Hussam MA Ibrahim
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Remah Salah I Elkhidir
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Fatima Mirghani
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Esraa M Ali
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Esraa M Ali
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Abu baker Abdalla
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Mubark Hussein
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

Correspondence
Hussam MA Ibrahim
Department of Haematology and
Immunohematology, Faculty of
Medical Laboratory Sciences,
International University of Africa,
Khartoum-Sudan

The effect of green tea consumption on coagulation profile among adult healthy Sudanese

Hussam MA Ibrahim, Remah Salah I Elkhidir, Fatima Mirghani, Esraa M Ali, Eman Ali, Abu baker Abdalla and Mubark Hussein

Abstract
Green tea is commonly used as a beverage worldwide, especially in China, Japan, Morocco, and Saudi Arabia. Green tea and its constituents have been considered very effective in the prevention and treatment of various diseases. It contains a variety of catechins, which show a pivotal role in the modulation of biological activities and also act as chemo preventive agents. Fibrinogen is the main constituent that format the blood clot elevated fibrinogen level raises heart disease risk by (60 to 90%) this study aimed to draw attention to the importance of healthy green tea over other kinds of tea and to explore the effect of green tea on coagulation profile. This can be achieved through experimental study. This study aimed to assess the effect of green tea consumption on coagulation profile among apparently healthy adult Sudanese individuals. In this study venous blood sample 9:1 in Trisodium citrate 3.2 *.%* Were collected from healthy adult controls (n=30) (12 male and 18 female) randomly selected. The Prothrombin time (PT), activated partial thromboplastin time (APTT), and fibrinogen test were performed by the coagulometer. There was statistical significant difference ($p.<0.05$) in the fibrinogen level before and after consumption of green tea (before 339.9±62.5) (after 310.6±47.9).While there was no statistical significant difference in other coagulation tests. Moreover there was statistically significance in levels of fibrinogen between males and females. The mean of fibrinogen level in male before and after were (306±55) (275±28) respectively and in female were (362±57) (343±44) respectively. This study didn't obtain any statistical significance in fibrinogen levels between different age group.

Keywords: Green tea, fibrinogen

1. Introduction

Green tea is a product made from the Camellia sinensis plant and is commonly used as beverage worldwide, (Costa *et al*., 2002; Rietveld *et al.,* 2003) [1, 2]. From the ancient time, green tea and its constituents show role in health management via modulation of biological process including molecular and biochemical pathways. Green tea shows health promoting effects mainly due to the polyphenol content (Khan N., Mukhtar H.,2007; Arshad H. Rahmani, *et al* 2015) [3, 4], especially flavonols, which constitutes 30% of fresh leaf dry weight (Ayat *et al*., 2014.; McKay D. L., Blumberg J.B, 2002) [5, 6].

The chief constituents of green tea are catechins where (−)-epigallo catechin gal late is one of the most effective types of catechins (Khan N., Afaq F *et al*., 2006) [7]. However, the consumption of steamed green tea has various beneficial pharmacological effects. (F. Jalali *et al*., 2008) [8].

According to the published researches, tea could be beneficial to one's health, such as reduction of the incidence of hyper lipidemia, atherosclerosis and anti-oxidant (Mannu GS, Zaman MJ, Gupta A, *et al*; 2013) [9]. Black tea and green tea are powerful sources of flavonoids and other polyphenolic antioxidants, which have a protective effect in coronary artery disease (CAD) (Elattar *et al*., 2000; Hakim IA *et al* 2003; Jun Pang, Zheng Zhang *et al* 2014) [13, 10, 11]. It was also shown that catechin contained in green tea prevents the cell proliferation of arterial wall muscle. (Benzie IF, Stvain JJ, Tomlinson B., 1999) [12]. The protective effects of flavonoids contained in green tea are not only antioxidant, anti-thrombotic, and anti-inflammatory properties, but also additive to the rate of the coronary flow velocity reserve (Cheng TO, 2005) [14].

Fibrinogen is a large, stable globulin protein (molecular weight, 341,000). It is the precursor of fibrin, which forms the resulting clot. When fibrinogen is exposed to thrombin, two peptides split from the fibrinogen molecule, leaving afibrin monomer. These monomers aggregate together to form the final polymerized fibrin clot product. Many experts feel that fibrinogen may be the overall single best risk factor for predicting heart attacks and strokes. Elevated fibrinogen levels have also been linked to increased risk of diabetes, hypertension, and even cancer. Several researchers have shown that a high fibrinogen level is associated with a seven folds increase in deaths from all causes. Maintaining a normal fibrinogen level thus translates into huge health dividends (ER1).

Although tea drinking is one of the most popular Sudanese habits but green tea is still rarely used for daily consumption by Sudanese in spite of their beneficial effect. Because there is a published data on its beneficial effects on fibrinogen level this study was conducted to confirm whether green tea well reduces the coagulation profile or not.

2. Materials and Methods
This study is experimental study (interventional), was conducted in Khartoum state during the period from March 2016 to May 2016, apparently healthy adult Sudanese individuals were enrolled to assess the effect of green tea consumption on coagulation profile.

Venous peripheral blood samples were collected in 3.2% tri-sodium citrate containers (1.8 ml of blood). Most routine coagulation investigations are performed on platelet poor plasma and then centrifugation at 2000-4000round/min for 15 minutes. Coagulation profile was measured using Techno clone modified clauses method (Stago st- art4coagulometer, french). The Data were entered and analyzed by using SPSS 16 statistical software. The mean and standard deviation (SD) were calculated for each test before and after. The P-value less than 0.05 were considered significant.

