Applications of green tea in dentistry

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ABSTRACT

Tea is one of the most consumed beverages in the world. Majority of people consume black tea more than green tea. Green tea is prepared from the dry leaves of Camellia sinensis bush. The extent of oxidation of the leaves determines the type of tea prepared. Green tea is made from the un-oxidised tea leaves and is a type of less processed tea. Therefore, it contains the most number of antioxidants and beneficial phenols. These polyphenols prevent the acid production of bacterial species like Streptococcus mutans and Porphyromonas gingivalis, which are solely involved in the development of dental caries and periodontal diseases. Around 30 articles from Pubmed and other Scopus indexed journals were collected and the data was extracted from them. The articles were selected based on their relevance to the topic and characteristics. The review methods, applications of green tea in various systems, applications of green tea in dentistry and their risk and side effects were discussed. The above topics were discussed accurately and the data was selected accordingly. The topic was discussed to see whether green tea can be used in dentistry.

INTRODUCTION

Tea is commonly consumed all around the world. Majority of people consume black tea more than green tea. Green tea is prepared from the Camellia sinensis dry leaves. The extent of oxidation of the green tea leaves determines the type of tea. Green tea is made from the un-oxidised tea leaves and is a type of less processed tea. Therefore, it contains the most number of antioxidants and beneficial phenols. Green tea contains polyphenols, caffeine, flavonols, thiene and other aromatic compounds. Herbal polyphenols precipitate proteins. E.g.: Flavone and Tea catechins. The polyphenols seen in green tea are proven to have antibacterial qualities. They prevent the acid production of Escherichia coli, Streptococcus species, Staphylococcus aureus and Porphyromonas gingivalis (Araghizadeh et al., 2013).

The bacteria like Streptococcus mutans and Porphyromonas gingivalis consists of the main etiology of dental caries and periodontitis. Dental caries is caused due to a collection of factors and if untreated leads to severe toothache, infection and tooth loss. The green tea contains polyphenols which aid in the control of Streptococcus mutans (Yang and Kong, 2016). Previous studies have shown the use of green tea.
teas as mouth rinses to prevent caries. However, it was proven that it has weaker effects on controlling the formation of caries compared to common synthetic compounds used as mouth rinses such as fluoride and chlorhexidine.

Further studies are required to utilize green tea (Jazaeri, 2015). Another study review shows the anti-cariogenic property of green tea by utilizing the predominant catechins present in it (Sakanaka et al., 1990). Another study shows that iron and silver nanoparticles mediated with green tea have some cytotoxic and antimicrobial activity (Nakhjavani et al., 2017). Dental caries can cause various serious infections. Poor oral hygiene leads to infections such as gingivitis, periodontal diseases and can result in tooth mobility and loss of a tooth. Green tea contains anti-cariogenic products which can aid in the prevention of dental caries. If green tea can be mediated with nanoparticles, it can prove to be a great asset for better oral hygiene. The polyphenols present in green tea may function as reducing agents as they reduce metal cations as well as capping agents. It can also be infused into products like toothpaste for maintaining better oral health (Mathew, 2020). The aim of this study is to review the applications of green tea in dentistry.

MATERIALS AND METHODS

Review methods

The review articles are collected from PubMed and other Scopus indexed journals. Around 30 articles were collected due to the similarity to the topic. The articles which are in other languages are irrelevant and excluded. The articles are based on the characteristics of the topic.

Green tea and other therapeutic actions

The benefits of green tea are increasingly recognized a lot. In the ancient ages, green tea is seen as traditional Chinese medicine and a healthy beverage. Recent trials have shown that green tea helps in the maintenance of function of the endothelial membrane and homeostasis of blood vessels and their associated production in atherogenesis and subsequent reduction in the risk of cardiovascular problems and cancer (Neralla, 2019; Pavithra and Jayashri, 2019).

