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EFFECT OF CAFFEINATED AND DECAFFEINATED COFFEE ON BLOOD PRESSURE

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ABSTRACT: *The world's most popular stimulant, caffeine, accounts for 80% of all caffeine consumption. It is widely used as a component in pharmaceuticals due to its high antioxidant and nutrient content, including phenol and polyphenol. In the presence of caffeine, drinks are categorised as caffeinated and decaffeinated. The present study was conducted to evaluate the effect of caffeinated and decaffeinated coffee on blood pressure among the young generation. This experimental study was conducted on 85 healthy individuals (both male and female, non-hypertensive) between 18-28 years of age. Blood Pressure (BP) was measured by an automatic digital blood pressure monitor, before and after taking of coffee in 30, 60, and 90 minutes. Each participant ingested 100 mL of coffee prepared from 50 mg of caffeinated coffee in water. The consumption time of each individual was between 2-4 minutes. It was noticed almost 65.7% participants were found normal. While a significant difference were noticed in systolic blood pressure (SBP) and diastolic blood pressure (DBP) after the intake of caffeinated coffee at p-value (<0.001) by Friedman test. An increase of 4.4 mmHg and 5.02 mmHg was found in systolic blood pressure after 60, and 90 minutes respectively from the normal that is <20mm Hg. It was concluded by the study that individual responses were varied, particularly an increase in BP after taking caffeinated coffee Some people might be more sensitive to caffeine and feel its effects more strongly, while its effects are quite normal for others.*

Keywords: Coffee, Caffeine, Systolic, Diastolic

INTRODUCTION

Caffeine is a natural stimulant usually found in a variety of foods and drinks, like chocolates, some soft drinks, energy drinks, tea, and coffee (Nawrot et al., 2003; Nour et al., 2010; Reyes and Cornelis, 2018). In a world where caffeine is consumed in a variety of ways, coffee appears to be one of the most popular drinks (Hečimović et al., 2011; Parikh, 2019; Barrea et al., 2023; Ullah et al., 2023). A significant risk factor for cardiovascular disease is hypertension (HPT) that is a result of high blood pressure (Kannel, 2000; Zanchetti et al., 2001). According to the WHO, high blood pressure (BP) is the major cause of death all over the world (Mancia et al., 2007; Fujiyoshi et al., 2012; Redon et al., 2011).

Over the decades, there has been much discussion regarding coffee's effects on arterial hypertension and the cardiovascular system. On the contrary, coffee's composition is much more complex and depends on a variety of factors, including its type, production, and preparation methods. Coffee typically contains more than 1000 chemical components, many of which have biological activity (van Dam et al., 2020).

The negative effects of caffeine typically appears as restlessness,

tachycardia, anxiety, changes in mood, insomnia, and speech that appears after consuming large doses (Rath et al., 2012; Jones, 2017). Caffeine's potential role in controlling blood pressure is contentious (Corti et al., 2002). According to the European Society of Cardiology and the European Society of Hypertension's recommendations for the treatment of arterial hypertension HPT, no firm advice regarding the consumption of coffee can be given due to insufficient literature (Wierzejska, 2016).

Single doses of caffeine ranging from 80 to 300 mg were found to affect BP, increasing systolic and diastolic blood pressure on average by 3-8 mmHg and 4-6 mmHg, respectively, with significant inter individual variation. Usually, BP increases after 30 minutes of caffeine consumption and after 60-90 minutes it reaches on peak and goes down after two to four hours (EFSA 205).

According to several researches, the effect of caffeine on BP is considerable. The use of coffee and tea has been significantly increased in the young population over time. The aim of this study was to evaluate the effect of caffeine consumption on blood pressure in the young generation and healthy individuals.

MATERIALS AND METHODS

Time and duration of the Study

The present study was designed for 3 months from September 2022 to December 2022. The participants data was taken from morning (9:00 am) to midday (1: 00 PM).

Inclusion Criteria

A total of 85 healthy individuals (non-hypertensive) of 18-28 years were considered.

Exclusion Criteria

An individual with hypertension or less than 18 years and above 28 years were not considered for the study. Further, the persons taking tea before 9:00 am and after 1:00 PM were not considered.

Preparation of Coffee

The caffeinated coffee was prepared by using 50 mg coffee and 100ml of water. The amount of coffee was measured by using a Digital External Milligram Scale. The consumption time of each individual was between 5-8 minutes.

The whole procedure was repeated for decaffeinated coffee.

Procedure to take Blood Pressure

BP was measured by an automatic digital blood pressure monitor (Omron HEM-7120), before intake of coffee and after 30, 60, and 90 minutes. Each participant received a freshly prepared 100 mL caffeinated coffee.

Statistical Analysis

Data was analyzed using SPSS vs. 26. The Friedman test was applied to see the significance of the study. P-value ≤ 0.05 was considered significant.

RESULTS

This study was investigated on 85 individuals where 34(40%) were females, and 51(60%) were male participants. The average age of both male and female participants was 22.65 ± 2.33 years. However, age of females and males was noticed as 22.18 ± 2.15 years and 22.96 ± 2.42 years respectively (Table 1). It was noticed almost 65.7% participants were found normal and only 34.3% have changed SBP and DBP.

