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Original Article

Biochemistry Section

Relationship of Caffeine with Adiponectin and Blood Sugar Levels in Subjects with and without Diabetes

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ABSTRACT

Introduction: Coffee though not usually thought of as healthy food but can be treated as one of the beneficial drink. Many researchers have found strong evidence that coffee reduces the risk of several serious ailments, including diabetes, heart disease, cirrhosis of the liver, etc. The long term beneficial effect of coffee on diabetes is now understood to be more influential and obliging.

Materials and Methods: This study comprised 220 healthy subjects of which 143 consumed coffee and 77 did not. These were matched with 90 diabetic subjects. Among the 90 diabetics, 48 consumed coffee and 42 did not consume coffee.

Results: The mean adiponectin value was significantly higher in coffee consumed normal and diabetic subjects than the subjects who did not consume coffee. The decrease in fasting blood sugar and HbA1c values were also observed in normal and diabetic subjects who consumed coffee than the other groups who did not consume coffee. Significant difference ($p<0.05$) in mean FBG, PPBS, HbA1c and adiponectin were observed between coffee consumed and no coffee consumed groups.

Conclusion: The long term use of caffeine is more efficient on blood sugar and adiponectin levels, which needed in the prevention of complications in diabetic subjects.

Keywords: Adiponectin, Caffeine, Type 2 diabetes

INTRODUCTION

Insulin resistance or abnormal insulin secretion, are the characteristics of type2 diabetes mellitus (DM2), resulting in a diminished body glucose disposal. Those with chronic hyperglycemia, insulin resistance, or DM2 are at greater threat for its associated risk factors like hypertension, dyslipidemia, and cardiovascular disease. Genetic background and diet are considered to be one of the risk factors for developing type2 diabetes. Interestingly, among the several factors present in diet, coffee is considered as a potent dietary-component associated with reduced risk of diabetes and its complications [1].

Most generally consumed beverage is coffee in the world, and its beneficial effects on health have been attracting substantial consideration [2-4]. The common protective effect of coffee against diseases like cancer [5], cardiovascular diseases [6] and type 2diabetes mellitus [1,4,7] has been considered.

Better glucose tolerance and a substantially lower risk of type 2 diabetes have been connected with high coffee consumption in diverse populations [4,8,9]. The components responsible for the obvious beneficial effect of coffee on glucose metabolism remains blurred.

Animal studies have shown that intake of the coffee components like chlorogenic acid [10,11], quinic acid [12] and trigonelline [13], has enhanced glucose metabolism. Intervening metabolic studies on short term in humans have shown that caffeine can intensely lower insulin sensitivity [14,15]. However, a regular high caffeine intake on long term has been linked with improved insulin sensitivity [16].

An important secretory product of adipocytes is adiponectin, a marker and perhaps a mediator of metabolic and cardiovascular disease risk [17-20] acts as a hormone with anti-inflammatory and insulin sensitizing properties [19]. Further adiponectin levels are low in insulin-resistant subjects regardless of their obesity [21]. A growing body of evidence has shown that high adiponectin levels confirm a protective effect against glucose intolerance budding in Pima Indians who are at high risk for diabetes [22]. Further, it might be anticipated that the adiponectin level be affected with coffee consumption.

Therefore, in this study we aimed at estimation of the effect of coffee consumption on adiponectin in levels in diabetic and normal subjects.

MATERIALS AND METHODS

This was a cross-sectional study comprised 220 normal and 90 diabetic subjects. Of the 220 normal subjects 143 were consumed coffee and 77 did not consume coffee. They were matched with 48 diabetic subjects who consumed coffee and 42 diabetic subjects who did not consume coffee at all. The quantity and duration of coffee consumption of subject selected was three cups per day for more than 15 y. All the healthy participants were free from ailments. The diabetics were on oral hypoglycaemic drugs and were free from micro and macrovascular complications. The duration of diabetes, the subjects suffered from was more than 5 y. Ethical clearance was obtained for the study and informed consent was also collected.

Fasting blood sample of 5 ml was collected. Blood glucose was estimated by GOD-POD method using Agappe commercial kit and adiponectin was estimated using ELISA technique with Ray biotech kits. The patient's history was also taken and care was given to the habitual consumption of filter coffee and those never with coffee.

We used statistical package of SPSS 11.0 and the significance between the groups was calculated using students unpaired t-test. The independent sample t-test was used to demonstrate the association between FBS and PPBG, HbA1c and adiponectin in control and diabetics with and without coffee consumption. The general linear model was used to show the interaction between diabetic status and coffee.

