Experimental Study of Efficacy of Reducing Lipid in Hyperlipidemia Persons Comparing between Green Coffee Bean Extract and Green Tea Extract

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Abstract

Background

Adult dyslipidemia have become worldwide problems. Issues of cost and potential side effects of prescription anti-dyslipidemic drugs have led dyslipidemia and dyslipidemic patients to try nutraceuticals that may aid dyslipidemia. One promising nutraceutical is green tea extract (GTE) , which contains epigallocatechin gallate (EGCG) that are known to health benefits and to influence cholesterol metabolism. Green coffee bean extract (GCBE) which contains high concentrations of chlorogenic acids that are known to health benefits and to influence fat metabolism. Studies about GCBE influenced cholesterol metabolism are not conducted. A 6-week randomized controlled trial was conducted to examine the efficacy of GCBE comparing with GTE at reducing lipid in 40 hyperlipidemic persons.

Method

Subjects received GCBE 400mg per day , or GTE 400mg per day in six-week treatment periods. Primary measurements were body weight, height, and body mass index. TG , LDL-c , and HDL-c were also measured.

Results

Significant decreasing were observed in LDL-c at GCBE group (-4.06% (P=0.041)), and LDL-c at GTE group (-3.32% (P=0.046)) and no difference between groups. Significant increasing were observed in HDL-c at GCBE group (3.96% (P=0.037)), and HDL-c at GTE group (6.19% (P=0.031)) and no difference between groups. No significant increasing were observed in TG at GCBE group (2.24% (P=0.054)), and TG at GTE group (2.33% (P=0.058)) and no difference between groups

Conclusion

GCBE and GTE which are nutraceutical for reducing lipid , may help dyslipidemic patients for supporting effect of anti-dyslipidemic drugs and may use for prevent dyslipidemia in the group of hyperlipidemic persons that need to modify their life style for long-term prevention. GCBE and GTE were not significantly differenced in efficacy for reducing lipid.

Keywords: Green coffee bean extract / Green tea extract / Hyperlipidemia / Triglyceride / LDL-c / HDL-c

Introduction

Cardiovascular disease caused over 18 million deaths in the world in 2005. Of these deaths, eight million (44%) occurred in people under 60 years of age and 80% took place low- and middle- income countries. The World Health Organization surveyed data from 8 countries included Thailand. 30-60% of population aged 40-79 years with high total serum cholesterol were found.[3] Dyslipidemia lead to cardiovascular disease. With the high cost of prescription anti-dyslipidemic drugs and the fear of side effects, the general public is turning to nutraceuticals.

Green Tea Extract (GTE) which contains epigallocatechin gallate (EGCG) that are known to health benefits and to influence cholesterol metabolism. A 14 randomized controlled trials was conducted to examine the efficacy of GTE at reducing lipid in dyslipidemic patients. GTE consumption significantly lowered the Triglyceride (TC) concentration by 7.20 mg/dL (P<0.001) and significantly lowered the LDL-cholesterol (LDL-c) 2.19 mg/dL (P<0.001). The

mean change in blood HDL-cholesterol (HDL-c) was not significant.[4] Green coffee bean extract (GCBE) which contains high concentrations of chlorogenic acids (>45.9% by weight) that are known to health benefits and to influence fat metabolism.[5,6] Studies about GCBE influenced cholesterol metabolism were conducted in mice but not conducted in human.[7] The purpose of this study was to investigate the efficacy of GCBE comparing with GTE at reducing lipid that Triglyceride (TG) , LDL-cholesterol (LDL-c) , and HDL-cholesterol (HDL-c) in hyperlipidemic subjects.

Material and methods

Subjects

The study included 40 subjects (6 males and 34 females) aged 25-55 (mean 33.4 ±9.5 (GCBE) 34.5 ±9.8 (GTE)) years. The mean values for additional measures taken at baseline are listed in **TABLE1** and **TABLE2**. Subjects exhibited hyperlipidemia or above optimal levels, as indexed by LDL-c 100-129 mg/dL. All subjects were euthyroid, nondiabetic, and nonhypertensive, and were not on or been receiving steroids in the recent past. No subjects was on or had been recently on medications known to influence lipid profiles for the past 6 months. All subjects had similar diet and exercise profiles. All subjects gave their written informed consent before beginning the study. Informed consent was of a standard format, as per Thai regulatory requirements governing research human subject research, which are consistent with the ethical principles put forth in Declaration of Helsinki.

TABLE 1 Characteristics of 40 hyperlipidemic subjects at baseline of study

Population Data	**GCBE**	**GTE**
Male	3	3
Female	17	17
Age (Mean (SD) : Years)	33.4 (9.5)	34.5 (9.8)
Weight (Mean (SD) : kg)	63.5 (12.3)	65.6 (11.5)
Height (Mean (SD) : metre)	1.62 (0.08)	1.64 (0.07)
BMI (Mean (SD) : kg/m^2)	23.4 (1.5)	23.7 (1.4)

TABLE 2 Lipid profile of 40 hyperlipidemic subjects at baseline of study

LIPID PROFILE (mg/dL)	**GCBE Mean (SD)**	**GTE Mean (SD)**	**P-value in 2 gr. difference**
TG	165.4 (20.65)	158.6 (22.35)	0.145
LDL-c	120.6 (8.02)	123.4 (7.34)	0.353
HDL-c	55.6 (8.54)	58.2 (7.52)	0.407

Materials

GCBE 400mg per capsule. GCBE subjects received 42 capsules for 42 days.

GTE 400mg per capsule. GTE subjects received 42 capsules for 42 days.

The dosage of GCBE and GTE used here were based on previous experience using them in human study of the health benefits.

