Coffee Consumption: Health Perspectives and Drawbacks

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Abstract

Globally coffee is considered to be amongst commonly used beverages due to the presence of chemical components like caffeine, cafestol, kahweol and many micronutrients. It is considered as a primary source of caffeine intake among teenagers and adults. The purpose of this review article is to understand the theory of recent researches on the health benefits and risks in human beings by consuming coffee. Results of many studies indicated that consumption of coffee provide the prevention against diabetes, Parkinson's diseases and colorectal cancer. However, coffee also contributing the negative impact on body and increased the risk of developing heart diseases, stroke, cardiac arrhythmias and hypertension due to the presence of lipid content in it which enhanced the blood lipid profile of human body. Serious consequences of too much coffee intake also have been seen in pregnant ladies in the form of still birth, miscarriages and mentally retard fetus. Coffee consumption also associated to inhibit the absorption of calcium, iron and zinc. Although, intake of 2-3 cups of coffee per day seems to be healthy and is related with beneficial outcomes for human body.

Keywords: Coffee; Health; Diabetes; Heart Disease; Caffeine

Introduction

Globally coffee is considered to be amongst commonly used beverages. It showed numerous beneficial effects when consumed adequately in daily routine but excessive intake of it leads to many diverse complications. Coffee beans are roasted and extolled for its flavor and smell. Most attractive component in coffee is caffeine. Chemical nature represents that it contains numerous components such as, alkaloids, nitrogenous compounds, carbohydrates, minerals, vitamins, phenolic and lipids [1]. Many epidemiological studies demonstrate the health risk of large consumption of caffeine due to its strong relation with inadequate behavior including sedentary lifestyle and smoking. Most of the researches in humans on health effects are observational [2]. However, results of recent studies exhibited that drinking coffee in recommended amounts decreased the risk of chronic ailments [3,4]. The purpose of this review article is to understand the theory of recent researches on the health benefits and risks in human beings by consuming coffee [5].

Role of coffee compounds in human physiology

Naturally occurring purine alkaloid compound in coffee beans is caffeine [6]. Its mechanism of action is associated with the antagonistic effect of adenosine receptors (A1 and A2) [7]. Opposing behavior of adenosine represents the stimulatory outcomes after coffee consumption including minute enhancement in blood pressure and diuresis also having spontaneous stimulation on nervous system and metabolic rate [8]. Small intestine is responsible for absorption of caffeine and it distribute very rapidly in all tissue of body. Primarily caffeine is metabolized in liver with the help of cytochrome-P450 1A2 (CYP1A2), which is responsible for its 94% metabolism. CYP1A2 converts the caffeine into Para-xanthine, which further undergoes the process of demethylation and hydroxylation by CYP1A2 and CYP1A6, respectively. After demethylation Para-xanthine changes its structure and called methyl-xanthine, which further oxidized by xanthine oxidase to form methyl-uric acid. Hydroxylation of Para-xanthine results in dimethyl-uric acid [9,10]. Concentrations of caffeine in beverages can be varying. Recent analysis of 14 different studies on coffee in US showed that amount of caffeine in 250ml ranged from 73-13mg [5].

Some research studies indicated that consumption of coffee is related to increase the blood level of lowdensity lipo-proteins and total cholesterol in human subjects [11]. Different randomized controlled trails on coffee beans found that ingestion of filtered coffee and boiled coffee results in minute increase in blood level of cholesterol and great increase in low-density lipo-protein concentrations, respectively. Factors which are responsible for increasing the cholesterol level, initially discovered in coffee oil and named as cafestol and kahweol. Extraction of these compounds occurs in brewing. Highest level (6.5-11.9 mg per cup) of these compounds is present in French and Turkish coffees, whereas, filtered coffee contains the lowest level (0.1-0.5 mg per cup)

of cafestol and kahweol [12]. Numerous studies in ileostomy patients who consumed unfiltered coffee showed that about 71% of the cafestol and kahweol is absorbed rapidly in intestine [13] and enhanced the activity of cholesterol ester transfer protein which further increase the production of low density lipo-proteins (LDL). Coffee containing diverse range of micronutrients like potassium, magnesium, tocopherol and vitamin B. United State Department of Agriculture, nutrient database, demonstrated that 250ml of brewed coffee contains 110 mg of potassium and 6.9mg of magnesium as compare to 25ml of espresso which provides 35mg of potassium and 23mg of magnesium. Niacin is present in coffee beans formed by the demethylation of trigenolline and provides 1.5-3.5mg of B3/ cup. One cup (250 ml) of coffee containing almost 0.25mg of alpha-tocopherol [14].

Health Perspectives of Coffee Consumption

Overall health claims of coffee and its association with diverse ailments shown in Table 1.

