IJBCP   International Journal of Basic & Clinical Pharmacology

Original Research Article

Comparative evaluation of effect of green tea and green coffee on blood cholesterol level and body weight in albino rats

Ratan Kumar*, Manoj Kumar Purty

Department of Pharmacology,
MGM Medical College,
Jamshedpur, Jharkhand, India

Received: 10 August 2018
Revised: 14 September 2018
Accepted: 18 September 2018

*Correspondence to:
Dr. Ratan Kumar,
Email: drratan58@gmail.com

ABSTRACT

Background: Overweight and obesity are chronic medical condition responsible for risk factors for many non-communicable diseases. Development of rapid upsurge of these condition in medium and low-income group countries increased the awareness and uses of many types of remedies. Along with other natural herbal products green tea and green coffee have also became popular in communities. Aim of this study was to compare the effect of green tea and green coffee on blood cholesterol and weight in experimental animals.

Methods: The experiment of this study was conducted in the Department of Pharmacology, MGM Medical college, Jamshedpur after ethical approval. 24 albino rats were selected and divided randomly in four groups A B C D. Group 'A' was kept as control group, group 'B' was given fat rich diet to produce hypercholesterolemia, group 'C' and 'D' were given green tea and green coffee respectively along with cholesterol rich diet. Weight and cholesterol level of rats were measured on 1st day, 2nd week and 4th week.

Results: There was significant increase in serum cholesterol in non-treated animals as compared to control group but parameter showed significant less rise of cholesterol and weight in treated group by both green tea and green coffee than non-treated group. The comparative effect of green tea and green coffee had not much difference.

Conclusions: This study has provided the information that natural products like green tea and green coffee are useful and helpful in preventive therapy of dyslipidemia and obesity.

Keywords: Green tea, Green coffee, Overweight, Obesity

INTRODUCTION

According to WHO, overweight and obesity are defined as abnormal or excessive fat accumulation that present a risk to health. A crude population measure of obesity is body mass index (BMI). BMI ≥25 and ≥30 are considered as overweight and obesity respectively.[1]

In 2016 more than 1.9 billion adults of 18 years and above were overweight. Female ratio is more than male. Over 340 million children and adolescent of 05 to 19 years age group are overweight or obese.[1] Unhealthy high calorie, fat rich diet and physical inactivity are key factors for major non-communicable diseases.

Diet, exercise and behavioral therapy are recommended for all patient with BMI >25kg/m^2. Pharmacotherapy to bariatric surgery are considered for patient with BMI >40kg/m^2.[2] Globally including our country there are many remedies derived from natural source are very common and popular, being used for control of bodyweight, diabetes mellitus, hypertension and for maintenance of good health. Among the home remedies green tea is well known established naturally derived product and now green coffee has been under common use for same purposes.

Green tea is a type of tea that is made from Camellia sines is which have not undergone the process of withering and oxidation. This contains antioxidants and, beneficial polyphenols. Consumption of green tea have shown co-relation with reduced risk of death from cardiovascular diseases. It may also have favourable effect on blood pressure, blood glucose, blood cholesterol and body weight. It is found that countries have lower cancer rate where green tea consumption is high but have no strong evidence.[3] Several studies show that flavonoids and caffeine in green tea increases fat oxidation, improve insulin activity and help in weight reduction.[4-6]

Green coffee (Coffea Arabica) is cultivated in Brazil, Cuba, Vietnam and also in India. Green coffee bean seeds of fruit that is non-roasted have high level of chlorogenic acid and many antioxidants as compare with regular roasted coffee. The contents of chlorogenic acid in green coffee is said be responsible for inhibiting conversion of glucose into fat.[7] Broadly this natural product is also considered as a health friendly in overweight person, in obesity, diabetic, hypertensive patients and in Alzheimer disease.[8] Green coffee contains caffeine similar to regular one therefore can cause caffeine related side effects.

METHODS

The study was carried out in the Dept. of Pharmacology, MGM Medical College Jamshedpur.

Green tea was obtained as a gift for personal use, (manufactured and marketed by Madhu Jayanti Int. Pvt Ltd. Kolkata -700023, one bag contains 1.5gm green tea) Green coffee was obtained as a gift for personal use (manufactured by Sanzyme (p) Ltd, Hyderabad -500052), one bag contain 2gm green coffee. Both products are available in the market for common use for the society/community. One sachet of green tea contains 1.5gm in small granules, similarly one sachet of green coffee contains 2gm of coffee in powder form. Albino rats were obtained from Kolkata through local supplier.

All the animals used in our study were taken care of under ethical consideration after approval from ethical committee of MGM Medical College.

Experimental design

Twenty-four albino rats of either sex weighing 100-200 gm were taken for this study. The animals were divided randomly in four groups (A, B, C, D) of six rats in each group. The animals were maintained on a standardized diet and water ad libitum. For experimental purpose the animals were kept fasting overnight but allowed free access to water.

