subjects were advised to visit for the follow ups with empty bottles of mouthwashes, which was replenished and provided to them by the second examiner. Based on the clinical findings at the end of 4 weeks, more definitive periodontal treatment was instituted to all the subjects.

At the end of the study, decoding was done and the data obtained were subjected for the statistical analysis.

Results

Collected data were analyzed by both descriptive and inferential methods. Descriptivemethods such as mean and standard deviation were computed to summarize the data.

Inferential statistics included Analysis of Variance (ANOVA) test followed by Post Hoc Tukeys test. P value <0.05 was considered as statistically significant. The level of significance in the present study was 5%, with 80% power and effect size of 0.5. Data were subjected to statistical analysis with the statistical package for social science software (SPSS, version 24.0).

The present study was carried out to compare the efficacy of 0.25% green tea mouthwash and 0.2% chlorhexidine gluconate mouthwash as an adjunct to scaling and root planing in the treatment of chronic periodontitis patients. Subjects in group A received chlorhexidine gluconate mouthwash and subjects in group B received green tea mouthwash .

The subjects in both the groups were evaluated for clinical parameters like PI, GI, PPD, CAL, MSI at baseline, 2 weeks and 4 weeks.

Comparison of plaque index between the groups at baseline showed statistically significantdifference with the p value of 0.001 (Table 1). At 2 weeks and 4 weeks comparison, the mean differences were statistically not significant with the p values of 0.885 and 0.270 respectively (Table 1). Comparison of gingival index between the groups at baseline showed statistically significant difference with the p value of 0.001 (Table 1).

Comparison of mean difference at 2 weeks was found to be statistically not significant with the p value of 0.475 (Table 1). At 4 weeks comparison, the mean differences was statistically significant with the p value of 0.0* (Table 1).

Comparison of probing pocket depth between the groups at baseline, 2 weeks and 4 weeks showed statistically not significant differences with the p values of 0.665, 0.391, 0.228 respectively (Table 1). Comparison of clinical attachment loss between the groups at baseline, 2 weeks and 4 weeks showed statistically not significant differences with the p values of 0.501, 0.391, 0.228 respectively (Table 1). Comparison of modified staining index between the groups at baseline was found to be statistically not significant with the p value of

0.158 (Table 1). At 2 weeks and 4 weeks comparison, the mean differences were found to be statistically significant with the p values of 0.00* and 0.00* respectively (Table 1).

Intragroup comparison of group A and group B for plaque index at baseline, 2 weeks, 4 weeks was found to be statistically significant with the p values of 0.02* and 0.05* respectively.

Intragroup comparison of group A and group B for gingival index at baseline, 2 weeks, 4weeks was found to be statistically significant with the p values of 0.04* and 0.02* respectively.

On intragroup comparison of PI at baseline, 2 weeks and 4 weeks in group A, it was found to be statistically significant with p value of 0.02*. Likewise in group B, comparison of PI at baseline, 2 weeks and 4 weeks found to be statistically significant with p value of 0.05*. GI when compared within the group at baseline, 2 weeks, 4 weeks found to be statistically significant for both group A and group B with p value of 0.04* and 0.02* respectively.

These results are in accordance with the previous studies by Balappanavar et al.,Hambire et al.,Radafshar et al.,[11,13,14]. Possible ways in which green tea could prevent or reduce gingivitis would be by directly killing the causative organisms, interfering with the formation of plaqueat the gingival margin, disrupting preformed plaque, preventing adhesion and invasion of gingival epithelial cells by causative organisms and inhibiting bacteria-induced host cell pro-inflammatory cytokine production, thereby reducing the plaque induced inflammation[14].

Comparison of Probing pocket depth and Clinical attachment level within the group showed statistically insignificant results for both group A and group B. Although the mean values of

PPD and CAL for both group A and group B was found to be decreasing significantly from baseline to 4th week (Table 1). This could be due to the presence of catechins, such as epigallocatechin gallate (EGCG) in green tea which inhibit the growth of Porphyromonas gingival is, Prevotella intermedia, and Prevotella nigrescens and the adherence of Porphyromonas gingivalis onto human buccal epithelial cells[16]. These bacteria have been strongly implicated in destruction of periodontal tissues and their reduction can lead to theimprovement of periodontitis [15]. In addition, green tea catechins with the steric structures of 3-galloyl radial, EGCG, ECG and (-)-gallocatechin gallate (GCG), which are the major tea polyphenols, inhibit the production of toxic end metabolites of P. gingivalis [17]

Intergroup comparison of MSI in group A and group B at 2 weeks interval with mean values of 1.994 and 1.606, respectively found to be statistically significant with p value of 0.00* (Graph 1). Likewise comparison of MSI in group A and group B at 4 weeks interval showed mean values of 2.184 and 1.525 respectively, found to be

statistically significant with p value of 0.00* (Graph 1). The results of the present study on staining is consistent with a study by Radafshar and colleagues in 2015[11], comparing the effects of green tea and chlorhexidine 0.2%. In both studies, green tea was as effective as chlorhexidine in reducing plaque accumulation and gingivitis, with reduced tooth discoloration than chlorhexidine group.

