The Effect of Green Tea Consumption on Prothrombin Time among Healthy Sudanese Volunteers

Nasma Y. Mohammed[1] and Ibrahim K. Ibrahim[2]

[1]Sudan University of Science and Technology, Khartoum, Sudan
[2]Al Neelain University, Khartoum, Sudan

Abstract

Background: Tea is a product made up from the leaves and buds of the plant *Camellia sinensis.* It is the second most consumed beverage in the world, well ahead of coffee, beer, wine and carbonated soft drinks. Originating from China, tea has gained the world's taste in the past 2000 years. The economic and social interest of tea is clear, and its consumption is part of many people daily routine, as an everyday drink and as a therapeutic aid.

Objective: To study the effect of the consumption of green tea on prothrombin time level among apparently healthy Sudanese volunteers.

Materials and methods: A total of 40 healthy Sudanese volunteers aged 20-45 years were investigated. 21 of them were females and 19 were males. Each volunteer was instructed to consume steamed green tea for one month (two cups per day). 2.5 ml venous blood were collected in 3.2% tri-sodium citrate from each participant before and after the consumption of green tea. Platelet-poor plasma was prepared and used for measurement of prothrombin time (PT). Determination of PT was performed by a semi-automated coagulometer (Stago, France).

Results: The mean of pro thrombin time level was found shorter in specimens collected after green tea consumption than in specimens collected before green tea consumption (14.33 ± 0.96 sec and 14.06 ± 0.90 sec respectively). This difference was statistically significant ($p = 0.000$). Also, a statistically significant difference was found between the mean of pro thrombin time levels in males and females in both pre-and post-green tea consumption ($p = 0.000$ and 0.005 respectively). As per age incidence, there was no statistically significant difference was found in males and females ($p = 0.09$ and 0.06 respectively).

Conclusion: Consumption of green tea twice per day may slightly decrease the level of prothrombin time among healthy Sudanese volunteers.

Keywords: Green tea, Prothrombin time, Semi-automated coagulometer, Sudanese volunteers.

Introduction

Depending on the manufacturing process, teas are classified into three major types: non-fermented green tea (produced by drying and steaming the fresh leaves to inactivate the polyphenol oxidase enzyme and to form non-oxidation), semi-fermented oolong tea (produced by subjecting fresh tea leaves to partial fermentation before drying), and fermented black and

red (Pu-Erh) teas which underwent a post-harvest fermentation stage before drying and steaming). The fermentation of black tea is due to an oxidation process catalyzed by polyphenol oxidase, and Pu-Erh tea is attained by using microorganisms[1].

McKay and Blumberg reported a per capita mean consumption of tea in the world of 120 milliliter/day. Approximately 76-78% of the tea produced and consumed is black tea, 20-22% is green tea and less than 2% is oolong tea.

Black tea is consumed principally in Europe, North America, and North Africa (except Morocco). While green tea is widely drunk in China, Japan, Korea and Morocco. Oolong tea is popular in China and Taiwan. In USA, the 80% of tea consumed is black ice tea[2].

Green tea is prepared without fermentation and heating. The process of fermentation of black tea leads to the activation of various enzymes and intensive changes in color, aroma, and flavor. These changes are usually desirable for taste. Since green tea is heated before the process of fermentation, it is not usually suitable for taste with respect to aroma and flavor.

However, the consumption of steamed green tea has various beneficial pharmacological effects. Black tea and green tea are powerful sources of flavonoids and other polyphenolic antioxidants, which have a protective effect in coronary artery disease (CAD)[3].

According to the available published reports, tea could be beneficial to human health by decreasing the incidence of hyperlipidemia, atherosclerosis and antioxidation. Black tea and green tea are potent sources of flavonoids and other polyphenolic antioxidants, which have a protective outcome in coronary artery disease. It was also shown that catechin contained in green tea prevent the cell proliferation of arterial wall muscle. The protective effects of flavonoids are not only antioxidant, anti-thrombotic, and anti-inflammatory properties, but they also add to the rate of the coronary flow velocity reserve[4].

Even though drinking tea is one of the most popular Sudanese behavior, but green tea is still infrequently used for daily consumption by Sudanese population despite their beneficial effect. Since there is no published data on the beneficial effects of fibrinogen level, this study was conducted to verify whether green tea has an affect the coagulation profile.

Materials and methods

This was a prospective, interventional study conducted in Khartoum State (Sudan) at the Sudan University of Science and Technology. during the period from March to May 2018 to evaluate the effect of green tea consumption on prothrombin time test.

A total of 40 healthy Sudanese volunteers aged 20-45 years were investigated. 21 of them were females and 19 were males. Each volunteer was instructed to consume steamed green tea for one month (two cups per day). 2.5 ml venous blood were collected in 3.2% tri-sodium citrate from each participant before and after the consumption of green tea. Platelet-poor plasma was prepared and used for the measurement of prothrombin time level and activated partial thromboplastin time in the pre- and post- consumption blood specimens collected from them. prothrombin time. Determination of PT were performed by a semi-automated (Coatron M2) coagulometer (Stago, France).