Total duration of experiment was 05 weeks, in which first one week was spent to acclimatization of animals. At starting day of experiment all animals were weighed with estimation of serum cholesterol. Then animals of group A were given standard diet served as control group, similarly group B received standard diet plus egg yolk orally 20% of total diet (5gm) daily. Animals of group C were given similar to group B plus 10 mg of green tea in 2ml in luke warm water daily. Group D was provided similar to group B plus 10 mg of green coffee in 2ml in luke warm water daily. Weight of animals were taken at every two-weeks, blood cholesterol was estimated in two weeks interval on 3rd and 5th week. In our experiment blood was collected from tail of the rats. After experiment all necessary care was provided to the animals.

Biochemical analysis

The serum cholesterol was estimated by Cholesterol kit (CHOD/PAO method)

Statistical analysis

The data were subjected to statistical analysis using two-tailed t-test of unequal variance. P value ≤0.01 was considered statistically significant.

RESULTS

Table 1 shows the level of blood cholesterol and weight of animals of control group 'A' (n=06), and high cholesterol fed animals group 'B' (n=06). Both bodyweight and blood cholesterol level of the albino rats of group 'B', fed with high cholesterol diet (egg yolk: 5gm/day) is slightly raised in 2nd week and significantly on 4th week as compared with control group 'A' with normal diet (p <0.01).

Table 1: Observational data of weight and cholesterol of albino rats of group A, and B, from 1st day to 4th week.

Group A						Group B					
Weight (gm)			Total cholesterol (mg/dl)			Weight (gm)			Total cholesterol		
1st day	2nd week	4th week	1ST day	2nd week	4th week	1ST day	2nd week	4th week	1ST day	2nd week	4th week
100.5	100.4	100.2	74.5	74.2	74.4	100.6	104.5	110.4	75.5	80.2	101.2
100.6	100.5	100.4	76.2	72.2	74.2	102.4	103.6	118.5	76.4	82.6	102.4
102.2	102.5	101.4	80.6	78.8	78.2	104.2	108.4	120.4	80.4	90.4	106.4
104.6	104.2	102.5	82.2	81.8	80.2	106.2	106.2	116.6	82.6	89.8	104.2
100.5	101.2	101.1	76.8	76.4	75.3	100.6	108.5	121.2	84.2	92.2	106.4
101.4	99.5	99	78.2	78.4	76.6	102.4	105.5	116.8	81.6	90	102.8

Table 2: Observational data of weight and cholesterol of albino rats of group C and D from 1st day to 4th week.

Group C						Group D					
Weight (gm)			Total cholesterol (mg/dl)			Weight (gm)			Total cholesterol		
1st day	2nd week	4th week	1ST day	2nd week	4th week	1ST day	2nd week	4th week	1ST day	2nd week	4th week
102.4	103.4	106.2	78.2	78.8	84.2	106.2	110.2	11.2	82.6	83.4	87.8
102.2	104.2	106.6	77.8	78.2	82.8	104.4	108.4	110.4	84.2	85.6	90.4
104.6	108.6	110.4	76.8	78.4	85.6	100.4	104.4	108.2	76.8	78.4	85.2
108	110.2	112	80.4	80.4	86.4	102.6	104.6	107.6	75.8	78.4	84.6
104.4	108.6	110.4	82.2	83.4	88.6	101.4	107.2	112.2	78.2	78.8	82.6
101.8	106.8	109.4	78.6	80.4	90.2	106.6	109.2	111.8	80.8	82.2	88.4

Table 3: 4th week data of weight and cholesterol levels (Mean and SD).

A	B	C	D	A	B	C	D
Weight (gm)				Cholesterol (mg/dl)			
4th week							
100.2	110.4	106.2	111.2	74.4	101.2	84.2	87.8
100.4	118.5	106.6	110.4	74.2	102.4	82.8	90.4
101.4	120.4	110.4	108.2	78.2	106.4	85.6	85.2
102.5	116.6	112	107.6	80.2	104.2	86.4	84.6
101.1	121.2	110.4	112.2	75.3	106.4	88.6	82.6
99	116.8	109.4	111.8	76.6	102.8	90.2	88.4
100.77±1.19	117.32±3.86	109.17±2.3	110.23±1.92	76.48±2.35	103.9±2.16	86.3±2.74	86.5±2.86

Table 2 shows bodyweight and blood cholesterol of animal of group 'C' (n=6) and 'D' (n=6) after administration of green tea (10mg/day) and green coffee (10mg/day) on start of experiment on 2nd and 4th week of experiment. Parameters of body weight and cholesterol in group C and D show the mild elevation of weight and cholesterol on 2nd week, but significant elevation on 4th week as compare with control group.

