



Research Article

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Blood Pressure, Cholesterol and Triglycerides Level Changes in Short Term Green Tea Consumption Persons in South Indian Population

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ABSTRACT

Green tea has become the subject of interest because of its beneficial effects on human health. Green tea (GT) contains catechins which reduces radicals and thereby protects from cardiovascular diseases. Diabetes mellitus and cardiovascular problems are most severe problems which are encountered most frequently in our country. Aim of the study was to study Blood pressure, Cholesterol and Triglycerides levels changes in short term green tea Consumption persons in south Indian population. The Present study was carried out in the Department of Biochemistry, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry. The analysis of plasma LDL, Cholesterol, triglycerides were evaluated by enzymatic methods, Blood pressure were calculated by using BP operator. The results indicated that green tea beverages and green tea extract supplementation significantly reduced TC and LDL-cholesterol concentrations and blood pressure. Green tea intake results in significant reductions in blood pressure, total cholesterol, and LDL cholesterol. The effect size on systolic blood pressure is small, but the effects on total and LDL cholesterol appear moderate. Longer-term independent clinical trials evaluating the effects of green tea are warranted.

Key words: Lipid profile, Triglycerides, Green tea, Catechins

INTRODUCTION

Tea has been cultivated for centuries, beginning in India and China. Tea consumption has its legendary origins in China dating back to more than 4,000 years ago, making it the oldest plant-based tea known. According to legend, green tea was first brewed in 2737 BC during the reign of Emperor Shennong [1]. Epidemiologic studies have reported an inverse relation between green tea consumption and CVD risk. Persons who drink 2 cups of green tea/d had lower plasma total cholesterol (TC) concentrations and have been shown to reduce their risk of death from CVD by 22–33% [2]. During 17th century, the first green tea was exported from India to Japan. About 2.5 million tons tea leaves are produced each year throughout the world, out of which 20% produced as green tea and mainly consumed in Asia, some parts of North Africa, United states and Europe [3].

Green tea is made from *Camellia sinensis* leaves that have not undergone the same withering and oxidation applied when processing *Camellia sinensis* into oolong tea and black tea. Green tea originated in China, but its production has spread to many countries in Asia. Green Tea Contains Polyphenols include epigallocatechin gallate (EGCG), epicatechin gallate, epicatechins flavanols [4] and Tannins: A group of simple and complex phenol, polyphenol, and flavonoid compounds. Produced by plants, all of the tannins are relatively resistant to digestion or fermentation. All tannins act as astringents, shrinking tissues and contracting structural proteins in the skin and mucosa [5].

Green tea contains anti carcinogenic property which causes inhibition of tumour initiation and promotion, induction of apoptosis thereby retarding the growth and development of neoplasms [6-7]. Antioxidant potential is directly related to the combination of aromatic rings and hydroxyl groups causing the binding and neutralization of free radicals by the hydroxyl groups. Green tea polyphenols stimulate the detoxification of xenobiotic compounds [8-9]. Green tea polyphenols inhibits the production of arachidonic acid metabolites mainly pro-inflammatory prostaglandins [10].

Consumption of green tea has been associated with a significant reduction in death from all cancers such as colon, oesophagus, lungs, kidney, stomach and pancreas. There is limited evidence to suggest that green tea consumption may be associated with a slightly lower risk of esophageal cancer in the Chinese population, a lower risk of lung cancer in women, and a lower risk of oral cancer in Asian people [11-13]. Consumption of green tea has been associated with a lower risk of death from cardiovascular disease, and other chronic diseases and also reduces the blood pressure, risk of stroke, coronary heart disease, Reduces the blood glucose levels. Several studies shows that regular consumption of the antioxidant rich green tea could reduce blood lipid levels and cut the risk of developing heart disease, suggests a small trial from Portugal [14].

Green tea has been used traditionally to control blood sugar levels. Epidemiological Animal studies [15] suggest that green tea may help prevent the development of type 1 diabetes and slow the progression once it has developed. In people with type 1 diabetes, their bodies make little or no insulin, which helps convert glucose or sugar into energy. Green tea may help regulate glucose in the body. Research also suggests that regular consumption of green tea may help manage type 2 diabetes.

Green tea is one of the most common beverages. Green tea extracts are thought to possess antioxidant and ACE-inhibitor properties. Green tea polyphenols also inhibit the absorption of lipids from the intestines and facilitate the conversion of cholesterol into bile acids. Epidemiologic studies have shown that green tea has a cardioprotective effect and evidence synthesis has shown that consumption of green tea is associated with blood vessel relaxation [16].