Green tea is said to be useful for insect bites due to its anti-inflammatory effects and its efficiency to stop bleeding. Studies have suggested an inverse association between green tea consumption and the risk of kidney stone formation. Tea catechins are well absorbed in the gastrointestinal tract and activate intracellular antioxidants, inhibit procarcinogen formations, suppress angiogenesis and cancer cells proliferation. Green tea is also used widely in skin-related diseases and also in reducing weight (Petruk, 2018).

Green tea and dental caries

Oral conditions such as dental caries, periodontitis and tooth loss determine human health status. Dental caries is caused due to an array of infectious diseases caused by bacteria (Prabakar et al., 2018a; Mohapatra, 2019). The bacteria chiefly involved here are Streptococcus mutans and Prevotella gingivalis. Green tea protects against numerous bacteria-induced dental caries and plaque scores (Prabakar et al., 2018a,b). It controls the acid production of bacteria, limits glucan biosynthesis that gets stuck on teeth (Khati, 2019). Studies have shown that extracts of green tea may be especially benefitting in preventing plaque formation by bacteria in the mouth. Polyphenols of green tea act as plaque preventing agents by inhibiting glucosyltransferase used by oral bacteria to feed on sucrose (Prabakar et al., 2018c). Therefore consuming green tea is seen to prevent caries activity (Prabakar et al., 2016; Samuel et al., 2020).

Green tea in oral cancer prevention

The polyphenols in green tea are seen to reduce tumour growth in randomized controlled trials and can protect against ultraviolet radiation (Kannan, 2017; Kumar and Preethi, 2017). The polyphenols in green tea are said to have cytotoxic activity against cancer cells and reduce the risk of oral cancers (Harini and Leelavathi, 2019). A previous study about the role of green tea in the prevention and management of oral cancer is taken into account here. The patients with potentially premalignant lesions are given three doses of green tea extract vs placebo thrice a day, then evaluated for chemoprotective biomarkers. Patients who are given green tea extract show a good dose-response effect to it. VEGF in stroma and cyclin D1 is increased in symptomatic and reduced in asymptomatic patients. Green tea extract in the above study shows the blockade of stimuli to angiogenesis and reduces the possibility of premalignant lesions (Ramshankar and Krishnamurthy, 2014; Kumar and Vijayalakshmi, 2017).

Green tea in halitosis

Halitosis, also known as bad breath is due to the volatile sulphide components like methyl mercaptan and hydrogen sulfide, which are the products of gram-negative bacteria. Green Tea, polyphenols, catechins and especially epigallocatechins gelate abolish halitosis by modification of odorant sulphur components (Pratha and Prabakar, 2019). Previous
studies about the effect of green tea as mouth rinse against salivary Streptococcus mutans is taken. The effects of chlorhexidine and green tea are compared here. The long term usage of chlorhexidine, however, causes brown staining of teeth, oral mucosal ulcers, parotid swellings. Green tea causes no such effects and has better beneficial properties (Nagar, 2019).

GREEN TEA IN PERIODONTAL DISEASE

The antioxidant and antimicrobial effect of green tea catechins prove to be useful in the treatment of periodontal diseases. It also inhibits the growth of Porphyromonas gingivalis, Prevotella intermedia and Prevotella nigrescens and also prevents the production of toxic metabolites of Prevotella and Porphyromonas species. Epigallocatechin gallate present in green tea also helps in osteoclast growth prevention and thus prevent bone resorption (Mao, 2017). Catechins also are bactericidal against Prevotella species. The previous study showing the uses of green tea in patients with periodontal diseases is taken into account. The uptake of green is associated with criteria such as a reduction in bleeding on probing, probing depth and clinical attachment loss. Hence green tea intake is beneficial for periodontal health (Chatterjee, 2012).

CONCLUSIONS

In this review, we have seen the applications, actions, adverse effects of green tea. Green tea can also be infused to any product like toothpaste and used in laboratories to improve its effects, also constituents from green tea are effective against mutans bacteria by making the tooth surface irregular for bacteria to produce enamel affecting acid.

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Conflict of Interest

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