Table 1: A descriptive data of male and female participants

No of female participants	No of male participants
34(40%)	51(60%)
22.18 \pm 2.15 years (age)	22.96 \pm 2.42 years (age)

According to the results, the systolic blood pressure before the consumption of caffeinated coffee was 118.32 mmHg, and diastolic blood pressure was 76.09 mmHg. The average systolic blood pressure increased to 118.42 mmHg, 122.72 mmHg, and 123.34 mmHg after the ingestion of caffeinated coffee at 30, 60, and 90 minutes respectively. The diastolic BP increased to 77.83 mmHg, 78.62 mmHg, and 79.18 mmHg at 30, 60 and 90 minutes, respectively. So, there was no mean change for systolic BP in the first 30 minutes but significant change was observed in systolic BP after 60 and 90 minutes. A marked increase was noticed in SBP at 60-90 minutes after the consumption of

caffeinated coffee, a 4.4 mmHg increase after 60 minutes, 5.02 mmHg increase was observed at 90 minutes (Table 2).

This study revealed that there was little change in the first 30 minutes after the consumption of decaffeinated coffee. The average BP was 118.25 mmHg before consumption of decaffeinated coffee, at 30 minutes 118.17 mmHg, at 60 minutes 117.95 mmHg, and 90 minutes 118.21 mmHg. A minimal changes were recorded in systolic at diastolic BP at 30, 60 and 90 minutes after the consumption of decaffeinated coffee. (Table 2). There was non-significant difference was noticed after the intake of decaffeinated coffee in systolic and diastolic blood pressure.

Table 2: A descriptive detail of SBP and DBP in individuals after intake of caffeinated and decaffeinated coffee

BP	Time (Minutes)	Min	Max	Mean±SD	P-value
Caffeinated Coffee					
Systolic	0	100.00	140.00	118.32±11.73	<0.001*
Systolic	30	90.00	141.00	118.42±12.53	
Systolic	60	94.00	145.00	122.72±12.84	
Systolic	90	100.00	145.00	123.34±11.85	
Diastolic	0	60.00	93.00	76.09±8.03	<0.001*
Diastolic	30	65.00	113.00	77.83±9.93	
Diastolic	60	65.00	90.00	78.62±6.54	
Diastolic	90	64.00	90.00	79.18±7.44	

Decaffeinated Coffee					
Systolic	0	100.00	141.00	118.25±9.10	0.161
Systolic	30	95.00	140.00	118.17±9.68	
Systolic	60	95.00	130.00	117.95±11.91	
Systolic	90	86.00	138.00	118.21±12.35	
Diastolic	0	60.00	90.00	76.25±7.23	0.179
Diastolic	30	60.00	95.00	76.17±6.83	
Diastolic	60	60.00	90.00	76.67±8.78	
Diastolic	90	60.00	90.00	76.29±6.62	

*showed significant p-values at 0.05 level of significance, Friedman test was applied.

DISCUSSION

In the current study, we were able to show that healthy peoples' SBP and DBP were significantly elevated after ingesting caffeine. Although, the rise was only for the short period of time. The average age of male participants was 22.96±2.42 years, while the average age of female participants was 22.18±2.15 years.

In the current study, males were involved in more intake of coffee than females. According to Verster and Koenig (2018) intake of caffeine was higher in males as compared to females. A study was conducted on university students to observe the effect of caffeine consumption that showed females were higher consumers than males (El-Nimr et al 2019). In this study after caffeinated coffee effect of caffeine was noted, same as in another study conducted in the US, caffeine

consumption due to coffee intake was noted in the young population (Somogyi, 2010). However, the Texas Christian University study found that the most common daily beverage consumed was coffee, followed by tea,

energy drinks, and soda (Ullah et al., 2023). The current study is comparable with many other studies, almost 60% of the participants experienced the symptoms after ingestion of caffeinated coffee (NCA, 2019; Verster and Koenig, 2018).

Several other studies evaluated the effects of caffeine on blood pressure. We considered the coffee as a major source of caffeine in the present study. Usually, caffeine is absorbed in the blood within 45 minutes after consumption. Previous literature reported that, normally blood pressure increases 30 minutes after ingestion of

caffeine and it reaches high after 60 minutes to 90 minutes (Corti et al., 2002; EFSA, 2015). The present study has the compatibility with this study conducted EFSA.

The majority of caffeine consumers in a study did not experience caffeine withdrawal, which is likely due to the daily consumption of caffeine over an extended period strengthening reliance on caffeine and preventing withdrawal. The young generation who were experiencing caffeine withdrawal were more likely than those who weren't to consume caffeine at risky levels because the more caffeine is consumed, the more dependent consumers become and the more symptoms they experience when they stop using it (El-Nimr et al., 2019). According to the present study, there is a significant difference between caffeine intake (caffeinated coffee) and blood pressure. There are also conflicting results from multiple types of research examining the relationship between caffeine and BP in normal individuals i.e. non-hypertensive patients (Zhang et al., 201). A meta-analysis published in 2012 found no correlation between coffee consumption and BP (Steffen et al., 2012).

A single dose of caffeine (200–250 mg), which is almost equal to 2-3 cups of coffee, was found to increase systolic

blood pressure by (3–14 mmHg) and DBP by (4–13 mmHg) in normotensive participants in randomized controlled trials that looked at the effects on BP of single doses of caffeine or caffeinated coffee among normotensive and hypertensive contributors (EFSA, 2015). These analyses draw attention to the significant study-wide variability, the hazy definition of coffee consumption, and adherence to the prescribed quantity.

CONCLUSION

It was concluded in this study that males were higher in number for the consumption of coffee than females. Overall use of caffeinated coffee results in increase of BP among young people. A significant increase in SBP and DBP were observed for a specific time after the intake of caffeinated coffee. No significant difference was seen after the consumption of decaffeinated coffee among participants.

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