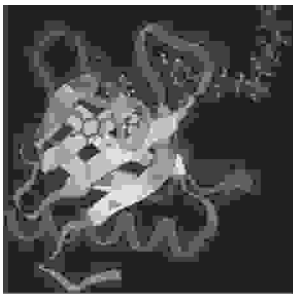
ORIGINAL PROF-996

EFFECTS OF TEA ON PLASMA LIPIDS



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ABSTRACT... Objective: To find out the possible association between levels of cholesterol and tea consumption in the general population known to consume large amount of tea in a day. **Place and Duration:** The study was conducted in the periphery areas of Multan district from 1990 to 1993. **Materials and Methods:** The data was obtained on 550 (300 (20-40 years) male subjects and 250 older age group (41-65 years) male subjects. Information collected on each subject included detailed demographic data, personal habits including smoking, frequency of participation in leisure time, physical activity, a detailed history of daily tea intake and weekly egg consumption. They were also questioned about medication and special dietary intake (such a low salt, low cholesterol, low saturated fat or weight reducing diets).Height and weight were measured. Relative weight was defined by Quetelet index (weight in g) / (height in cm^2). Blood samples, obtained by venepuncture, were drawn in vacuum tubes without additive, with the subject supine and after fasting for between 9 and 10h. Serum was separated from the whole blood within 2h of being drawn. Sera separated from the whole blood were frozen at -70°C until analyzed. Total cholesterol (TC) was estimated by enzymes assay (Boehringer Knoll kit, Mannheim, FRG). HDL-cholesterol (HDL-C) was measured after precipitation with heparin and manganese chloride.. Triglycerides were estimated by enzyme assay (Boehringer Knoll kit, Mannheim, FRG). Serum low density lipoproteins cholesterol (LDL-C) was estimated. Quality control methods were employed throughout all the analyses. The data presented here are for the those subjects who were not an any special diet, medication or suffering from any endocrine disease. The association between tea intake and other dietary variables were tested using the Chi square test. An analysis of covariance was used to examine the association between tea intake and lipid levels. Separate analyses of covariance were carried out in each of two age groups 20-40 years and 41-65 years. **Results:** A negative association between drinking of tea and TC levels were found in both age groups studied. The difference was found to be entirely due to a difference in LDL-cholesterol levels. The negative association between tea consumption and TC levels was significant in heavy drinkers of tea with or without smoking. **Conclusion:** General population is known to consume large amounts of tea. It was concluded that tea consumption may be an independent factor influencing serum lipid levels because there was a negative association between tea consumption and serum total cholesterol and LDL-cholesterol concentrations. There are reports that consumption of tea is associated with a reduction in serum total cholesterol and LDL-cholesterol. As tea has no nutritive value ,so its excessive use is useless. .It has also been reported that caffeine is involved in the maldevelopment of foetus .,birth defects ,bone malformation and even in cancer formation. There is a great need on the Govt. level to create awareness in public sector about consumption of large amount of tea. Work may be extended to explore that how caffeine may be involved as a risk factor in the pathogenesis of CHD, birth defects , cancer patients and in metabolism of calcium..

Key words: Caffeine, plasma lipids

INTRODUCTION

The levels of blood cholesterol and its distribution indifferent lipoproteins in a population depend upon many factors like diet, life-style, race, sex, age and genetic susceptibility[1,2,3,4,5,6]. There is a growing awareness, from a large number of studies, that cholesterol is one of the major risk factors of coronary artery disease (CAD)[8]. This implication has led many workers to gather information on cholesterol on an inter-community basis[9]. Some of the recent studies show a positive association between consumption of coffee and total cholesterol and a negative association between tea intake and total cholesterol[10,11,12].

The 3 important methylxanthines are theophylline, the bromine, and caffeine. Their major source is, of course, beverages (tea, Cocoa, and coffee, respectively) Theophylline is important as a therapeutic agent in the treatment of asthma[14]. Theophylline is 1,3-dimethylaxanthine; the bromine is 3,7-dimethylxanthine; and caffeine is 1,3,7-trimethylaxanthine.

