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Evaluation of Green Tea Extract on Gingival and Periodontal Status: A Randomized Controlled Pilot Study

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Abstract: The purpose of this study was to design to evaluate the effect of the daily intake of the green tea on the periodontal diseases. 60 systemically healthy female patients (age range 26-49 years) with chronic periodontitis and minimum of 20 teeth were selected from the outpatient department of the faculty. Pregnant and lactating mothers were excluded from the study. Patients were divided into three groups using a block randomization method. The first group received scaling and root planning alone (SRP). The second group (SRP+GT) received scaling and root planning at baseline along with green tea for a period of 4 months. The third group received only green tea (GT) for a period of 4 months without any professional SRP. All the three groups showed significant ($P < 0.05$) improvement in all the parameters measured at baseline and compared at 2 and 4 months. The comparison of Plaque Index 2 and 4 months was highly significant ($P < 0.05$) for all the three groups. Comparison of gingival index among the three groups at 4 months showed statistically significant results ($P > 0.05$). These results suggest significant improvement in the oral hygiene status between groups as compared to baseline and at 2 months. The Periodontal Index comparisons between the groups at baseline scores, 2 months and 4 months did not showed any statistically significant outcomes ($P < 0.05$). This study has reaffirmed the beneficial effects of green tea on periodontal diseases for prophylactic as well as therapeutic purpose.
Keywords: Green tea, Gingivitis, Periodontal diseases, antioxidants, Catechins, Oral health.

INTRODUCTION

Green tea, an aqueous infusion of dried leaves of the plant Camellia sinesis, is the most popular beverage consumed worldwide [1]. It has received considered attention because of its scientifically proved beneficial effects on human health. Globally, it is estimated that approximately 2.5 million tons of tea leaves are produced each year, out of which approximately 20% production were green tea [2]. It is consumed throughout the ages in India, China, Japan and Thailand. In specific, green tea has been proved to have many functional properties, and at present, its consumption is widely recommended. The health-promoting effects of green tea are mainly attributed to its polyphenol (catechins). Epigaleocatechin-3-gallate and epicatechin-3-gallate are the most important catechins. The antioxidant, antimicrobial, ant collagenase, ant mutagenic, and chemo preventive properties of these catechins are proved to be therapeutic and beneficial in the treatment of various chronic diseases [3]. Several epidemiological studies have proven that green tea also has some general health beneficial properties like anti-hypertensive, anti-bacterial, anti-viral and anti- fungal activity. It has cognitive function and positive impact on bone density, dental caries and periodontal health [4]. Green tea is usually available in the form of beverage, mouthwash containing extract of green tea, and as a chewing gum. Periodontal diseases are infectious diseases involving gingival inflammation and destruction of periodontal tissue [2]. Its incidence and progression are dependent on the type of periodontal pathogens and various host as well as environmental factors. Very few studies have been carried out in the past to know the beneficial effects of green tea on periodontal health. However, there are very few studies

to determine the positive effect of the dietary intake of green tea on periodontal diseases. The present study was designed to evaluate the effect of the daily intake of the green tea on the periodontal diseases.

MATERIALS AND METHODS

A blind, randomized controlled clinical study was conducted in the Department of Periodontics. 60 systemically healthy female patients (age range 26-49 years) with chronic periodontitis and minimum of 20 teeth were selected from the outpatient department of the faculty. Pregnant and lactating mothers were excluded from the study. Patients were divided into three groups using a block randomization method. The first group received scaling and root planning alone (SRP). The second group (SRP+GT) received scaling and root planning at baseline along with green tea for a period of 4 months. The third group received only green tea (GT) for a period of 4 months without any professional SRP. The Plaque Index (Sillness and Loe)[5], Papillary Bleeding Index (Muhlemann and Son)[6] and Periodontal Index (Russel)[7] were recorded at baseline, 2 months and 4 months to evaluate the consumption of green tea on dental plaque, gingival inflammation and periodontal disease respectively.

Green tea (Camellia sinensis) was used in the study in the form of tea bags. The patients had three cups of green tea per day. No attempt was made to quantify the type of additives as sugar or honey as the main focus of the study was to study the effect of green tea on periodontal status. The study was approved by the Research Committee at College of Dentistry and informed written consent was obtained from the participants. The data was analyzed statistically by using the measures of Analysis of Variance (ANOVA) test for comparison of the three groups with statistical significance at $P< 0.05$.

RESULTS

It was observed that the regular oral intake of the green tea led to the improvement of oral health status. All the three groups showed significant ($P < 0.05$) improvement in all the parameters measured at baseline and compared at 2 and 4 months. The comparison of Plaque Index 2 and 4 months was highly significant ($P < 0.05$) for all the three groups (Table 1). Comparison of gingival index among the three groups at 4 months showed statistically significant results ($P > 0.05$) [Table 2]. These results suggest significant improvement in the oral hygiene status between groups as compared to baseline and at 2 months. The Periodontal Index comparisons between the groups at baseline scores, 2 months and 4 months did not showed any statistically significant outcomes ($P < 0.05$). Comparison of mean differences among the three groups at baseline, 2 months and 4 months period shown in Table 4. These results are suggestive of the positive effects of green tea on the clinical parameters irrespective of whether professional plaque control is performed or not.