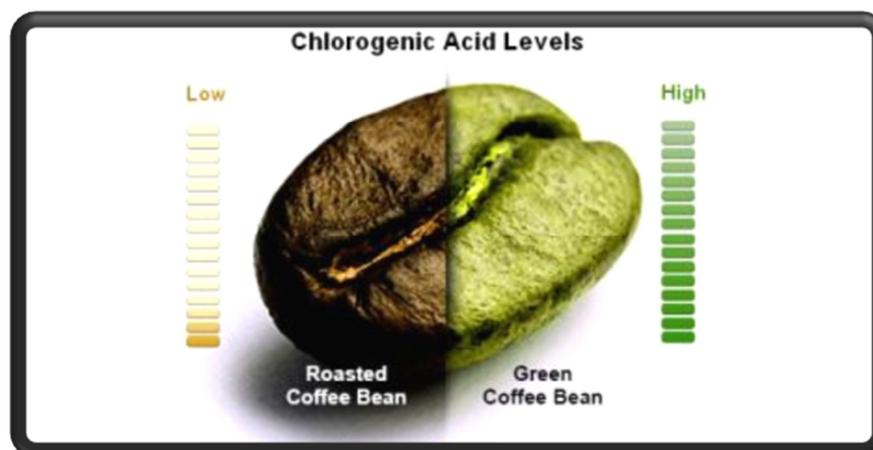


Figure 1 Chlorogenic Acid Levels in Coffee Bean

Chlorogenic acids in green coffee & BP management

Chlorogenic acids are naturally occurring compounds which are abundant in unroasted coffee beans (green coffee)(Figure1). Laboratory studies have shown that chlorogenic acids can scavenge free radicals and increase antioxidant capacity, and researches in animals have also demonstrated that chlorogenic acids can cause blood vessel dilatation [17].

Green tea also seems to protect the liver from the damaging effects of toxic substances such as alcohol. Green tea helps protect against liver tumors in mice [18]. Epidimiological studies of several animal and human studies suggest that plant chemicals in green tea called catechins, may help treat viral hepatitis, an inflammation of the liver. In these studies, catechin was used by itself in very high amounts [19].

Green tea extract may boost metabolism and help burn fat. Combination of green tea and caffeine improved weight loss and maintenance in people who were overweight and moderately obese. Green tea can help prevent dental cavities. Green tea may also be useful in inflammatory diseases, such as arthritis. Chemicals in green tea may help treat genital warts, treat dermatologic conditions, and prevent symptoms of colds and flu. Green tea may play a role

in preventing Parkinson disease, cognitive decline, and osteoporosis. Studies also shown that drinking green tea is associated with reduced risk of dying from any cause (figure 2) [20].

Cardiovascular disease (CVD) is a leading cause of morbidity, mortality, and disability worldwide [21]. Hyperlipidemia, which results from abnormalities in lipid metabolism, leads to the development of atherosclerotic plaques and is one of the key risk factors of CVD [22]. Risk of heart attack is 3-fold higher in subjects with hyperlipidemia than in subjects with normal lipid status [23], whereas a 1% decrease in serum cholesterol has been shown to reduce risk of CVD by 3% [24]. With the increasing incidence of hyperlipidemia, more and more consumers are aware of the effects of what they eat and drink on their blood lipid profiles.

Recent animal studies have revealed that green tea catechins could inhibit key enzymes involved in lipid biosynthesis and reduce the intestinal absorption of TC, thereby improving blood lipid profiles [25-26]. Because of promising results in preclinical models, a substantial number of clinical trials have been performed to investigate the effect of green tea beverages and extracts on lipid profiles of subjects with cardiovascular-related diseases as well as of healthy individuals [27-29]. However, results of these trials were inconsistent, and sample sizes were relatively modest. As a result, the precise effect of green tea on lipid profiles has not been established to our knowledge. Therefore, we conducted a meta-analysis of all published randomized controlled trials (RCTs) that investigated the effects of green tea on blood cholesterol, including TC, LDL cholesterol, and HDL cholesterol.



Figure 2: Overview of green tea Uses

By observing several studies we aimed to identify and quantify the effect of green tea and its extract on total cholesterol (TC), LDL cholesterol, and HDL cholesterol in south Indian population.

EXPERIMENTAL SECTION

This study will be conducted in healthy individuals (after obtaining informed consent among staff & students) of *Sri Lakshmi Narayana Institute of Medical Sciences (SLIMS), Bharath University, Puducherry, India*. A total of 50 participants aged between 20 and 50 years will be enrolled in the study. 4 ml of venous blood will be collected from each participant in the fasting state. Serum will be separated immediately by centrifugation at 2000 rpm for 15 minutes. Separated serum will be either analysed immediately or within two hours of collection. Blood samples will be collected in plain tubes for lipid analysis. All participants reported to the Department of biochemistry between 9 and 10 am after a 12-hr overnight fast and having avoided strenuous exercise, smoking, alcohol, and caffeinated beverages for the preceding 24 h. On their arrival, standard measures of height and weight, blood pressure will be taken.

All the participants will be given two cups of green tea per day for a period of eight weeks and in each green tea bag, one cup is equal to 1.74 g. After the completion of the experimental period the same parameters described earlier will be re-estimated. Lipid profile will be determined after a 12 to 14-hour period of fasting after experimental period. Estimations will be made of serum lipids (LDL-cholesterol will be calculated by the Friedwald formula).