The theophylline preparation most commonly used for therapeutic purposes is the theophylline ethylenedramine complex aminophylline. A synthetic analogue of theophylline (dyphylline) is both less potent and shorter-acting than theophylline. The metabolic products partially demethylated xanthines (not uric acid), are excreted in the urine[15,16]. They can be shown in vitro to inhibit the enzyme phosphodiesterase. Since phosphodiesterase hydrolyzes cyclic nucleotides. This inhibition is many times more potent than theophylline in inhibiting bronchoconstriction in asthmatic subjects[17].

Daily consumption of the amount of caffeine in 3 ½ cups of coffee or seven cups of tea has been shown to almost double the risk of developing osteoporosis. There is evidence to suggest that caffeine has ability to increase the risk of osteoporosis[18,19].

Caffeine is a commonly thought that it is dietary item obtained form coffee, tea, and cocoa. It has no nutritional significance, but it does have some physiological effects and is considered one of the most widely used drugs. Because 80% of the adult population regularly consumes caffeine, it is appropriate to consider it a component of the diet. The caffeine content of common beverages ranges form 6 to 85 mg per serving. Average consumption of caffeine in United State is estimated 2.6 mg/kg of body weight, or 150 to 200 mg/day. About 60% of this cola beverages, chocolate, and medications. Caffeine consumption in Canada is estimated 450 mg/day. In addition to its well-known role as a stimulant of the central nervous system, caffeine also acts as a diuretic (increasing urine production), relaxes smooth muscles, stimulates the heart muscle, estimates gastric secretion, increase oxygen consumption, increase the levels of free fatty acids and glucose in blood plasma, and apparently depresses the absorption of iron[20,21,22,23]. Caffeine is absorbed completely and quickly to become distributed throughout various tissues, it is excreted in the form of xanthines and uric acid 3 to 6 hours after ingestion. Daily intakes between 65 and 130 mg of caffeine have beneficial effects on both motor and mental performance, whereas daily intakes of 400 mg or more cause insomnia performance. It has been alleged that caffeine may be involved in the onset of cancer, cardiovascular disease, and birth defect. At present there is no conclusive evidence of any relationship between caffeine consumption and health, but pregnant women are advised to use caffeine in moderation[24,25,26,].

Two compounds related to caffeine are theophylline and theobromine. Theophylline is found in tea and is also a stimulant of the central nervous system. Theobromine is found in cocoa. Neither theophylline nor theobromine has any nutritional benefit. The evidence suggesting that caffeine consumption possess risks during pregnancy is much less convincing that the evidence against alcohol[27]. An attempt has been made to find out the possible association between these levels of cholesterol and tea consumption in the population known to consume large amounts of tea in day .

MATERIALS & METHODS

Between 1990 and 1993 male and female employees of five different factories in the periphery areas of the Multan district were studied. Subjects involved in either sedentary or physical work were screened for cardiovascular disease. The data were obtained on 550 male subjects.

Information collected on each subject included detailed demographic data, personal habits including smoking, frequency of participation in leisure time, physical activity, a detailed history of daily tea and weekly egg consumption. They were also questioned about medication and special dietary intake (such a low salt, low cholesterol, low saturated fat or weight reducing diets). Height and weight were measured. Relative weight was defined by Quetlet index (weight in g) / (height in cm^2).

Blood samples, obtained by venepuncture, were drawn in vacuum tubes without additive, with the subject supine and after fasting for between 9 and 10 hrs. Serum was separated from the whole blood within 2h of being drawn. Sera separated from the whole blood were frozen at -70°C until analyzed. Total cholesterol (TC) was estimated by enzymes assay (Boehringer Knoll kit, Mannheim, FRG). HDL-cholesterol (HDL-C) was measured after precipitation with heparin and manganese chloride. Triglycerides were estimated enzyme assay (Boehringer Knoll kit, Mannheim, FRG). Serum low density lipoprotein cholesterol (LDL-C was estimated. Quality control methods were employed throughout all the analyses.