RESULTS

Our study comprised a total of the 220 normal subjects of which 143 were consumed coffee and 77 did not consume coffee. They were matched with 48 diabetic subjects who consumed coffee and 42 diabetic subjects who did not consume coffee at all. The mean value of adiponectin in coffee consumed normal and diabetic subjects were significantly higher than normal and diabetic subjects who did not consume coffee [Table/Fig-1]. The fasting blood glucose was significantly lower in normal and diabetic subjects

Dependent Variables	Normal (mean ± SE)		Diabetics (mean ± SE)	
	with coffee	without coffee	with coffee	without coffee
FBG	76.59 ±1.58	79.83 ± 2.30	115.917± 2.70	121.619± 2.88
PPBS	104.26 ±1.78	107.56± 2.58	132.583± 3.03	142.310 ±3.23
HBA1c	6.32±0.079	6.10± 0.11	6.648±0.13	7.498±0.14
Adiponectin	19.11±.648	16.11± 0.940	17.00±1.10	14.05± 1.18

[Table/Fig-1]: Interaction effects with diabetic status and coffee
With respect to FBG there were no significant interaction effects with diabetic status and coffee.
With respect to PPBG there were no significant interaction effects with diabetic status and coffee.
With respect to HbA1C there are significant interaction effects with diabetic status and coffee.
Diabetics who drink coffee had significantly lower HbA1C than those who did not drink coffee.
With respect to Adiponectin there was significant interaction effect with diabetic status and coffee

	FBG	PPBG	HbA1C	Adiponectin
Coffee	86.69 ± 1.87	111.53 ± 1.69	6.41 ± 0.06	18.57 ± 0.59
No Coffee	96.08 ± 2.63	121.07 ± 2.76	6.64 ± 0.12	15.31 ± 0.68

[Table/Fig-2]: Mean ± SE of the variables measured in subjects with and without coffee consumption
Mean FBG, PPBG, HBA1C, Adiponectin are significantly different at p<0.05 between those that consumed coffee and those that did not consume coffee.
There was a significant difference between those that consumed coffee and those that did not consume coffee for the variables FBG, PPBG and Adiponectin

who consumed coffee [Table/Fig-1]. Mean FBG, PPBG, HbA1C, adiponectin were significantly different (p<0.05) between those that consumed coffee and those that did not consume coffee [Table/Fig-2]. With respect to FBG and PPBS there were no significant interaction effects with diabetic status and coffee. With respect to HbA1c there were significant interaction effects with diabetic status and coffee. Diabetics who drink coffee had significantly lower HbA1c than those who did not drink coffee [Table/Fig-1]. With respect to Adiponectin there was significant interaction effect with diabetic status and coffee [Table/Fig-1,3].

DISCUSSION

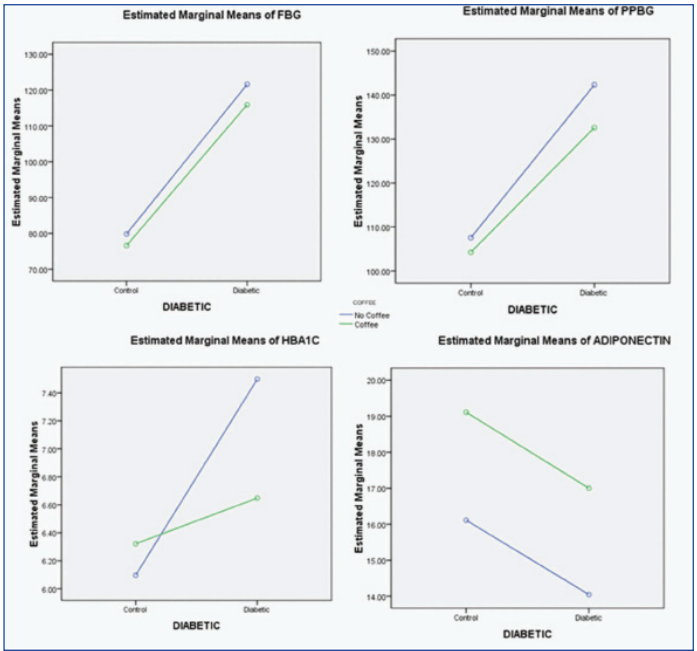
The present study was conducted to examine the association between coffee consumption and circulating adiponectin level. The important observation of this study was that the adiponectin levels of those drinking coffee (more than three cups of coffee per day for more than 15 y) were significantly higher than subjects who never consumed coffee. This study demonstrated significantly lower fasting blood glucose level in coffee consumed group.

Further there exists a significant positive association of coffee consumption with adiponectin levels and is consistent with the previous reports from other studies [23-25]. Adiponectin is a secretion from adipocytes [19]. In fact, one of the major substances that coffee contains along with several other substances is caffeine. An experimental study on caffeine has shown that the caffeine of the coffee is responsible for the up-regulation of peroxisome proliferator-activated receptor γ expression [26], which is an essential regulator of adipocyte differentiation and maintenance [27,28].

Impaired glucose tolerance and decrease in insulin sensitivity was found in acute caffeine administration in a number of controlled clinical trials [14,15,28,29].

Several epidemiological studies imply that long-term, consistent coffee consumption may facilitate the maintenance of normal glucose tolerance. The cross-sectional studies in Japan [30], Spain [31], and Sweden [32] have found coffee intake to be inversely linked with the impaired glucose tolerance after an oral glucose load. Moreover, a prospective cohort study of more than 1100 Dutch men and women found that the risk of developing impaired glucose tolerance over the next six years [33] was decreased with coffee consumption.

Overall, there is little support of health risks and extra evidence of health benefit for those consuming moderate amounts of coffee on the long run. Obviously, more research is required to realize the detrimental effect of long-term caffeine consumption.



[Table/Fig-3]: Graph showing the estimated marginal means for measured variable with coffee and no coffee

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