Brief Communication

Association between Dietary Intakes of Tea, Coffee, and Soft Drinks in Patients Undergoing Coronary Angiography with Coronary Artery Stenosis

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Abstract

Background: Coronary artery disease (CAD) is one of the major causes of mortality that is related to the nutritional habits and lifestyle. The aim of this study was to examine the association between tea, coffee, and soft drink consumption and coronary artery stenosis in patients undergoing coronary angiography. **Methods:** Out of all the patients, 208 cases (101 Female) with 57.81 ± 12.18 (mean ± SD) were assigned to participate in this cross-sectional study. In total, 168-items, semi-quantitative food frequency questionnaire collected for assessments of dietary intakes of black tea, coffee, caffeine, and soft drinks and record demographic and clinical questionnaire. **Results:** There were negative association between arteries with stenosis of more than 50% number with dietary intakes of tea (P = 0.011, r = – 0.187), coffee (P = 0.069, r = – 0.098) intakes, and dietary caffeine intake (P = 0.043, r = –0.118). The high consumptions of soft drinks (P = 0.005, r = 0.387) were associated with an enhancement in arteries with stenosis of more than 50% number. In addition, dietary consumption of black tea have a negatively significant association with the history of previous angiography (P = 0.044, r = –0.121), the history of previous Stanton (P = 0.035, r = –0.132), and coronary artery bypass graft surgery nomination (P = 0.008, r = –0.216). Coffee consumption showed a significant negative relationship with engagement for coronary artery bypass graft surgery (P = 0.004, r = –0.598). **Conclusions:** Dietary intakes of tea, coffee, and caffeine may have a negative relationship with CAD and cardio vascular diseases. Healthy dietary lifestyle is an important issue for the prevention of chronic diseases.

Keywords: *Caffeine, carbonated beverages, coffee, coronary stenosis, tea*

Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide, so that it can be one of the causes of an increase in the incidence of sudden death. In addition, this disease can cost a lot to the patient, impose the underlying cause of most heart disease vascular is atherosclerosis. In spite designing methods new therapy to prevent and treat atherosclerosis, the number of deaths from the CVD most countries remains stagnant.[1] Coronary artery disease (CAD) is one of the most important causes of mortality among American men and women, they are the second cause known to be death among them.[2]

The American Heart Association has reported that 20% of men and women suffer from CAD, and the costs of it was about 368 billion dollars in the United States in 2004.[3] Increased incidence of CAD in the last decades attributed to improving the economy, well-being, and comfort. The nutritional factor is a key factor in epidemiologic research and the previous study demonstrated a positive correlation between well-being and comfort with atherosclerosis.[4] In Iran, cardiovascular events among the causes of death have risen from 42 to 105 per 100,000 population from 1970 to 2000. However, CVD with 46% is the most common cause of death in Iran. This is while accidents with 17.5% and cancers with 14.5%, second and third grades.[5] More than 100,000 people in Iran dead leads to CVDs annually.[5,6]

Behavioral changes in lifestyle can reduce CVD or delay the onset of the disease.[7]According to the World Health Organization report, the mortality rate due to ischemic heart disease in the years between 1940 and 1960 increased and reached its peak in 1963, and then declined,

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so that since 1968 has declined to 75% by 1990, due to changes in lifestyle habits such as quitting smoking or reducing the number of cigarettes consumed daily, reducing the consumption of animal fat and cholesterol, and controlling blood pressure.[8]

Good nutrition can maintain health and well-being. Polyphenols are commonly found in nutrients, mainly from fruits, vegetables, tea, coffee, cocoa, mushrooms, beverages, and traditional medicinal plants. They are potentially toxic against oxidation-related diseases, for example, CVD, especially ischemic heart disease associated with atherosclerosis and stroke, which has recognized health and economic problems around the world.[9] Polyphenols reduce the production of reaction oxygen species by inhibiting oxidase, reducing superoxide production, inhibiting low density lipoproteins (LDL) oxidative (low fat lipoprotein formation), inhibiting vascular smooth muscle cells release and migration, reducing platelet aggregation, and improving oxidative mitochondrial stress.[9] Coffee has been shown to be among the drinks consumed worldwide, which affects a number of effects on human health.[10] The relationship between coffee consumption and various diseases has been widely studied, and often with conflicting results. The main concern about the safety of that content is caffeine, physiological stimuli worldwide, with adverse effects on cardiovascular outcome.[11] Owing to increased blood pressure as a result of an overall increase in peripheral resistance, caffeine content is considered as the main cause of such effects. However, the duration of randomized controlled trials confirmed most of the acute effects of coffee intake, while observational studies often lacked proper control for confounding factors (e.g., smoking status), resulting in negative outcomes of consumption of coffee. Later, the advances in analytical techniques discovered many potentially beneficial components in coffee, including antioxidant polyphenols, which were highly concentrated in coffee.[12]