The data presented here are for those subjects who were not on any special diet, medication or suffering from any endocrine disease.

The association between tea intake and other dietary variables were tested using the Chi square test. Analyses of co variance was used to examine the association between tea intake and lipid levels. Separate analyses of covariance were carried out in each of two age groups 20-40 years and 41-65 years

RESULTS

The mean results for the entire study population are shown in Table I. In the younger age group (20-40 yrs) 300 male subjects were taken for the present study and 250 subjects in the older age group (41-65 years) were included. Sixty-five per cent of the subjects who took tea in the younger age group and 60 % in the older age group were smokers. The remaining were non-smokers/ Eight per cent of the total subjects in the younger age group and 12 % in the older age group did not drink tea. The subjects who took tea were divided into two groups based on the intake of tea per day; those who took three to five cups of tea/day (the minimum number of cups of tea taken/day was three) and those who took more than five cups/day (6+; six to 10 cups / day).

Table-I Characteristics of the study population, men aged 20-65 years (mean mg/dL ± standard deviation)

Age (years)	20-40 yrs	41-65 yrs
No of patients	300	250
Quetelet percent	2.50± 0.64	2.70±0.70
Smoker	65	60
TC	160±30.0 mg/dl	165±35.0 mg/dl
HDL-C	48±14.0 mg/dl	46±15.0 mg/dl
LDL-C	105±20.4 mg/dl	110±22.0 mg/dl
TRIG	120±15.6 mg/dl	135±20.0 mg/dl

Smoking showed a positive correlation with tea drinking in both age group studied ($p \leq 0.014$). Seventy per cent of the subjects in the younger age group and 60% in the older age drank more that five cups/day (indicated as 6+).

The effect of tea consumption on lipid and lipoprotein levels are given in Table II.

Tea Consumption

A negative association between drinking of tea and TC levels were found in both age groups studied. The difference was found to be entirely due to a difference in LDL-cholesterol levels.

Table-II Adjusted means of serum cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides according to tea consumption.

Lipids and Lipoproteins (mg/dl)	No.	TC	HDL-C	LDL-C	TRIG
Cups of tea/day, 20-40 years mg/dl					
3-5 (Smokers)	145	164	42	115	105
3-5 (Non smokers)	65	160	40	105	105
6+ (Smokers)	55	135	40	80	125
6+ (Non smokers)	35	140	42	85	130
P value	-	-	-	-	-
41-65 years					
3-5 (Smokers)	90	165	40	120	130
3-5 (Non smokers)	60	160	37.5	115	135
6+ (Smokers)	60	145	40	95	140
6+ (Non smokers)	40	140	42.5	90	140
P value		0.05	NS	0.05	0.05

NS: Not significant.

The negative association was independent of smoking as there was no significant difference between the levels of TC in subjects who drank tea with smoking and without smoking. An increase in triglyceride levels was observed in those groups of subjects who took 6+cups of tea/day in both age groups. The levels of TC did not show significant difference between nondrinkers of tea and those who took three to five cups of tea/day. The negative association between tea consumption and TC levels was significant in heavy drinkers of tea with or without smoking.

DISCUSSION

Caffeine is probably the most widely used social drug worldwide. Most people do not consider it to be a drug, although many, especially as they age, experience disturbing effects on sleep and heart rhythm from too much coffee A withdrawal syndrome characterized by lethargy, irritability, and headache a has been recognized in users of more than 600 mg/d(roughly 6 cups of coffee)[28].

Caffeine is thought to increase cAMP concentration by blocking the catabolic enzyme phosphodiesterase, thus increasing the effects of catecholamine neurotransmitters. Another possible mode of action is interaction with receptors for adenosine, a purine neurotransmitter structurally similar to caffeine.