Data were analyzed using the Statistical Package for Social Sciences (SPSS), version 21. Independent S-sample t-test was used to compare the mean fibrinogen level before and after consumption of green tea. A p-value less than 0.05 was considered significant.

Mohammed, *et al.,* 2020: Vol 5 (9)

Results

The participants prothrombin time (PT) level before and after green tea consumption was 14.06 (± 0.91) and 14.33 (±0. 96) respectively. This difference was statistically significant (p = 0.000). As shown in Table (1), the PT levels in both females and males before green tea consumption was 13.8 (±0.72) and 14.85 (±0.90) respectively. Whereas the mean of PT level in both females and males after green tea consumption was 13.7 (±0.85) and 14.5 (±0.81) respectively. This difference was statistically significant (p = 0.005 and p = 0.000) respectively. On comparing the prothrombin time levels in different age groups, the mean PT level in pre-green tea consumption specimens among participants aged 20-32 years was 14.0 (±0.80) and participants aged 33- 45 years was 14.6 (±1.0). While the mean of prothrombin time of post-green tea consumption specimens among participants aged 20-32 years was 13.8 (±0.90) and it was 14.3 (±0.88) in specimens collected from participants aged 33-45 years. This difference showed no significant difference between these two age groups on pre- and post- consumption specimens (p = 0.09 and 0.06 respectively).

Table (1): Prothrombin time level in pre- and post-consumption specimens according to gender and age incidence

Parameter	Pre-consumption specimens	Post-consumption specimens
Females	13.80 (± 0.72) sec	13.70 (± 0.85) sec
Males	14.85 (± 0.90) sec	14.50 (± 0.81) sec
20-32 years	14.0 (± 0.80) sec	13.80 (± 0.09) sec
33-45 years	14.60 (± 1.0) sec	14.30 (± 0.88) sec

Discussion

Prothrombin time test is an important test used to evaluate the extrinsic and common pathway of coagulation, and it is used for monitoring of patients on oral anticoagulation therapy. This study was carried out to evaluate the effect of green tea consumption (two cups per day) on prothrombin time level in apparently 40 healthy Sudanese people aged 20-45 years.
In this study the mean of prothrombin time level in post-consumption specimens was found significantly lower than the mean of pre- consumption specimens. This finding agrees with the findings of a study conducted in Iran[5] to investigate prothrombin time among volunteers after regular consumption of 4 g/day green tea for one month; and reported a small significant decrease in prothrombin time level.
Another study conducted in Sudan[6] investigated healthy volunteers after regular consumption of two cups of green tea for one month and reported a small significant decrease in prothrombin time.
In the present context, there was no statistically significant difference in the mean of prothrombin time level between males and females. Also, there was no statistically significant difference on comparing the mean prothrombin time level between two age groups (20-32 and 33-45 years) investigated. A study conducted in India[7] to study the effect of green tea on pharmacodynamics of warfarin drug showed that after regular consumption of green tea for one

month by patients consuming green tea with warfarin there was a reduction in prothrombin time level as compared with patients using warfarin alone.

Further studies with different sample sizes, different numbers of cups per day, and different duration of consumption need to be conducted to evaluate the effect of green tea consumption on prothrombin time level among patients with known high prothrombin time level.

Conclusion: Consumption of green tea twice per day may slightly decrease the level of prothrombin time among healthy Sudanese volunteers.

Acknowledgments: The authors wish to thank all the Sudanese, healthy volunteers who participated in the study. Also, the investigators are indebted to thank the staff of the Department of Haematology, Faculty of Medical Laboratory Sciences, Sudan University of Science and Technology, Khartoum, Sudan.

References

1. Willson KC. Coffee, cocoa and tea. New York. *CABI Publishing*, 1999.

2. Wu CD, Wei GX: Tea as a functional food for oral health. *Nutrition.*2002; 18:443-444.

3. Elattar TM, Virji AS. Effect of tea polyphenols on growth of oral squamous carcinoma cells *in vitro. Anti Cancer Res* 2000; 20 (53): 3459-65..

4. Cheng TO. All teas are not created equal: the Chinese green tea and cardiovascular health. *Int J Cardiol.* 2005; 21(1):83-86

5. F. Jalali MD, *et al.* Qualified health claim petition-green tea and reduced risk of cardiovascular disease in Iran. 2008; *Docket* (297).

6. Hussam MA Ibrahim, Remah Salah, *et al.* The effect of green tea consumption on coagulation profile among adult healthy Sudanese. *International Journal of Applied Research*. 2017; 3(3):703-705.

7. Kannan Eagappan, Mamatha G. Philip, Deena C. Sangeetha. *et al.* Effect of green tea on the pharmacodynamics of warfarin. *World Heart Journal.* 2004; 4(3):135-140.

Mohammed, *et al.,* 2020: Vol 5 (9)