

Comparative Efficacy of Local and Branded Green Tea on Patients Suffering From Hyperlipidemia

Sidra Khalid^{1*}, Sana Arif², Hafsa Kamran¹ Shaista Jabeen¹ and Maria Aslam¹

¹ University Institute of Diet and Nutritional Sciences, Faculty of Allied Health Sciences, University of Lahore, Lahore, Pakistan

² Institute of Home Sciences, University of Agriculture Faisalabad, Faisalabad, Pakistan

Abstract:

Green tea is well known to reduce body weight, and blood lipid profile in cardiovascular patients suffering from hyperlipidemia, because of antioxidative properties of polyphenols present in green tea.

Objective:

To inspect and compare the consequence of commonly available green tea in market and branded (Lipton) green tea on cholesterol, low density lipoproteins (LDL), high density lipoproteins (HDL) and triglycerides of cardiovascular patients suffering from dyslipidemia.

Methods:

A total of 60 patients were randomly selected from Punjab Institute of Cardiology, Lahore for experimental study. Data was collected through pre-tested questionnaires and from the lab records of lipid profile investigations performed before, during and after the intervention by the hospital lab. SPSS Version 17 was used for data analysis. Assessment of means between groups was executed through one way Analysis of Variance (ANOVA).

Results:

After the intervention was carried out on lipid profile of cardiovascular patients suffering from hyperlipidemia, analysis of variance of: cholesterol, HDL, LDL and triglycerides to find out the comparative efficacy of local and branded green tea on cardiovascular patients, was found to be significant ($P < 0.01$). Analysis of variance of body weight of cardiac patients suffering from

hyperlipidemia was also found to be significant ($P < 0.01$).

Conclusions:

Green tea has ability to lower the level of blood lipid profile including serum triglycerides, serum cholesterol, low density lipoproteins (LDL), while increase the level of high density lipoproteins (HDL) effectively. It is also effective in lowering the weight. So it can act as hypo-lipidemic and weight-lowering agent and it improves the cardiovascular function.

Key words:

Green tea, High density lipoproteins (HDL), Low density lipoproteins (LDL), Triglycerides, Cholesterol.

Introduction:

Tea is commonly consumed drink worldwide besides water. Green tea is prepared from *Camellia sinensis* leaves by drying the tea leaves after harvesting, therefore, encompasses additional antioxidants as compared to black and oolong tea. During preparation, steaming practice decreases the enzymes liable to break color pigments and favors the tea to retain its color, so after harvesting fresh leaves are instantly steamed to avoid fermentation and resulting in a dry stable product.¹ Green tea leaves have diversity of nutrients. For human health green tea leaves have three chief components xanthic bases (caffeine and theophylline), essential oils and especially, polyphenols.² Among green tea leaves constituents' polyphenols are the fascinating nutrients hence, green tea is taken as noteworthy dietary source of polyphenols. Catechins comprise the one third ratios of green tea nutrients and only

nine percent of black tea.³ Epicatechin (EC), epicatechin-3-gallate (ECG) epigallocatechin (EGC) and epigallocatechin-3-gallate (EGCG) are four primary catechins which comprise 6.4, 13.6, 19 and 59 percent respectively.⁴ As compared to black, green tea has been found beneficial due to antioxidant activity due to the more number of epigallocatechin-3-gallate.⁵ As CVD preventive mediators polyphenols of green tea have been broadly examined.^{7,8} Cardiovascular diseases (CVD) are basic reason of disability, and mortality all around the world. Cardiovascular diseases are recognized as multifactorial diseases. Recognized hazard factors for progression of CVD includes older age, male sex, obesity, hypertension, cigarette smoking, diabetes mellitus, genetics, dyslipidemia and many more.⁹ Atherosclerotic cardiovascular disease (CVD) is basic reason of death in the industrialized countries.¹⁰