RESULTS AND DISCUSSION

Table. No. 1: Mean± SD of BP, Cholesterol, TGL levels in Short term green tea Consumption persons in south Indian population

S.No.	Parameters	Mean± SD Green Tea consumption person	After 2 weeks supplementation	P value
1	Systolic Blood Pressure(mm Hg)	110±3.24	106.5±3.12	<0.05*
2	Diastolic Blood Pressure(mm Hg)	76.4±2.40	76.0±2.24	
3	Cholesterol	110.4±5.2	82.3±2.1	
4	TGL	123.2±3.0	109.2±5.2	
5	LDL	36.2±3.3	29.7±0.6	

*Statistically significant

Our study was conducted on 50 participants with 2 cups of green tea daily for about 8 weeks. They are aged between 20 to 50 years and the baseline values were considered as the control group in our study.

Hypertension is mostly caused by hyperlipidaemia. Increased LDL-C levels leads to increased oxidised LDL, which is most potent atherogenic and plays an important role in pathogenesis of atherosclerosis and hypertension. As green tea consumption brings down the cholesterol levels, in our study those individuals who are consuming green tea, lipid profile and blood pressure is maintained with in normal limits.

Green tea contains a class of polyphenolic flavonoids called catechins which reduces superoxide radicals thereby useful for inhibiting the in vivo oxidation of LDL, VLDL and subsequent cardiovascular diseases. Green tea exerts a variety of beneficial metabolic effects causing reduction in oxidative status and LDL oxidation and amelioration of lipid Metabolism. Supplementation of green tea has the favourable effect on body mass, lipid profile, glucose and antioxidant status in many studies [30]. Some authors suggest that the polyphenolic components of green tea have an anti obesogenic effect on fat homeostasis. A number of studies conducted to find the effect of green tea on carbohydrate metabolism and lipid profile [31].

Green tea contains anti carcinogenic property which causes inhibition of tumour initiation and promotion, induction of apoptosis thereby retarding the growth and development of neoplasms. Antioxidant potential is directly related to the combination of aromatic rings and hydroxyl groups causing the binding and neutralization of free radicals by the hydroxyl groups. Green tea polyphenols stimulate the detoxification of xenobiotic compounds. Green tea polyphenols inhibits the production of arachidonic acid metabolites mainly pro-inflammatory prostaglandins and leukotrienes which decreases the inflammatory response.

Our study is in contrast with other study [32] who states that there was no positive correlation between the supplementation of green tea and cholesterol levels. Also correlated with study of Japanese population[33] who conducted epidemiological study on individuals and stated that the consumption of green tea associated with lower levels of total cholesterol. In the present study the triglycerides in the individuals shown a significant decrease ($p < 0.05$) when compared with baseline value which is correlated with the study of Abd – Elraheim A, Eishater *et al* [34] who states that extracts from green tea normalized cholesterol, triglycerides and LDL- cholesterol. In 2003, Raederstorff *et al*[35] explained green tea exerts the hypolipidemic action and the extracts from green tea normalizes the plasma triglycerides, cholesterol concentration and suggested that green tea might decrease intestinal absorption of lipids in 2005, Tas *et al*[36] suggested that extracts from green tea have beneficial effects on serum paraoxonase activity by its anti hyperglycaemic, antihyperlipidaemia and antioxidant action^[34]In our study, LDL significantly decreased ($p < 0.05$) after supplemented with green tea. This is correlated with the study of Nikolaos Alexopoulos *et al* [37] who stated that consumption of green tea reduced the total and low density lipoprotein cholesterol.

Daily green tea consumption in the current meta-analysis was equivalent to 2 cups, and the trials varied in length from 3 weeks to 8 weeks, and no subjects experienced major adverse effects. This phenomenon may be attributed to the following 2 factors: 1] the durations of studies involved in our meta-analysis were not long enough to observe serious side effects, and 2] consumption of 2 cups of green tea/day may be not enough to cause adverse effects. Therefore, safety issues need to be evaluated in the future under conditions of long-term and high-dose exposure of green tea.

CONCLUSION

Green tea significantly reduced serum total Cholesterol and LDL-cholesterol concentrations and the changes were not influenced by the type of intervention, treatment doses of green tea catechins, study duration, individual health status, or quality of the study. For intervention groups, the mean change in blood HDL-cholesterol concentrations showed a favorable trend. In our study consumption of green tea produced a significant reduction in lipid profile and there is no much change in the glucose level. As our study period is only 2 months and we can't able to do further

investigation and we are planning for a long run for further processing of parameters like Vitamins, Enzymes, Malondialdehyde, FRAP, Catalase. We also want to focus on Oxi-LDL as it helps in finding the net effect on cardiovascular disease. The development of Biomarkers for green tea consumption as well as molecular markers for its biological effects will facilitate future research in this area.

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