Collection of subgingival samples and analysis of the microbial profile may add another perspective to the comparative evaluation between the groups. Comparative evaluation within the same subjects with the appropriate washout period, a longer follow up period and inclusion of inflammatory biomarkers assessment may be considered for future investigations.

Conclusion

Usage of green tea mouthwash showed a statistically significant reduction in Gingival index, Plaque index and Modified staining index when compared to chlorhexidine gluconate mouth wash from baseline to 4 weeks. Both Chlorhexidine gluconate mouthwash and green tea mouthwash showed significant reduction in all the clinical parameters from baseline to 2 weeks and 4 weeks. Therefore it may be concluded that 0.25% green tea mouthwash is as effective as 0.2% Chlorhexidine gluconate mouthwash with additional benefit of causing reduced or no stains. It can be used as an adjunct to scaling and root planing in the treatment of chronic periodontitis subjects.

Clinical significance

Green tea mouthwash has been shown to be effective in reducing clinical parameters like plaque index, gingival index, probing pocket depth and clinical attachment loss. It also has additional benefit of causing reduced or no stains during the usage.

Acknowledgements

The authors would like to thank the Yenepoya pharmacy college, Mangalore. Their explicit talent, experience and guidance enabled to complete this interdisciplinary work.

References

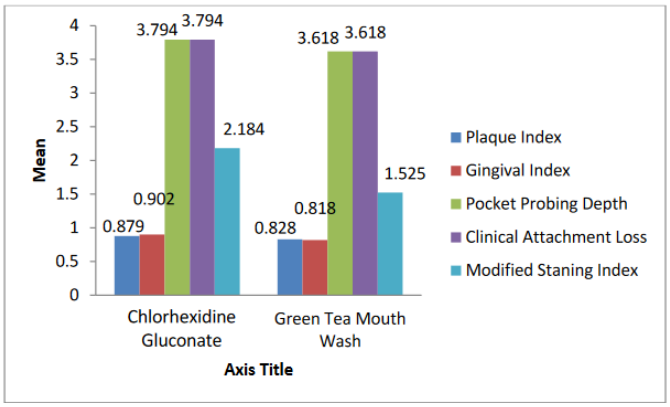
1. Eke, P.I.; Dye, B.A.; Wei, L.; Thornton-Evans, G.O.; Genco, R.J. Prevalence of periodontitis in adults in the United States: 2009 and 2010. J. Dent. Res. 2012, 91, 914–20.
2. Kassebaum, N.J.; Bernabé, E.; Dahiya, M.; Bhandari, B.; Murray, C.J.; Marcenes, W. Global burden of severe periodontitis in 1990–2010: A systematic review and meta- regression. J. Dent. Res. 2014, 93, 1045–53.
3. Jones CG. Chlorhexidine: Is it still the gold standard? Periodontol 2000 1997;15:55-62.
4. Mathur S, Mathur T, Shrivastava R, Khatri R. Chlorhexidine: The gold standard in chemical plaque control. Natl J Physiol Pharm Pharmacol 2011;1:45-50
5. Narotzki B, Reznick AZ, Aizenbud D, Levy Y (2012) Green tea: a promising natural product in oral health. Arch Oral Biol 57(5):429– 35.
6. McKay DL, Blumberg JB (2002) The role of tea in human health: an update. J Am Coll Nutr 21(1):1–13
7. Cabrera C, Artacho R, Gimenez R (2006) Beneficial effects of green tea–a review. J Am Coll Nutr 25(2):79–99. Kushiyama M, Shimazaki Y, Murakami M, Yamashita Y (2009) Relationship betweenintake of green tea and periodontal disease. J Periodontol 80(3):372–7.
8. Okamoto M, Leung KP, Ansai T, Sugimoto A, Maeda N (2003) Inhibitory effects of green tea catechins on protein tyrosine phosphatase in

