



## ASSOCIATION BETWEEN COFFEE INTAKE AND THE RISK OF IMPAIRED CARDIAC FUNCTIONS AMONG HEALTHY YOUNG SUDANESE PEOPLE

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### ABSTRACT

Serum lipids (T.Cholesterol, triglyceride, HDL-C, and LDL-C) and creatine kinase (CK-MB) were estimated in serum of 150 healthy volunteers between age 18 and 40 years. Volunteers were classified into 3 groups. Control group (n=50) included healthy young volunteers who do not take coffee drinks. Group I (n=50) included those who drink 1 – 3 cups of coffee daily (140 – 420mg caffeine). Group II (n=50) included those who drink more than 3 cups of coffee daily (more than 420mg caffeine).

When compare to control group, coffee intake (in both groups) showed significant increase ( $P < 0.05$ ) in serum total cholesterol, LDL-cholesterol, and CK-MB concentrations; and insignificantly reduction ( $P > 0.05$ ) in levels of serum HDL-cholesterol, but had no significant ( $P < 0.05$ ) effect on serum triglyceride. These results suggest that coffee intake predisposes consumers to coronary heart disease especially to those who take more than 3 cups of black caffeinated coffee daily.

**Key words:** Coffee intake, Caffeine, Coronary heart disease, Blood lipids.

### INTRODUCTION:

Drinking coffee is very common in eastern societies. In the Sudan, for example, 58% young people aged 18 - 40 years drink caffeinated or boiled coffee <sup>(1)</sup>. Caffeine chemically is a trimethylxanthine. Caffeinated Coffee drinking has been associated with higher levels of serum cholesterol in some, but not all, observational studies <sup>(2)</sup>.

Coffee is a chemical mixture reported to contain more than a thousand different molecular substances, including carbohydrates, lipids, nitrogenous and phenolic compounds, vitamins, minerals, and alkaloids. Caffeine, cafestol, kahweol, and chlorogenic acids are related to lipid metabolism and theoretically may influence serum lipid profile <sup>(4)</sup>.

In 1965, Bellet et al reported a clinical trial of the effect of caffeine on the level of fatty acids. Since then, a number of investigations in humans have been published <sup>(3)</sup>. Results of these trials have been inconsistent, perhaps because of small sample sizes or other design features. A dose-response relation between coffee consumption and both total cholesterol and LDL cholesterol was identified <sup>(5)</sup>.

Caffeine is found in many everyday products like coffee, tea, kola nuts, chocolate, soda beverages, drugs etc. Thus it is widely and immensely consumed. In third world

countries, the consumption of caffeine has increased possibly as a result of culture assimilation <sup>(6)</sup>.

The interest in researches pertaining to caffeine has been increasing in recent years, and this has resulted in a surge of publications dealing with a variety of pharmacophysiological effects of caffeine. Caffeine has been shown to have various pharmacological and cellular responses in a wide spectrum of biological systems <sup>(7)</sup>.

The objectives of this study were to examine the effects of boiled black coffee consumption on serum lipids and CK-MB and accordingly, to assess whether the heart is at risk by coffee consumption or not.

### MATERIALS AND METHODS:

The study is based on 600 volunteers between age 18 and 40 years. The study group consist 400 volunteers who have consumed coffee for more than five years and they are separated into two groups. Group I included those who drink 1 – 3 cups of caffeinated coffee daily (140 – 420mg caffeine). Group II included those who drink more than 3 cups of caffeinated coffee daily (more than 420mg caffeine) <sup>(8)</sup>. The other 200 volunteers are young normal healthy and all of them are non-coffee consumer (control). The subjects with known cardiac, pulmonary, diabetic and musculoskeletal problems were excluded from the study and control group.

Fasting 7ml of venous blood from antecubital vein was drawn from the cases and controls and was collected in serum separator tube (SST) and serum was separated and analyzed within 1 hour after collection.

The lipid tests (T.Cholesterol, triglyceride, HDL-C, and LDL-C) with CKMB were analyzed in each sample. All estimations were done using ready made kits using an Auto Chemistry Analyzer (ACA-1900ES). The determination of serum total cholesterol concentration was done using the cholesterol esterase – oxidase method reported by Gohil et al<sup>(9)</sup>. The serum CK-MB was obtained by creatine phosphate and ADP method reported by Lopes et al<sup>(10)</sup>.

Data thus obtained was analyzed by using student t-test by Statistical Packages for Social Science Software (SPSS) where the value of  $p < 0.05$  considered as significant.