Tea is utmost broadly used drink globally such as green or black tea. Tea extracts as well are consumed as dietary supplements. Researchers recommend that tea intake may perhaps lessen the hazard of CVD, but consequences were unreliable. A study conducted by Sueaka et al. conclude that green tea has defensive consequences on equally long-lasting seditious illness and lifestyle related illness, together with CVD and cancer, ensuing in elongation of life.¹¹ The connotation of tea and flavonoid consumption with myocardial infarction (MI) inspected by Geleijnse et al. revealed that comparative hazard of instance MI was lesser in tea drinkers than non-tea drinkers.¹² consequences of polyphenol in green tea on the serum anti-oxidative action and cholesterol intensities explored by Yokozawa et al. suggested that green tea polyphenol may possibly employ an atherosclerosis preventing act thru advantage of its anti-oxidant belongings and via aggregating HDL cholesterol intensities.¹³ Readerstroff explore the pathway by green tea to lessen plasma saturated fatty acid and frequency of cholesterol immersion concluded. The study recommended

that one of the basic procedures thru which EGCG disturbs fatty acid digestion is thru meddling by means of the micellar availability of saturated fat in the gastrointestinal region, which formerly in crack diminished saturated fat immersion.¹⁴ Ohmori et al. inspected beneficial influences of green tea consumption on atherosclerosis and informed that green tea has revealed to hinder LDL oxidation, platelet aggregation, and matrix metallo proteinases activities in vitro.¹⁵ Coimbra et al. investigated consequence consumption of green tea on the lipid analysis in individuals. They concluded that on consumption of green tea, a noteworthy favorable perfection in the lipid analysis of individuals was perceived.¹⁶ Basu et al. conducted a study and concluded that green tea drink auxiliary depress lipid peroxidation contrasted with age and sex.¹⁷ Mineharu et al. concluded that coffee along with green tea consumption is connected through a lesser hazard of mortality from cardiac disease.¹⁸ The importance of the study is to highlight the health benefits (to reduce hyperlipidemia along with reduction in weight) of consumption of both branded and local green tea. So awareness will be created among the hyperlipidemic obese persons through extensive health education which will indirectly reduce the mortality and morbidity.

Methods:

An experimental study was conducted on randomly selected 60 patients of cardiovascular diseases, of both sexes aged between 40-60 years, suffering from hyperlipidemia for a follow up with green tea intake, from Punjab Institute of Cardiology, Lahore for the period of 9 months, in 2013. Lipton green tea was purchased from Metro (cash and carry Pakistan) and local tea was purchased from local market of Lahore. Patients were further divided into three groups of twenty patients each as: in group-1 no treatment (control Group), group-2 branded (Lipton) green tea was given and in group-3 locally available green tea was given. 1 tea spoon of green tea

(Lipton/local) was recommended to patients, with 150mL of water to prepare a cup of green tea. Patients were recommended to take three cups a day regularly. Blood lipid profile including HDL, LDL, cholesterol and triglycerides levels and body weight of the patients were checked at start, after a month and at the end of the trial. Lipid profile of patients was checked from a standard protocol. All the data obtained were statistically analyzed for mean and standard deviation. Statistical analysis was carried out using SPSS (Version 17). Comparison of means among groups was performed via one way Analysis of Variance (ANOVA) and value was taken as statistically different when p value was less than 0.05.

Results:

Serum Cholesterol (mg/dL)

Analysis of variance of serum cholesterol comparative efficacy of local and branded green tea on cardiovascular patients revealed that: treatments days and their interaction treatments and days was found to be significant ($P<0.01$). Mean comparison of different treatments and days of serum cholesterol was found significantly increased at baseline 226.74 ± 3.45 in T_2 and decreased in 60th day of 137.34 ± 2.09 in (T_2) branded green tea as compared to all others treatments and days. Overall mean of serum cholesterol in treatments was found significantly increased in local green tea (193.76 ± 4.47) followed by placebo (192.30 ± 1.64) and branded green tea (180.67 ± 8.32). While, overall mean of serum cholesterol in days was found significantly increased (210.76 ± 3.82) in baseline followed by 30th day (188.88 ± 2.37) and then decreased in 60th day (167.09 ± 5.39) (Table 1).