Prevotella intermedia. Oral Microbiol Immunol 18(3): 192–5

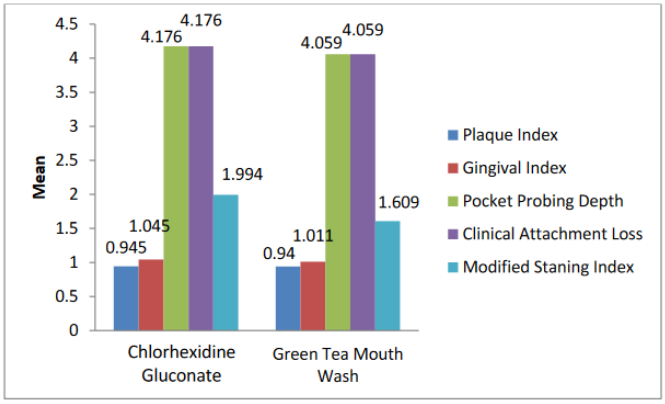
9. Tijburg LB, Mattern T, Folts JD, Weisgerber UM, Katan MB (1997) Tea flavonoids and cardiovascular disease: a review. Crit Rev Food Sci Nutr 37(8):771–85.
10. Radafshar, G., Ghotbizadeh, M., Saadat, F., &Mirfarhadi, N. (2015). Effects of green tea (Camellia sinensis) mouthwash containing 1% tannin on dental plaque and chronic gingivitis: a double-blinded, randomized, controlled trial. J Investig Clin Dent. 2015; 8(1):1-7.
11. Kaur H, Jain S, Kaur A. Comparative evaluation of the antiplaque effectiveness of green tea catechin mouthwash with Chlorhexidine gluconate. J Indian Soc Periodontol 2014;18:178-82
12. Balappanavar AY, Sardana V, Singh M. Comparison of the effectiveness of 0.5% tea, 2% neem and 0.2% Chlorhexidine mouthwashes on oral health: A randomized control trial. Indian J Dent Res 2013;24:26-34.
13. Hambire CU, Jawade R, Patil A, Wani VR, Kulkarni AA, Nehete PB, et al. Comparing the antiplaque efficacy of 0.5% Camellia sinensis extract, 0.05% sodium fluoride, and 0.2% chlorhexidine gluconate mouthwash in children. J Int Soc Prev Community Dent 2015;5:218-26
14. Magnusson I, Lindhe J, Yoneyama T, Liljenberg B (1984). Recolonization of a subgingival microbiota following scaling in deep pockets. J. Clin. Periodontol., 11: 193-207.
15. Makimura M, Hirasawa M, Kobayashi K (1993). Inhibitory effect of tea catechins on collagenase activity. J. Periodontol., 64: 630-6.
16. Sakanaka S, Okada Y (2004). Inhibitory effects of green tea polyphenols on the production of a virulence factor of the periodontaldisease-causing anaerobic bacterium Porphyromonas gingivalis. J. Agric. Food Chem., 52: 1688-92.

Legend Graph and Tables

Graph 1: Inter Group Comparision at Baseline



Graph 2: Inter Group Comparision at Second Week



Graph 3: Inter Group Comparision at Fourth Week

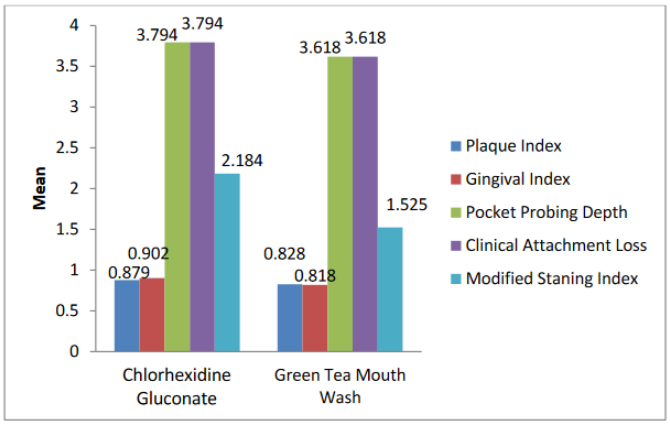


Table: 1 Intergroup Comparison

		BASELINE			2 WEEKS			4 WEEKS		
	Groups	Mean	Std. deviation	P-value	Mean	Std. deviation	P-value	Mean	Std. deviation	P-value
PLAQUE INDEX	Chlorhexidine Gluconate	1.463	0.128	**0.001***	0.945	0.136	0.884	0.879	0.253	0.27
	Green Tea Mouthwash	1.343	0.155		0.940	0.164		0.828	0.085	
GINGIVAL INDEX	Chlorhexidine Gluconate	1.594	0.129	**0.001***	1.045	0.150	0.475	0.902	0.068	**0.00***
	Green Tea Mouthwash	1.396	0.188		1.011	0.226		0.818	0.096	
PROBING POCKET DEPTH	Chlorhexidine Gluconate	4.882	0.409	0.665	4.176	0.387	0.391	3.794	0.478	0.22
	Green Tea Mouthwash	4.824	0.672		4.059	0.693		3.618	0.697	
CLINICAL ATTACHMENT LOSS	Chlorhexidine Gluconate	4.88	0.409	0.501	4.176	0.378	0.391	3.794	0.478	0.22
	Green Tea Mouthwash	4.79	0.641		4.059	0.693		3.618	0.697	
MODIFIED STAINING INDEX	Chlorhexidine Gluconate	1.72	0.372	0.158	1.994	0.354	**0.00***	2.184	0.321	**0.00***
	Green Tea Mouthwash	1.58	0.408		1.609	0.450		1.525	0.478	