Prevention against Type 2 Diabetes Mellitus

Prospective of 6 out of 9 cohort studies indicated that consumption of coffee has inverse relation with type II Diabetes mellitus (DM) [15,16]. Another study on 18,000 Dutch people demonstrated that who consumed seven cups of coffee/day having 49% lower the risk of type II diabetes as compared to those who consumed two or less cups [17]. Study conducted on 15,000 men and women in Finland reported that men whose intake of coffee was nine cups per day showing 50% reduction in Diabetes mellitus than men who drank only one to two cups daily [18]. On the other side consumption of nine cups of coffee by women reduced the incidence of developing Diabetes mellitus by 80%. Study conducted on Swedish women followed for 17 years demonstrated that women who had taken 4 cups of coffee daily decreased the Diabetes mellitus risk by 49% [19]. Results of Previous Finnish studies with fourteen years of follow-up investigated that daily intake of six cups of coffee was not linked with type II diabetes [20]. Assumed reason of scientist behind this theory was excessive usage of boiled coffee in Finnish. However, the recent Finnish studies described the inverse connection exist between the consumption of boiled coffee and three times increased risk of diabetes mellitus [21].

Prevention against Parkinson's disease

Numerous studies highlighted the inverse association between coffee and Parkinson's disease [22] not only coffee but other sources of caffeine also include in this aspect. Health professional study demonstrated that people who consumed at least one cup of coffee per day have less chance to develop this disease as compared to those who didn't drink. Another follow-up of study which involved seven thousand Japanese men showed that those who didn't drink coffee have three to six times more risk to develop Parkinson's disease [23]. These studies exhibited that intake of coffee showed inverse association with disease in men and somehow in women [24].

Post-menopausal women and Coffee

One strong reason to not find any authentic association between women and coffee consumption might be due to the usage of hormone replacement therapy [25]. Research study conducted by Nurses Health showed that postmenopausal women who hadn't used estrogen having inverse relation with disease as compared to those who used both coffee and estrogen. Similar results were highlighted by Cancer Prevention Study which indicated that if women after menopause not utilized estrogen therapy then risk of this disease decreased by many fold [26].

Prevention against Colorectal Cancer

Coffee consumption in recommended amounts significantly reduces the risk of colorectal cancer. Approximately fifteen case control studies separately found that intake of five or more than five cups of coffee per day lower the risk of developing cancer by 25% as compared to non-drinkers [27] on the other side prospective studies didn't show any association between coffee intake and risk of colorectal cancer. One reason is that case control studies include many patients especially with cancer as compared to other studies and properly take histories after defined duration which is not usually happen in prospective [28]. Recent American review indicated that people who drank two cups of coffee without caffeine suffer less (50%) from rectal cancer as compared to others who utilized coffee with higher concentrations of caffeine. Numerous range of studies have been made to see the components of coffee which shown the beneficial effect in the reduction of genotoxicity; important are kahweol and cafestol. Chief role of these components to inhibit the cytochrome P450 which basically involved in cancer initiation. Overall conclusion of all studies showed the inverse relation between cancer and intakes of coffee which will be more specifically elaborated by further researches [29, 30].

Health Claims	Action of coffee intake	References
Diabetes Mellitus	Enhance the physiological functioning of pancreatic beta cells Improve glucose tolerance Consumption of 7-9 cups significantly reduces it	20,21
Parkinson's Disease	Improve the neuronal stability Intake of coffee showed inverse association with disease It reduces the development of disease by intake of one cup/day	22, 23,24
Colorectal Cancer	Kahweol and cafestol compounds of coffee are important Decrease the genotoxicity Inhibit the cytochrome p450	28,29,30

Table 1: Health claims of coffee against diseases

Health Risks of Coffee

Consumption of excessive amounts of coffee is strongly associated with the development of heart diseases [31] due to the presence of its lipid component i.e. cafestol which increased the cholesterol level in body and initiate the process of coronary heart diseases stroke, cardiac arrhythmias and hypertension. Study results reported that more than ten cups of coffee/ day aggravate the process of myocardial infarction Many clinical trials indicated that six to seven cups of coffee enhanced the severity of cardiac arrhythmias [32]. Caffeine consumption is negatively associated with calcium levels. Study indicated that one cup of coffee decreased the 4-7 mg of calcium from body and increased the risk of fractures mostly hips [33]. Excessive intake of coffee also related to mineral deficiencies including iron and zinc. Polyphenols and phytates contents present in coffee beans inhibit the iron and zinc absorption/bioavailability from intestine by 25-70% and 20-32% respectively [34]. Another serious effect of higher intake of coffee 500-1000mg per day contributing to delay the period of conception in women [26]. Varied range of epidemiological studies indicated that excessive intake of caffeine increased the incidence of spontaneous abortion if this type of baby survives then surely suffered from serious consequences including low birth weight, mental retardation and disturb the fetal growth of baby [35]. Further studies will be needed to properly understand the all negative impacts of coffee on health.

Conclusion

Coffee is combination of complex chemical compounds which play significant roles in human body. It is considered as a primary source of caffeine intake among teenagers and adults. Results of many studies indicated that consumption of coffee provide the prevention against diabetes, Parkinson's diseases and colorectal cancer, while increased consumption of coffee have association of developing heart diseases, stroke, cardiac arrhythmias and hypertension, still birth and miscarriages. Overall conclusion of this review is to intake the coffee in recommended amounts to obtain its beneficial aspects instead of consuming in large amounts. Adequate consumption of coffee is beneficial to avoid any negative aspects.

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