Modern scientific techniques have given the basis for the health-promoting effects of green tea, which have been recognized from ancient times. Many of the action mechanisms of green tea and its constituent EGCG are now known. For example, EGCG binds several enzyme proteins to inhibit their activities, induces oxidative stress in cells, and initiate signal transduction by binding to cell surface proteins. (67)

Our recent studies revealed that the intake of green tea taken orally is a healthy and helpful drink as it shows the positive effects on the periodontium and the gingival tissues.

Green tea extracts are nonoxidized/nonfermented derivatives of the leaves of Camellia sinensis, which belongs to the Theaceae family. Polyphenols (flavonols or catechins) found in the tea make up 30 to 40% percent of the extractable solids of dried green tea leaves. The main catechins in green tea are epicatechin, epicatechin-3-gallate, epigallocatechin, and epigallocatechin- 3-gallate (EGCG), with EGCG being the highest in concentration. These polyphenols have been shown to exhibit some potential antioxidant, anticarcinogenic, anti-inflammatory, thermogenic, probiotic, and antimicrobial properties. (68,69)
Recent findings of Okamoto et al. [70] suggest that green tea catechins may have the potential to reduce periodontal breakdown resulting from the potent proteinase activity of Porphyromonas gingivalis.

Apart from their polyphenol content, both green and black tea, are a natural source of fluoride and an effective vehicle for fluoride delivery to the oral cavity. According to Simpson et al. [70], after cleansing the mouth with tea, approximately 34% of the fluoride is retained and shows a strong binding ability to interact with the oral tissues and their surface integuments. This fluoride content may have a beneficial impact on caries and may carry out a wide range of biological activities including prevention of tooth loss and oral cancer [70,72].

Several studies have indicated that GTP inhibit growth, acid production, metabolism, and glucosyltransferase enzyme activity of S. mutans and dental plaque bacteria [73]. In consequence, green tea has been considered as functional food for oral health and is widely used in toothpaste formulation. (74)

In a few human trials, catechins (without added sugar) have been shown to inhibit plaque deposition (75) reduce plaque and gingival index (76) and inhibit acid production in dental plaque bacteria (77)

Oxidative stress plays an important role in the pathogenesis of periodontal disease, as well as many other disorders (78). Antioxidants such as polyphenols in green tea can neutralize free radicals and may reduce or even help prevent some of the
damage they cause. Makimura M, 1993(79) investigated the effect of various tea polyphenol and caffeine on induction of NO synthetase (NOS) in thioglycollate elicited and lipopolysaccharide(LPS)- activated peritoneal macrophages.

It has been reported that a dentifrice containing green tea catechins was effective in inhibiting gingival oxidative stress in periodontal lesions(80). Topical green tea catechins may also be an effective therapeutic agent, acting to suppress periodontal inflammation with decreasing gingival oxidative stress.(80)

More recently, the effects of the EGCg and its derivatives from Japanese green tea on the activities of Rgp and Kgp in P.gingivalis investigated, and the findings suggest that green tea catechins may have the potential to reduce periodontal breakdown resulting from the potent proteinase activity of P.gingivalis.(81) EGCg and epicatechin gallate inhibited lactate dehydrogenase and effective in reducing acid production in dental plaque and mutans streptococci(82).

Recently, Mitoshi Kushiyama, 2009(83) investigate the relationship between the intake of green tea and periodontal disease. In multivariate linear regression models, every one cup/day increment in green tea intake was associated with decrease in the mean probing depth, decrease in the mean clinical attachment level and decrease in bleeding on probing.

Blood from gingival hemorrhage contains both oxidants like toxic iron-catalyzed hydroxyl radical and oxygen-scavenging abilities (OSA) as antioxidant, which
protects other cells of oral cavity from oxidative stresses. It has been proven that red blood cells (RBC) binds with a variety of antioxidant polyphenols from nutrients increasing their OSA. Red blood cells coated by polyphenols, further act with salivary low molecular weight antioxidants (LMWA) to enhance the scavenging of reactive oxygen species, both acting as solubilizers of polyphenols making them antioxidants that are more effective.[84]

Deficiency of beta caroten can lead to periodontal destruction. Prostaglandin inhibitory effect of alpha tocopherol contributes in reducing periodontal inflammation. Epigallocatechin-3-gallate found in green tea reduces the risk of dental caries and plaque formation and is also effective in oral leukoplakia.[85]

Bacterial biofilm development in the marginal gingiva and periodontal pockets is important in the pathogenesis of periodontal disease. Scaling and root planning are effective in altering the flora and the green tea catechin has also been shown to be effective in altering the flora and acting as an adjunct to scaling and root planning.[86]

Similar mechanisms might be involved in the effects of the intake of green tea. Green tea extract has numerous effects on periodontal pathogens and periodontal tissues. Greater the concentration of catechins better the health benefits. Hence the consumption of green tea in comparison to other beverages may be widely recommended.[87]According to a pilot study conducted by
Awadalla et al. in 2011, green tea has inhibitory effect on S. mutans count, gingival bleeding and acidic plaque.[88]

Several *in vitro* studies have suggested that greentea catechins, such as EGCG, inhibit the growth of *Porphyromonas gingivalis*, *Prevotella intermedia*, and *Prevotella nigrescens* and the adherence of *Porphyromonas gingivalis* onto human buccal epithelial cells. These bacteria have been strongly implicated in destruction of periodontal tissues and their reduction can lead to the improvement of periodontitis. In addition, greentea 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*.

These reports of the inhibitory effects of catechin contained in green tea on periodontal pathogens may provide the basis for the beneficial effect of the daily intake of green tea on periodontal health. (89)

All the properties of green tea intake are responsible for the beneficial effects of oral intake of tea in the oral cavity, both in the periodontium as well as the gingival tissue. The same properties have been shown in the present study, where it is illustrated that intake of green tea on daily basis taken orally have effectively reduced the periodontal disease activity as well as gingival inflammation.

Improvement of oral hygiene status was observed in all the three groups, scaling and root planning alone, scaling and root planning with green tea, and green tea
alone. So green tea can be used as an adjunct to routine professional and personal plaque control. The present study has confirmed the earlier studies showing oral health benefits of green to some extent.