3. Result
A total of 30 healthy adult, Sudanese individual, were randomly selected during the study period (March 2016 to May 2016). Among them 12 (40%) were male and 18 (60%) were female. The mean of the coagulation tests were obtained before and after the intervention (drinking of green tea). The mean of fibrinogen before one month consumption of green tea was 339.9±62.5 while the mean of fibrinogen after was 310.6±47.9 and there was statistically significant difference in fibrinogen level before and after one month consumption of green tea ($p<0.05$) (Table 1) (figure 1).While there was no statistical significant difference in other coagulation tests (PT, APTT and INR).

Table 1: Coagulation test fibrinogen before and after one month's consumption of green tea

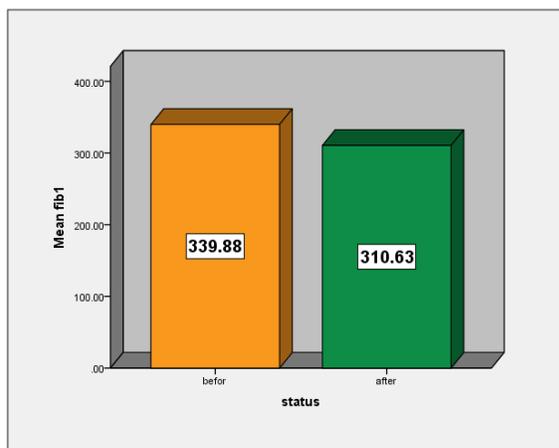| coagulation test	Before (n, 30) (mean ±SD)	After (n, 30) (mean ±SD)	P. value
Fibrinogen	339.9±62.5	310.6±47.9	<0.000

Fig 1: Mean SD of fibrinogen before and after one month's consumption of green tea

The mean of fibrinogen level in male before and after drinking green tea were (306±55) (275±28) respectively. While the mean of fibrinogen in female before and after the drinking of green tea were (362±57) (343±44) respectively. The present study revealed statistical significant difference between male and female and before and after drinking of green tea ($p<0.05$) (Table 2).

The mean PT in male before and after drinking green tea was (12.9±1.2) (12.7±0.6) respectively. While the mean of PT in female before and after drinking green tea (12.8±1.1) (12.7±1.05) respectively.

Regarding the mean of PTT in male before and after drinking green tea were (29.9±5.7) (29.5±4.7) respectively. The mean of PTT in female before and after drinking green tea were (28±4.8) (29.8±3.9) respectively. This study didn't revealed any statistical significant difference in PT and PTT in both gender before and after drinking green tea (p>0.05) (Table 2).

Table 2: Plasma clotting time before and after drinking green tea with regard to gender.

coagulation test	Male		Female		P. value
	Before	After	Before	After	
PT (sec)	12.99±1.2	12.7±0.6	12.8±01.1	12.7±1.05	>0.05
PTT (sec)	29.9±5.7	29.5±4.7	28.4±4.8	29.8±3.9	>0.05
Fibrinogen (mg/dl)	306±55	275±28	362±57	334±44	<0.05

4. Discussion
Fibrinogen is a 340 KD a plasma glycoprotein that plays a key role in coagulation. Upon cleavage by thrombin the fibrinogen is converted to fibrin which polymerizes into a fibrin network or clot Weisel JW (2005) [19]. In this study, the mean of fibrinogen level in the samples collected after green tea consumption was significantly lower than that of the samples collected before the green tea consumption. These findings were in agreement with the findings of study done by F Jalali et al. (2008) [8] and Ayat et al. (2014) [5] which they were reported the same findings.

However another study conducted by de Maat et al. (2000) [15] in Netherlands among adult smokers reported that there was no effect of green tea on the level of fibrinogen the

difference between our results and this findings may be due to the difference in the studied populations because de Maat *et al*. study was conducted on smokers while all others previous studies were conducted on non-smokers. (ER3)

Our findings of PT and PTT results before and after consumption of green tea were not in concordance with Jalali *et al*. (2008) [8] that obtained significantly decreased. However kang *et al*. (1999) [16] reported similar findings which revealed that the green tea did not produce significant change in coagulation parameters mainly PT and PTT.

This study revealed significant difference in the level of fibrinogen between males and females. Similar findings were obtained by Hugh E Montgomery *et al* (1996) [17] which revealed significant increase in fibrinogen level in female compared to male and this is could be attributed to body mass index and heavy exercise. Thus heavy exercise enhances fibrinogenolysis which decrease level of plasma fibrinogen in male. However these findings were not in agreement with Ayat *et al*. (2014) [5] that mentioned no statistical significant difference in fibrinogen level between males and females.

Moreover this study didn't obtained statistical significant difference in fibrinogen level or other coagulation tests with regards to age group and this similarly obtained by Ayat *et al*. (2014) [5] and Ganesh *et al*. (2009) [18] (ER2).

5. Conclusion
This study concludes that drinking two cups of healthy green tea per day reduce the level significantly decrease of fibrinogen. Also the present study obtained statistically significant difference between male and female with regard to fibrinogen level. However didn't reveal significant differences in other coagulation test or regard to age group.

6. Acknowledgements

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