Table 1: Mean serum cholesterol (mg/dL \pm SE) comparative efficacy of local and branded green tea on cardiovascular patients

Treat ments	Baseline	30 th Day	60 th Day	Overall I Mean
T_0	190.39 $\pm 2.90bc$	192.30 $\pm 2.93b$	194.21 $\pm 2.95b$	192.30 $\pm 1.64A$
T_1	215.16 $\pm 3.27a$	196.40 $\pm 2.99b$	169.73 $\pm 2.58d$	193.76 $\pm 4.47A$
T_2	226.74 $\pm 3.45a$	177.93 $\pm 2.71cd$	137.34 $\pm 2.09e$	180.67 $\pm 8.32B$
Overall II Mean	210.76 $\pm 3.82A$	188.88 $\pm 2.37B$	167.09 $\pm 5.39C$	188.91 ± 3.23

Significant at $P<0.01$

Mean sharing similar letter in a row or in a column are statistically non-significant ($P>0.05$). Small letters represent comparison among interaction means and capital letters are used for overall mean.

T_0 = Placebo

T_1 = Local green tea

T_2 = Branded green tea

Serum HDL (mg/dL)

Analysis of variance of serum HDL comparative efficacy of local and branded green tea on cardiovascular patients revealed that: Treatments, days and their interaction treatments and days was found to be significant ($P<0.01$). Mean comparison of in different treatments and days of serum HDL was found significantly increased at local green tea 59.95 ± 0.91 in T_1 and decreased in baseline 37.52 ± 0.57 (T_0) placebo as compared to all others treatments and days. Overall mean of serum HDL in treatments was found significantly increased in local green tea (49.29 ± 2.04) followed by branded green tea (41.77 ± 1.11) and placebo (40.89 ± 0.38). Whereas, overall mean of serum HDL in days was found significantly increased (49.98 ± 1.74) in 60th

day followed by 30th day (43.48±1.08) and then statistically decreased on baseline (38.50±0.39) (Table 2).

Table 2: Mean serum high density lipoprotein (HDL; mg/dL±SE) comparative efficacy of local and branded green tea on cardiovascular patients

Treatments	Baseline	30 th Day	60 th Day	Overall Mean
T ₀	39.87±0.61cde	41.18±0.63cd	41.62±0.63c	40.89±0.38B
T ₁	38.10±0.58de	49.83±0.76b	59.95±0.91a	49.29±2.04A
T ₂	37.52±0.57e	39.43±0.60cde	48.36±0.74b	41.77±1.11B
Overall II Mean	38.50±0.39C	43.48±1.08B	49.98±1.74A	43.99±0.91

Significant at P<0.01

Mean sharing similar letter in a row or in a column are statistically non-significant (P>0.05). Small letters represent comparison among interaction means and capital letters are used for overall mean.

T₀ = Placebo

T₁ = Local green tea

T₂ = Branded green tea

Serum LDL (mg/dL)

Analysis of variance of serum LDL comparative efficacy of local and branded green tea on cardiovascular patients revealed that: Treatments, days and their interaction treatments and days was found to be significant (P<0.01). Mean comparison of different treatments and days of serum LDL was found significantly increased 222.22±3.38 in T₂ on

baseline and decreased in 60th day 153.20±2.33 (T₂) branded green tea as compared to all others treatments and days. Overall mean of serum LDL in treatments was found significantly increased in local green tea (208.57±1.94) followed by Placebo (194.31±1.70) and branded green tea (186.93±6.50). However, overall mean of serum LDL in days was found significantly increased (208.34±3.35) in baseline followed by 30th day (197.07±2.90) and then decreased on 60th day (184.40±5.20) (Table 3).