Table-1: Comparative analysis of plaque scores between baseline, 2 months and 4 months (ANOVA)

		F	Sig.
Baseline	Between Groups	0.000	1.000
	Within Groups		
	Total		
2 Months	Between Groups	4.490	0.015*
	Within Groups		
	Total		
4 Months	Between Groups	6.611	0.003*
	Within Groups		
	Total		

* P value <0.05, are statistically significant.

Table-2: Comparative analysis of GINGIVAL scores between baseline, 2 months and 4 months (ANOVA)

		F	Sig.
Baseline	Between Groups	.000	1.000
	Within Groups		
	Total		
2 Months	Between Groups	1.611	0.209
	Within Groups		
	Total		
4 Months	Between Groups	3.329	0.043*
	Within Groups		
	Total		

* P value <0.05, are statistically significant

Table-3: Comparative analysis of Periodontal scores between baseline, 2 months and 4 months (ANOVA)

		F	Sig.
Baseline	Between Groups	0.000	1.000
	Within Groups		
	Total		
2 months	Between Groups	.245	0.784
	Within Groups		
	Total		
4 months	Between Groups	0.163	0.850
	Within Groups		
	Total		

* P value <0.05, are statistically significant

Table-4: Descriptive statistics for all three groups

		N	Mean	Std. Deviation
Baseline	SRP	20	2.3500	0.44544
	SRP+GT	20	2.3500	0.44544
	GT	20	2.3500	0.44544
	Total	60	2.3500	0.43783
2 months	SRP	20	1.8800	0.38334
	SRP+GT	20	1.7100	0.34167
	GT	20	2.0600	0.38169
	Total	60	1.8833	0.39064
4 months	SRP	20	1.6950	0.35015
	SRP+GT	20	1.4750	0.32907
	GT	20	1.8650	0.34070
	Total	60	1.6783	0.37102

DISCUSSION

Microbial plaque present on the teeth plays a very important role in the pathogenesis of periodontal disease. Some of the in vitro studies have shown that green catechin inhibits the growth of Porphyromonas gingivalis, Prevotella intermedia, and Prevotella nigrescens[8], as well as affects the adherence of P. gingivalis onto the human buccal epithelial cells[9]. The polyphenols present in green tea have shown to inhibit the production of toxic metabolites of P. gingivalis[10]. Epidemiological study by Kushiyama *et al.* concluded that there was a modest inverse association between the intake of green tea and periodontal disease [11].

In various previous studies, the antioxidants have been shown to have beneficial effects on various inflammatory diseases including periodontal diseases [12]. Various antioxidants like vitamin C have been shown to have beneficial effects on periodontal diseases [13]. The green tea catechins have also been demonstrated to have an antioxidant property with regards to prevention of cancer and cardiovascular diseases [14].

Green tea catechin (EGCG), a major polyphenol of green tea, reportedly exerts various biological effect including cryoststic property for preserving cells, anti-bacterial, anti-inflammatory reactions and anti-oxidant and anti-carcinogenic effect,[15] due to its effect against periodontal pathogen and to inhibit the production of related cytokines and their inflammatory pathway, such as carbon tetra chloride, tumor necrosis factor a, nuclear factor K.B, cyclooxygenase 2 and induceble nitro oxygenase synthase[16].

Green tea catechin (EGCG) significantly reduced the expression of matrix metalloproteinase-9 in osteoblast, thus, EGCG may prevent alveolar bone resorption that occurs in periodontal disease. Another inhibitory effect of green tea catechin on the adherence of porphyromonas gingivalis is onto the buccal epithelial cells [17].

The changing trends in the etiopathogenesis and prevention of periodontal disease are innumerable. From the point of eradication of the periodontal pathogens to regeneration of complete periodontium various treatment modalities are suggested. Green tea extract may have numerous effects on periodontal pathogens and periodontal tissues. Greater the concentration of catechins better the health benefits. So the consumption of green tea in comparison to other beverages may be widely recommended.

CONCLUSION

The present study has affirmed the earlier studies showing beneficial effects of green tea to some

extent and is also suggestive of the positive effect of daily oral intake of green tea on periodontal diseases. There is a need for the long-term studies with larger sample size before the green tea can be advocated for the prophylactic as well as therapeutic benefits in various periodontal diseases. Thus the evidence is strong that daily intake of green tea has a beneficial effect in prevention and treatment of chronic inflammatory diseases like periodontitis.

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