**RESULTS:**

Comparing to the control, total cholesterol and LDL-C of group I were increased significantly ( $p$  value  $< 0.05$ ) (table 1).

Total cholesterol, LDL-C and CK-MB of group II were increased significantly ( $p$  value  $< 0.05$ ) in group II much more than control group (table 2).

The results of total cholesterol, LDL-C and CK-MB group II were increased significantly ( $p$  value  $< 0.05$ ) comparing to group I (table 2).

Table (1): Effect of coffee drinking (caffeine) on serum lipids and CK-MB

Groups	T. Cholesterol (mg/dL)	Triglyceride (mg/dL)	HDL-C (mg/dL)	LDL-C (mg/dL)	CK-MB (U/L)
Control	141.9	98.8	55.9	67.2	140.3
Group I	204.6	99	45.6	138.3	168
P value	0.00	0.91	0.06	0.01	0.08

Table (2): Effect of coffee drinking (caffeine) on serum lipids and CK-MB

Groups	T. Cholesterol (mg/dL)	Triglyceride (mg/dL)	HDL-C (mg/dL)	LDL-C (mg/dL)	CK-MB (U/L)
Control	141.9	98.8	55.9	67.2	140.3
Group II	234.6	105	39.8	177.5	192
P value	0.00	0.07	0.05	0.00	0.01

Table (3): Effect of coffee drinking (caffeine) on serum lipids and CK-MB

Groups	T. Cholesterol (mg/dL)	Triglyceride (mg/dL)	HDL-C (mg/dL)	LDL-C (mg/dL)	CK-MB (U/L)
Group I	204.6	99	45.6	138.3	168
Group II	234.6	105	39.8	177.5	192
P value	0.04	0.85	0.09	0.04	0.02

**DISCUSSION:**

The publications on the effects of coffee on human health, especially pathogenesis of diseases, indicate that certain controversial issues are still unresolved<sup>(11)</sup>. The effect of caffeine on the serum CKMB and lipid profile is shown in Table 1. Caffeine has significantly ( $P < 0.05$ ) increased serum total cholesterol, LDL-cholesterol, and CKMB concentrations when compared with controls.

Many epidemiological studies have shown a strong inverse relationship between serum cholesterol concentration and the risk of coronary heart disease<sup>(12)</sup>. Also, increased serum LDL-cholesterol concentration has been associated with increased risk of coronary heart

disease<sup>(13)</sup>. Thus, the increased serum LDL-cholesterol and serum cholesterol concentration coupled with increased coronary heart disease risk observed in this study suggest that coffee intake may predispose to coronary heart disease especially in those who take more than 3 cups/day. Of recent, some researchers have reported that cafestol and kahweol are the active chemicals in coffee mechanistically responsible for the increase in serum cholesterol level after coffee consumption<sup>(14)</sup>. Hudzik *et al*<sup>(15)</sup> have also reported that increased total cholesterol concentration increases the incidence and prevalence of coronary heart disease. It thus implies that these chemicals are responsible for the

increased risk of coronary heart disease associated with coffee consumption. However, caffeine consumption has been reported to increase urinary calcium levels and causes cardiac arrhythmia (irregular heartbeat) in certain people<sup>(16)</sup>. Trials using filtered coffee demonstrated very little increase in serum cholesterol<sup>(17)</sup>.

Caffeine has insignificantly ( $P>0.05$ ) affected the triglyceride and HDL-C concentrations at both study groups when compared with control. However, the finding in this study is not agree with Zargar *et al*<sup>(18)</sup> which stated that there is no association of caffeine and beverage intakes with triglyceride concentration. The results of triglyceride concentration in both study groups denoted insignificant modification ( $p$  value $>0.05$ ) in both study groups comparing to results of control group, and this was the same result when comparing the two study groups with each other. These results were disagreed with Cai *et al*<sup>(2)</sup> who reported that the results of triglyceride concentration may imply that caffeine stimulates or increases the intake of triglyceride from the blood by tissues or it leads to an increased breakdown of triglyceride. Also the results of triglycerides in this study were disagreed with Beaudoin *et al*<sup>(4)</sup> who reported that the caffeine impairs the incorporation of triglyceride into lipoproteins in the liver, reducing triglyceride concentration and the possibility of concentration serving as a risk factor should still be further investigated.

#### CONCLUSIONS:

Drink up to three cups of black caffeinated coffee daily (140 – 420mg caffeine) may not have a direct effect on the heart muscle, while drinking more than 3 cups of caffeinated coffee daily (more than 420mg caffeine) has its direct effect on the heart.

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