Study design

This was a randomized, double-blind, 6-week study that implemented a design to compare a GCBE, and a GTE. Subjects were randomly assigned to GCBE sequence (n = 20), or GTE sequence (n = 20). Subjects stayed on a treatment for a period of 6 weeks.

Subjects were examined at weeks 0 , and 6 of the study. Subjects were examined individually at Mae Fah Luang University Hospital, Bangkok, Thailand. During each visit, the following measurements were taken: body weight to nearest 0.1 kg, height to nearest 0.01 m, and

a lipid profile blood test that TG , LDL-c and HDL-c. BMI was determined using the formula of BMI = weight in kg divided by the square of the height in meters. All subjects were counseled for diet and exercise compliance at every visit, with the initial interview to establish diet details at the start of the study done by the site nutritionist. Data gathered included daily calorie intake, nutrient composition, micronutrient intake, and incidence of binge eating.

Statistical analysis

The primary measures in this study were weight, height, and BMI ; however, lipid profile blood test taken at each visit were also analyzed. Statistical analyses were carried out with a repeated-measures analysis of variance and post hoc *t*-tests. Factors for the analysis of variance were sequence (GCBE versus GTE), and treatment arm (0 week versus 6 week). Finding these interactions significant in the omnibus analysis of variance would validate the comparisons made between the beginning and end data.

RESULT

The statistical analyses report the test statistic P value. From the mean data reported in **TABLE 3.**

There were statistically non-significant increasing in TG after consuming GCBE and GTE for the 6 week study. In GCBE TG increased by 2.24% (before 165.4 ±20.65 , after 169.1 ±19.34 ; mg/dL) (P=0.054) and in GTE TG increased by 2.33% (before 158.6 ±22.35 , after 162.3 ±21.45 ; mg/dL) (P=0.058). There were statistically non-significant difference between both groups (P=0.451).

There were statistically significant decreasing in LDL-c after consuming GCBE and GTE for the 6 week study. In GCBE LDL-c decreased by 4.06% (before 120.6 ±8.02 , after 115.7 ±7.67 ; mg/dL) (P=0.041) and in GTE LDL-c decreased by 3.32% (before 123.4 ±7.34 , after 119.3 ±8.34 ; mg/dL) (P=0.046). There were statistically non-significant difference between both groups (P=0.388)

There were statistically significant increasing in HDL-c after consuming GCBE and GTE for the 6 week study. In GCBE HDL-c levels increased by 3.96% (before 55.6 ±8.54 , after 57.8 ±7.59 ; mg/dL) (P=0.037) and GTE HDL-c level increased by 6.19% (before 58.2 ±7.52 , after 61.8 ±8.44 ; mg/dL) (P=0.031) There were statistically non-significant difference between both groups (P=0.253)

TABLE 3 Lipid profile of 40 hyperlipidemic subjects at baseline and end of study

LIPID PROFILE (mg/dL)	Week 0 Mean (SD)	Week 6 Mean (SD)	Difference	P-value Difference	P-value in 2 gr.
TG : GCBE	165.4 (20.65)	169.1 (19.34)	+3.7 (2.24%)	0.054	
TG : GTE	158.6 (22.35)	162.3 (21.45)	+3.7 (2.33%)	0.058	0.451
LDL-c : GCBE	120.6 (8.02)	115.7 (7.67)	-4.9 (4.06%)	0.041	
LDL-c : GTE	123.4 (7.34)	119.3 (8.34)	-4.1 (3.32%)	0.046	0.388
HDL-c : GCBE	55.6 (8.54)	57.8 (7.59)	+2.2 (3.96%)	0.037	
HDL-c : GTE	58.2 (7.52)	61.8 (8.44)	+3.6 (6.19%)	0.031	0.253

Disscusion

GCBE are un-roasted coffee (*Arabica coffea*) and have mainly chlorogenic acid (>45% by weight). Chlorogenic acid is potent anti-oxidant. The mechanism(s) of action of GCBE on weight loss and reducing lipid are unknown. Only research in mice has demonstrated the effect of GCBE on fat metabolism, with chlorogenic acid alone having a moderate effect.[7] They were able to obtain significant data suggesting that chlorogenic acid not only retards the absorption of fats from the intestine but also activates fat metabolism in the liver. This was demonstrated by significantly lower levels of liver triglycerides after chlorogenic acid ingestion. A recent study in

Japan found that coffee polyphenols enhance energy metabolism and reduce lipogenesis by downregulating sterol regulatory element-binding protein and similar molecules, which leads to the suppression of body fat accumulation.[8] Recently, intraperitoneal injection of chlorogenic acid to hamsters fed a high-fat diet caused an improvement in lipid profile, reduction in hepatic lipase, reduction in glucose and insulin and increased expression of peroxisome proliferator- activated receptor. This is one of the key regulators of lipids and glucose.[9] There have not been a human research with GCBE on fat metabolism.

The results of our study have discovered the effect of GCBE on fat metabolism. GCBE and GTE which are nutraceutical for reducing lipid , may help dyslipidemic patients for supporting effect of anti-dyslipidemic drugs and may use for prevent dyslipidemia in the group of hyperlipidemic persons that need to modify their life style for long-term prevention. GCBE and GTE were not significantly differenced in efficacy on reducing lipid.

In this study , subjects were 85% female and 15% male. For more reliable, next study may concern about ratio of male and female. Other limitations were the small sample size of the study and the short periods.

The studies about GTE for health were plenty. GTE may help about obesity , hyperlipidemia , hypertension , heart diseases , Diabetes Mellitus Alzheimer's disease , cancer prevention , chronic infection ,depression , improve performance and longevity but GCBE had few studies that only obesity , hypertension , heart diseases and Diabetes Mellitus. GTE and GCBE are same nutraceutical group that potent antioxidant and fat burner so the next study can looking for undiscovered remained topics.

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