To the best of our knowledge, the association between tea, coffee, and soft drink consumption and coronary artery stenosis in patients undergoing coronary angiography has not been examined. Therefore, the aim of this study was to examine the association between tea, coffee, and soft drink consumption and coronary artery stenosis in patients undergoing coronary angiography.

Methods

Study design

The present research is a cross-sectional study carried out in Dr. Shariati Hospital in Tehran (2016) that was approved by the Ethics Committee of Qazvin University of Medical Sciences (No. IR.QUMS.REC.2015). The subjects studied in this study were all cardiac patients referred to the cardiac artery by coronary artery angiography and have not had any coronary artery bypass surgery.

Sampling and data collection

These patients were selected from patients referring to the heart department of Shariati Hospital who had undergone angiography or angioplasty but did not perform bypass. According to the entry criteria, 208 patients (101 women and 107 men) were selected by random sampling method. We initially identified a number for all people who were studying. Then, using a random sampling method, 208 people were selected through a sampling software and entered the study in Shariati Hospital in a month. After completing the consent form and approval by the cardiologist, they referred to the interviewer. Demographic data (age, gender, educational level, occupation, job change, household size, history of heart disease in first-degree relatives of patients, and smoking) and demographic characteristics of participants including gender and age and anthropometric indices (height, body weight index, BMI, and wrist and waist circumference). Measuring height and weight by an experienced person using the SECA measurement and balance was measured with respect to important issues. Angiography and artery stenosis were performed by a cardiologist using gold standard for angiography.[13]

Physical activity and 168-semi quantitative Food Frequency Questionnaire (FFQ) for assessments of dietary intakes of black tea, coffee, caffeine, and soft drinks by an expert person.[14,15] After recording of FFQ, these data were entered into the Nutritionist 4 software for analysis and interpretation.[14]

Clinical assessment

CAD is considered as narrow stenosis of at least 50% in one of the main coronary arteries or its main branch. The number of arteries with stenosis of more than 50% was considered as a regression score that varied from zero to four. LM, LM, LAD, LCX, and RCA, history of the previous angiography, history of previous ultrasound, and appointment of patients for coronary artery bypass graft diagnosed by cardiologist.

Statistical analyses

Data analysis was performed by using SPSS software 22.00 and at a significance level less than 0.05. In addition, descriptive statistics, Chi-square, and Spearman correlation were used to examine the qualitative variables, and t test and Pearson correlation were used to examine quantitative variables.

Results

Mean ± SD The baseline characteristics, including age, sex, weight, height, wrist circumference, waist circumference, BMI, number of people in the patient's family, and duration of activity per week are summarized in Table 1.

Table 2 shows the relationship between dietary intake of black tea, coffee, soft drinks, and caffeine with coronary artery stenosis. There were a negative relationship between number of arteries with tea ($P = 0.011$, $r = -0.187$), coffee

(P = 0.069, r = – 0.098) intakes, and dietary caffeine intake (P = 0.043, r = –0.118). The high consumptions of soft drinks (P = 0.005, r = 0.387) were related with a rise in the vessels with stenosis of more than 50% number. In addition, dietary consumption of black tea may have a significant effect on the history of previous angiography (P = 0.044, r = –0.121), the history of previous Stanton (P = 0.035, r = –0.132), and coronary artery bypass graft surgery nomination (P = 0.008, r = –0.216). Coffee consumption showed a significant negative relationship with engagement for coronary artery bypass graft surgery (P = 0.004, r = –0.598). Soft drink intake was associated with a significant positive with LM artery stenosis (P = 0.003, r = 0.576) and the history of previous angiography (P = 0.038, r = 0.127). On the contrary, dietary intakes of caffeine were significantly negative associated with LM artery stenosis (P = 0.049, r = –0.118), LCX artery stenosis (P = 0.018, r = –0.161), the history of previous angiography (P = 0.037, r = –0.28), and the history of previous Stanton (P = 0.025, r = –0.139).