Data in Table 3 (mean and SD) presents the observation of weight and blood cholesterol on completion of experiment i.e., on 4th week in all group of animals. There is approximately 17gm gain in weight and 27.42mg/dl rise in cholesterol after giving high cholesterol diet (p<0.01). The rats in group 'C' and 'D' administered high cholesterol diet with green tea and green coffee respectively showed 8gm and 9gm of weight gain, that is approximately 8 to 9gm less than rats of group 'B' (p<0.01).

Similarly rise in cholesterol level are 17mg/dl less in groups treated with green tea and green coffee. The comparative changes in weight and cholesterol between group C and D are less significant, (p<0.5) (p<1) respectively.

Data mentioned in Table 4 presents the p-value within the groups which is compared by statistical analysis using two tailed t-test of unequal variance. Elevation of body weight and cholesterol between A / B, B/ C, B/C are significant and less significant between C/D.

Table 4: P-values within groups for alpha level (0.01).

Groups	p values for weight	p values for cholesterol
AB	5.70E-05	1.32E-09
BC	0.00217	6.06E-07
CD	0.40354	0.90416
BD	0.000313	8.39E-07

DISCUSSION

The result of this experiment demonstrates significant role of green tea and green coffee on blood cholesterol and weight. Green tea is widely marketed for the use of reduction of weight or obesity and also for life style related health problems.[9] According to many literature catechin with gallate ester in green tea is responsible for lowering cholesterol and weight. These ingredients of green tea interfere biliary micelle system in the lumen of intestine by forming insoluble co-precipitates of cholesterol and increasing fecal excretion of cholesterol. In addition, catechin have direct inhibitory effect on cholesterol synthesis. Several studies support that flavonoids and caffeine in green tea help in weight control of obese or overweight person, but more studies are required to make it significant.[10,11] Chlorogenic acid and other natural antioxidants present in green coffee are thought to be active ingredients to promote weight loss. It has inhibitory effect on enzyme glucose -6-phosphatase reduces glucose

absorption through intestine and inhibits fat accumulation.[12]

In this experiment green tea and green coffee both have similar effect on cholesterol fed animals. There is satisfactory reduction of in cholesterol and weight as compare with experimentally induced hyper cholesterolemic animals. Along with benefit of this natural derived remedy side effects due to its content caffeine should be always taken into consideration.

CONCLUSION

This study has provided information about usefulness of green tea and green coffee in an important non-communicable disease like dyslipidemia and obesity. These natural products may be helpful as preventive or as adjuvant in addition to others therapy in life style modification, but more research work is also required in this regard.

ACKNOWLEDGEMENTS

REFERENCES

1. Obesity and overweight -World Health Organisation. Available at: www.who.int/new-room/fact-sheet/detail/obesity-and-overwieght
2. Obesity, Kasper, Fauci, Hauser, Longo, Jameson, Loscalzo. Harrison's Manual of Medicine. 19th Ed. New York, MacGraw-Hill Education (India) Pvt Ltd.; 2016:901-903.
3. Kris Gunnar, on Jan 17, 2018. 10 Proven Benefits of Green Tea-Health Line. Available at: https://www.healthline.com/nutrition/top-10.
4. Chacko SM, Thambi PT, Kuttan R, Nishigaki I. US National Library of Medicine, National Institute of health. Beneficial effect of green tea: a literature review. Available at: http:www.ncbi.nlm.nih.gov/pubmed/20370896
5. Amanolahi F, Rakhshande H. Effects of ethanolic extract of green tea on decreasing the level of lipid profile in rat. Avic J Phytomedic. 2013;3(1):98.
6. Namita P, Mukesh R, Vijay KJ. Camellia Sinensis (green tea): A review. Glo J Pharmacol. 2012;6(2):52-9.
7. Chlorogeneic Acid-scientific review on usage-examine.com-research analysis by Kamal Patel and verified by Examine.com. Research Team. Last updated June 14.2018, Available at: https://examine.com/supplements/chlorogenic-acid.
8. Green Coffee: Uses, Side Effects, Interaction Dosage. Available at: https://www.webmd.com/vitamins/ai/ingredientmono-1264/green-coffee
9. Clement Y. Can green tea do that? A literature review of the clinical evidence. Preventive medicine. 2009 Aug 1;49(2-3):83-7.
10. Xin-xin Z, Yan-Lu X. Shao-Hua L. Green tea intake lowers fasting serum total and LDL cholesterol in adult. Ameta analysis of 14 randomised controlled trials. Ame J Clin Nutrit. 2011;94(2):601-10.
11. Koo SI, Noh SK. Green tea as inhibitor of the intestinal absorption oflipids: potential mechanism for its lipid-lowering effect. J Nutr Biochem. 2007;18:179-83.
12. Buchanan R, Beckett RD. Green coffee for Pharmacological weight loss. J Evi Bas Complemen Alter Medici. 2013;18(4):309-13.