Caffeine high intakes of caffeine affect the bioavial-ability of calcium by increasing the loss of calcium I urine and stimulating the secretion of calcium into the gastrointestinal tract[8,12]. Caffeine inhibit the enzyme phosphodiesterase. Since phosphatase hydrolyzes cyclic nucleotides, this inhibition results in higher concentrations of intracellular cAMP. This effect could explain the cardiac stimulation and smooth muscle relaxation produced by the drug caffeine, but it is not certain that sufficiently high concentrations are achieved in vivo to inhibit phosphodiesterase. Another proposed mechanism is the inhibition of cell surface receptors for adenosine. These receptors modulate adenylate cyclase activity, and adenosine has been shown to cause constriction of isolated airway smooth muscle and to enhance histamine release from cells present in the lung. These effects are antagonist of cell surface receptors for adenosine. It has also been shown, however, that xanthine derivatives devoid of adenosine antagonistic properties may be many times more potent that theophylline in inhibiting broncho constriction in asthmatic subjects[29,30,31,32]. The methyl xanthines have direct positive chemotropic and isotropic effects on the heart. At low concentrations, these effects appear to result from increased calcium influx, probably mediated by increased cAMP. At higher concentrations, calcium sequestration by the sarcoplasmic reticulum is impaired. In unusual sensitive individuals, consumption of a few cups of coffee may result in arrhythmias, but in most people, parenteral administration of higher does of the methylxanthines produces only sinus tachycardia and

increased cardiac output. Methyxanthines have occasionally been used in the treatment of pulmonary edema associated with heart failure. These agents also relax vascular smooth muscle except in cerebral blood vessels, where they cause contraction.

Methylxanthines decrease blood viscosity and may improve blood flow under certain conditions. The mechanism that cause this action is not well defined, but the effect is exploited in the treatment of intermittent claudication with pentoxiphylline, a dimethylxanthine agent. However, no evidence suggests that this therapy is superior to other approaches. Nicotine is obtained from the dried leaves of N tabacum and N ustica. It is rapidly absorbed from mucosal surfaces; the free alkaloid, but not the salt, is readily absorbed from the skin. Nicotine reacts with the acetylcholine receptor of the postsynaptic membrane (sympathetic, parasympathetic ganglia, neuromuscular junction), resulting in depolarization of the membrane. Toxic dosages cause stimulation rapidly followed by blockade of transmission.

Nicotinic receptors are located on plasma membranes of parasympathetic and sympathetic postganglionic cells in autonomic ganglia and also on membranes of muscles innervated by somatic motor fibers[35,36,37,38,39,40].

Evidence against caffeine is based almost entirely on studies of rats, mice, and rabbies, which have shown that caffeine intakes as low as 80 mg/kg of body weight can cause irreversible effects on a developing fetus. Intakes of only 6 mg/kg could cause less serious and more reversible effects. The most frequently observed problems involve bone malformation causing deformed figures ant toes and cleft palate. Because little is known about the differences in caffeine metabolism between species, it is difficult to determine the significance of these results in humans. If the effects on human were directly comparable, the daily consumption caffeine required to supply 80 mg of caffeine per kilogram to a woman weighing 110 to 132 Lb (50 to 60 Kg)would correspond to 25 to 35 cups of regular coffee, 75 to 100 cups of teas, or 50 12 –oz cola consumption of coffee, tea, or cola drinks. A finish study compared 466 pairs of mothers infants with and with out deformities. It detected no difference in the incidence of deformity between mothers who consumption at least four cups of coffee per day and those whose drank less. Until definitive large-scale studies on human are performed, the possibility of an association between caffeine, consumption and birth defects cannot be ruled out. In the meantime the FDA urges pregnant women to be prudent in their use of caffeine and if possible to avoid it[41,42].

In the present study of general population, a negative association between tea drinking and serum TC and LDL-C levels was observed. It is reported that a positive association was found between coffees drinking and TC[4]. The consumption of coffee is reported to causes an increase in LDL-cholesterol.[5]. In the present population the habit of tea drinking is significant when compared to coffee drinking. It appears from the result of the present study that a negative association does exist between tea consumption and serum lipids. Such negative association has also been reported for other population[6,7]. Therefore, it seems that tea drinking may have an independent association with serum cholesterol levels.

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