Discussion

The aim of this present study was to evaluate of the association between tea, coffee, and soft drink consumption and coronary artery stenosis in patients undergoing coronary angiography; our study demonstrated that the association between black tea consumption and the number of arteries with a narrowing of more than 50%, the history of previous angiography, previous history of Stanton, and the nomination for coronary artery bypass graft surgery were negative. In addition, the arteries with stenosis of more than 50% number and candidacy for coronary artery bypass graft surgery have a negative association with coffee intake. However, the association of consumptions of soft drinks with the arteries with stenosis of more than 50% number, artery stenosis of LM, and previous angiography history were positive. In addition, there were negatively significant correlations between dietary caffeine intakes with the arteries with stenosis of more than 50% number, LM artery stenosis, artery stenosis of LCX, previous angiography history, and previous standing history.

Our present study showed that the correlation with black tea and coronary artery stenosis were negative; this negative relationship between black tea intakes and arteries with stenosis of more than 50% number, previous angiography, previous Stanton, and engagement in surgery of coronary artery bypass graft. Ardalan *et al*. showed that taking black tea may improve endothelial function and endothelial-vasodilatation.[16] In addition, Widlasky and colleagues suggested that flavonoids or polyphenolic black

Table 1: The baseline characteristics of the participants

Variables*	Minimum	Maximum	Mean±S.D
Age (year)	16	81	57.81±12.18
Weight (Kg)	45	119	74.15±13.03
Height (M)	1	1.94	1.65±0.10
Wrist circumference (cm)	14.5	22	18.39±1.36
Waist circumference (cm)	64	150	97.50±11.72
BMI (kg/m^2)	15.94	55	27.13±5.18
Number of people in patients' family	1	13	4.30±2.10
Duration of moderate and low intensity activity per week (min)	0	1680	92.99±173.15
Duration of vigorous intensity activity per week (min)	0	1260	18.18±99.30

BMI: Body Mass Index, *This is the results of descriptive analysis of the baseline characteristics of the participants

Table 2: Relationship between black tea, coffee, soft drinks, and caffeine with coronary artery stenosis

Intensity of coronary artery stenosis dietary consumption	Number of coronary arteries with stenosis of more than 50%	LM artery stenosis	LAD artery stenosis	LCX artery stenosis	RCA artery stenosis	The history of previous angiography	The history of previous stenting	Candidacy for coronary artery bypassgraft surgery
Black tea	P* = 0.011, r =- 0.187	P=0.076, r = -0.086	P=0.051, r = -0.116	P=0.058, r = -0.102	P=0.107, r = -0.048	P=0.044, r =- 0.121	P=0.035, r = -0.132	P=0.008, r = -0.216
Coffee	P=0.069, r = -0.098	P=0.057, r = -0.109	P=0.085, r = -0.079	P=0.247, r = -0.039	P=0.157, r = -0.013	P=0.660, r = -0.005	P=0.695, r = -0.003	P=0.004, r = -0.598
Soft drinks	P=0.007, r=0.387	P=0.003, r=0.576	P=0.380, r=0.008	P=0.057, r=0.108	P=0.581, r=0.009	P=0.038, r=0.127	P=0.564, r=0.007	P=0.091, r=0.076
Caffeine (mg/day)	P=0.043, r=0.118	P=0.049, r = -0.118	P=0.489, r = -0.006	P=0.018, r = -0.161	P=0.589, r = -0.005	P=0.037, r= -0.128	P=0.025, r = -0.139	P=0.425, r = -0.007