Table 3: Mean serum low density lipoprotein (LDL; mg/dL±SE) comparative efficacy of local and branded green tea on cardiovascular patients

Treatments	Baseline	30 th Day	60 th Day	Overall I Mean
T ₀	191.36±2.91cd	194.64±2.96cd	196.93±3.00cd	194.31±1.70B
T ₁	211.43±3.22ab	211.23±3.21ab	203.06±3.09bc	208.57±1.94A
T ₂	222.22±3.38a	185.35±2.82d	153.20±2.33e	186.93±6.50C
Overall II Mean	208.34±3.35A	197.07±2.90B	184.40±5.20C	196.60±2.56

Significant at P<0.01

Mean sharing similar letter in a row or in a column are statistically non-significant (P>0.05). Small letters represent comparison among interaction means and capital letters are used for overall mean.

T₀ = Placebo

T₁ = Local green tea

T₂ = Branded green tea

Serum Triglyceride (mg/dL)

Analysis of variance of serum triglyceride comparative efficacy of local and branded green tea on cardiovascular patients revealed that: Treatments, days and their interaction treatments and days was found to be significant ($P < 0.01$). Mean comparison of in different treatments and days of serum triglyceride was found significantly increased 210.18 ± 3.20 in T_2 on baseline and decreased in 60th day 133.08 ± 2.02 (T_1) local green tea as compared to all others treatments and days. Overall mean of serum triglyceride in treatments was found significantly increased in T_0 (194.40 ± 1.62) followed by T_2 (177.58 ± 5.37) and T_1 (172.41 ± 7.11). Whereas, overall mean of serum triglyceride in days was found significantly increased (204.61 ± 2.34) in baseline followed by 30th day (176.42 ± 3.46) and then decreased on 60th day (163.36 ± 5.77) (Table 4).

Table 4: Mean serum triglycerides (mg/dL \pm SE) comparative efficacy of local and branded green tea on cardiovascular patients

Treatments	Baseline	30 th Day	60 th Day	Overall I Mean
T_1	$194.49 \pm 2.96b$	$194.21 \pm 2.95b$	$194.49 \pm 2.96b$	$194.40 \pm 1.62A$
T_2	$209.15 \pm 3.18a$	$175.00 \pm 2.66c$	$133.08 \pm 2.02e$	$172.41 \pm 7.11B$
T_3	$210.18 \pm 3.20a$	$160.05 \pm 2.43d$	$162.49 \pm 2.47cd$	$177.58 \pm 5.37B$
Overall II Mean	$204.61 \pm 2.34A$	$176.42 \pm 3.46B$	$163.36 \pm 5.77C$	181.46 ± 3.20

Significant at $P < 0.01$

Mean sharing similar letter in a row or in a column are statistically non-significant ($P > 0.05$). Small letters represent comparison among interaction

means and capital letters are used for overall mean.

T_0 = Placebo

T_1 = Local green tea

T_2 = Branded green tea

Discussion:

Results of comparative efficacy of green tea in current study showed that the body weight was found non-significantly increased after two months in no-intake group and decreased after two months intake of green tea. As two types of teas were used more significant decrease was observed by two months intake of Lipton green as compared to no-intake group and local green tea. These findings are in accordance with the results of Bogdanski et al. they investigated on overweight CVD patients and observed significant decrease in weight.¹⁹ In the same manner Basu et al. associated significant decrease in body weight and BMI by unbroken green tea consumption in humans.¹⁷ A double-blind, cross-over study by Rudelle et al. also revealed that intake of a drink encompassing green tea catechins, caffeine, and calcium upsurgers 24 hours energy expenses by 4.6%, but the involvement of the separate components could not be renowned. It was put forward that such amendments were satisfactory to avoid weight increase.²⁰ In another randomized, double-blind, cross-over pilot study, in which Thielecke and Boschmann, observed anti-obesity effects of green tea on weighty human volunteers, these discoveries put forward that EGCG lonely has the capacity to upsurge fat corrosion in humans and might in this manner fund to the obesity preventing consequences of green tea.²¹ Nagao et al. also experimented on humans and observed that unbroken green tea consumption rich in catechins lead towards decline in physique heaviness, hence they suggest green tea as effective anti-obesity tool.²² Comparative efficacy of local and branded green tea on cholesterol showed that there was non-significant increase in

no-intake group but a non-significant decrease was observed after two months intake of green tea. These results are in accordance with observed significant reduction in cholesterol and cholesterol: HDL by Coimbra et al. and Basu et al. also observed same kind of decrease in HDL cholesterol by investigating consequences of green tea in humans.^{16,17} In the same manner Zheng et al. also observed significant decrease of green tea on total cholesterol.²³ As Al-Dujaili et al. also stated that continuous ingesting of green tea accessible in open market results in refraining full cholesterol along with lessening systolic and diastolic BP, percentage body fat plus weight suggesting a purpose for green tea in plummeting recognized credible circulatory hazard issues.²⁴ Here perceived an important hypo-cholesterolemic consequence for green tea, which is in harmony with supplementary intelligences in human revealed by Maron et al.²⁵ Koo and Noh. also suggest suppression of cholesterol by green tea intake. Comparative efficacy of HDL was found significantly lower after one and two months in no intake group but significant increase as observed by green tea intake. Both teas significantly increased HDL ($P < 0.05$) but effect of local green tea was more significant as compared to Lipton green tea and no intake group. These findings follow the findings of Coimbra et al. as a significant increase was observed in HDL.¹⁶ But no effect of green tea was observed on HDL by Zheng et al.²³ Contrary to this, Bogdanski et al. observed elevated HDL by constant green tea intake.¹⁹ LDL was found non-significantly high at start, after one month and continuously after two months in no-intake group but a noteworthy decrease was observed after two months intake of green tea. Non-significant effect ($P > 0.05$) of green tea was observed on LDL. Comparative efficacy revealed that though both local and Lipton green tea had significant effect but Lipton green tea has more obvious and clear consequences on LDL. These results are in accordance with findings of Tinahones et al.²⁶

According to these findings intake of green tea excerpt was related by means of a note worthy lessening in the attentiveness of corroded LDL. The investigations reveal that green tea intake in form of extract by human females, for more than a month created variations in cardiac activity plus an imperative lessening in serum corrosion-ability. Results can also be interperated with findings of Zheng et al. in humans as they also have observed remarkable decrease in LDL, irrespective of the dosage and type of green tea, trial duration, distinct health status, or worth of the directed trial.²³ Basu et al. also associate lessening of LDL with green tea intake in humans.¹⁷ Nagao et al. also observed lessening of LDL cholesterol in addition to controlling blood pressure.²² Coimbra et al. also noticed a significant decrease in LDL.¹⁶ Erba et al. also noticed and concluded a reasonable significant decrease in LDL cholesterol with respect to control group in humans.²⁷ Miura et al. conducted an experiment on the way to inspect the consumption of polyphenols of green tea in reducing LDL resilient in human being and consequences suggested that per diem ingestion of 7-8 mugs (just about 100 mL in every mug) of green tea may perhaps upsurge opposition of LDL to inside vein corrosion, taking toward lowering the hazard of CVD.²⁸ Triglycerides were found non-significantly different in no intake, local green tea and Lipton green tea. Triglyceride were found high at start, after one month and continuously after two months in no-intake group but a remarkable decrease was observed after two months intake of green tea. Comparative efficacy revealed that though both local and Lipton green tea had significant effect but Lipton green tea had more obvious consequences on triglycerides. The results are in accordance with Zheng et al. who concluded that the concentrations of triglycerides, in the sera from the mice fed green tea powder, catechins and the anine diets were expressively lesser as compared to control. The level of triglycerides in the hepatic cells was remarkably

lessened by the catechins diet.²⁹ Koo and Noh in the same manner suggest a decrease in triglyceride by green tea consumption.³⁰

Conclusions:

Green tea has ability to lower the level of blood lipid profile including serum triglycerides, serum cholesterol, low density lipoproteins (LDL), while increase the level of high density lipoproteins (HDL) effectively. It is also effective in lowering the weight. So, it can act as hypo-lipidimic and weight-lowering agent and it improves the cardiovascular function.

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