LM: Left main, LAD: Left anterior descending, LCX: left circumflex, RCA: Right coronary artery. *The relationship between dietary intakes of black tea, coffee, and soft drinks reported in categorical qualitative amount (1 time per day, 2-3 time per week, 1 time per week, and rarely) and caffeine (mg/day) with intensity of coronary artery stenosis reported in 2 type (less than 50% and 50% and more). *P value obtained from Spearman correlation

tea molecules affect vascular health and the risk of CVD.[17] Duffy *et al*. showed that short and long-term use of black tea can improve endothelial dysfunction and endometrial vacuities in patients with CAD. Therefore, the findings may explain the relationship between tea consumption and CVD.[18] Many previous studies suggest that antioxidant components of black tea may have beneficial effects on chronic heart disease and can prevent CVDs.[17-21]

The results of the present study demonstrated the number of arteries with stenosis of more than 50% and candidacy for coronary artery bypass graft surgery reduced with coffee intake. DI Castelnuovo *et al*. was shown that moderate dietary intakes of coffee may have healthy outcomes.[21] Polyphelols components in coffee may be higher than tea that may reduce CVDs.[21-23] Klatsky *et al*. showed that coffee intake can reduce CAD risk only in non smokers. They suggest that smoking is an important factor for the beneficial effects of coffee intakes.[24] Anti-oxidants compounds in tea and coffee may decrease oxidative stress and general inflammation in CVD and other chronic diseases.[23,24] Polyphenols and other antioxidants compounds in a healthy diet can decrease lipids and proteins oxidation.[21-23]

The high consumptions of soft drinks were related with rising in arteries with stenosis of more than 50% number, artery stenosis of LM, and previous angiography history. Many previous studies demonstrated that soft drink consumption with high carbohydrate is one of the unhealthy habit that may be with insulin resistance and obesity that may be an independent risk factor for CVDs.[25-27] Soft drink intake can increase LDL and triglyceride that are risk factors for CADs.[28,29] However, some studies show that soft drinks with polyphenols components may have protective effects for CVDs.[30,31]

Caffeine is an important antioxidant component of foods and beverages. In our study, there was negatively significant correlation between dietary caffeine intakes with the number of arteries with stenosis of more than 50, LM artery stenosis, LCX artery stenosis, and the history of previous angiography (and the history of previous Stanton). Dijk *et al*. showed that there is a significant effect of caffeine on cardiac perfusion measurements, suggesting that caffeine intake in the diet may be effective in cardiovascular patients.[32] Casiglia *et al*. showed that excessive consumption of caffeine (>165 mg/day or >320 mg/day) is associated with atrial fibrillation in the general population.[33] However, some studies believe that diuretic effects of caffeine intakes may have some unhealthy effects; this study believes that high dietary intakes of caffeine with diuretic effect can lose vitamin B groups, including B6, folate, and coal-mine that may be with increase of C-reactive protein.[34] C-reactive protein is an absolute agent for CVDs and CADs; so in high intakes of caffeine, sufficient intakes of vitamin B groups are important.[34]

Limitation

Our study has limitations and weaknesses, including the cross-sectional study and the use of the FFQ questionnaire because the frequency questionnaire has some errors, such as reporting more or less about a number of diet items, as well as memory dependence. In addition, we measured caffeine intake from black tea, coffee, and dietary intakes of caffeine from other foods (for example coca, chocolate, etc.…) not measured that may have some errors on results. In addition, the cross-sectional study may have not shown the true correlation between exposure, outcome, and future case-control or cohort studies need.

The strengths of this study are in the novelty of study design and objectives because of the CVDs and CAD are common chronic diseases in worldwide; this in spite the fact that tea, coffee, and soft drinks are most common drinks in all societies.

Conclusions

In summary, our study demonstrated that there was a negative relationship between black tea intakes with stenosis of more than 50% number, previous angiography history, history of previous Stanton, and coronary artery bypass graft surgery candidate. In addition, arteries with stenosis of more than 50% number and candidacy for coronary artery bypass graft surgery has a negative association with coffee intake. However, the association of consumptions of soft drinks with stenosis of more than 50% number, artery stenosis of LM, artery stenosis of LCX, and previous angiography history were positive. In addition, there were negatively significant correlations between dietary caffeine intakes with arteries with stenosis of more than 50% number, artery stenosis of LM, artery stenosis of LCX, previous angiography history, and previous standing history.

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Conflicts of interest

There are no conflicts of interest.

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