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Review Article

Coffee's Health Benefits for Human Diet

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Abstract

Coffee is the most popular beverage in the world and the most consumed caffeinated beverage after water and tea. It contains a combination of several chemical components that, with the health benefits, most consumers start the day with at least one cup of coffee after eating and end the working day with coffee. It is considered an important part of modern-day life because it has an alarming effect on the human brain. In contrast, different groups report. They face unequal health risks and are therefore reluctant to drink coffee, suggesting individual differences in coffee intolerance. The purpose of this study was to briefly summarize the health benefits and risks of coffee consumption. Most informative reports suggest that long-term consumption of coffee and decaffeinated coffee can reduce the risk of many diseases. Among them, it is used to improve our physical performance, burn fat, reduce the risk of stroke, liver, prostate and colorectal cancer by 20%, the risk of Parkinson's disease by 25%. the risk of dementia and protect our mind, brighten our mood, help fight depression and minimize the risk of suicide by 50%. In addition, coffee drinkers have a lower risk of heart disease, with highly integrated DNA. It has also been reported that coffee consumption naturally lengthens sleep latency, decreases total sleep duration and efficiency, and worsens putative sleep functions. However, from the positive health perspective of coffee consumption, a recent study reveals that coffee consumption does not always provide protective benefits, since excessive consumption is associated with a negative impact or risk to our health. Some negative effects of coffee consumption on our health: reduces appetite, affects pregnant women, people with cholesterol, causes insomnia and restlessness, breast tissue cysts in women, digestive disorders related to incontinence and risk of headache In addition, it reduces the likelihood of fertility in women and men, causes allergies and abortions, violent heart contractions, anxiety, depression and the need for anti-anxiety drugs, inhibits the production of collagen in human skin, improves the hearing loss. it does not help with prolonged sleep deprivation, it interferes with ossification and may even lead to an increased risk of bone fracture. Finally, more recent studies have reported that the consumption of coffee is beneficial for our health when it is optimal, about four glasses on average. Further research will be crucial to clarify the health benefits and risks of coffee consumption.

Keywords

Coffee Consumption, Chemical Components, Health Aids, Health Hazards

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1. Introduction

Caffeine is considered a psychoactive substance and the most popular way to absorb it is by drinking coffee. The most popular varieties of coffee plants are Coffea arabica and Coffea robusta, however there are many others with intricate classifications [1]. The most prevalent bioactive ingredient in the world is caffeine. More than 60 plants, including cocoa, kola nuts, tea leaves, and coffee beans, naturally contain this alkaloid. Depending on the type of product, processing, agronomic and environmental conditions, and other considerations, his focus varies [2, 3]. Coffee beans, tea leaves, cocoa beans, and other plants contain the alkaloid caffeine (1, 3, 7-trimethylxanthine), which shares structural similarities with other nucleosides and xanthines from many natural sources [4]. Coffee has always been advised as a beverage to cut back on or give up because of its overall risk profile, but thanks to its most well-known phytochemical, this recommendation is slowly shifting. Caffeine is arguably the most well-known of the complex mixture of molecules that make up coffee, but it also contains a wealth of other bioactive substances that have a variety of physiological effects [2, 3]. Up to 1000 identified phytochemicals are in the list. They include lactones, diterpenes (like cafestol and kahweol), phenols (such chlorogenic acid and caffeic acid), niacin, and trigonelline, which is the precursor to vitamin B3. Coffee is also high in potassium, magnesium, and vitamin B3 [5, 6].

Many foods and beverages contain caffeine, but considerable amounts can be absorbed from coffee [2, 7, 8]. Depending on the coffee's variety and preparation method, there can be variations in the amount of caffeine it contains [2, 9]. The amount of caffeine in a cup of coffee can range from 65 to 360 mg, but a cup of decaffeinated coffee has less than 10 mg of caffeine. Currently, people in Scandinavia drink 8 to 12 kilograms of coffee each person, compared to 4.2 kg in the US and 2.8 kg in the UK. Coffee intake at various ages is documented by an epidemiological study of adult beverage consumption in Canada [1]. Coffee intake was higher than water consumption among men over 50. Furthermore, a number of researches have demonstrated that coffee is among the meals and beverages that contains the highest concentrations of polyphenols, particularly CQA [10]. Vegetables, fruits, and coffee beans contain over 71 different kinds of CQA [11]. 5-caffeoylquinic acid (5-CQA) has the greatest concentration of any of the eight CQAs found in green coffee beans (40–50 mg/g) [12]. According to a study, 5-CQA exhibited significant antioxidant activity at lower levels (5 μg/mL) and only weak pro-oxidant activity at relatively high levels (100 and 200 μg/mL). Although roasting reduces the concentration of CQA, ripe coffee beans have been found to have greater antioxidant activity than unripe green beans [13, 12].

These findings imply that CQA generates potent antioxidants throughout the ripening process. The 19 to 30-year-old age group was found to be an exception to the coffee-drinking tendency in this study. They reported drinking milk the day before, and the proportion of men in this age group who reported routinely consuming fizzy beverages was also higher. surpass the percentage of coffee drinkers. The average amount of coffee consumed by drinkers peaked between the ages of 31 and 50, weighing 639 grams for men and 586 grams for women. The average amounts were significantly lower at age 71 and older, 489 grams and 398 grams, respectively. Eighty-six percent of the caffeine taken by adults came from coffee. 12.3% and 5.5% go into tea and related beverages. 9% Numerous side effects of caffeine include bronchodilation, lipolysis and dilatation, arrhythmia in the heart, increased breathing rate, central nervous system stimulation, and gastrointestinal problems [14, 15]. palpitations that could be hypertensive [16]. Metabolxanthine, or caffeine, is a naturally occurring alkaloid. Oral intake results in around 99% absorption, a maximum blood concentration of 1 to 1.5 hours after ingestion, and an adult's half-life of 3 to 6 hours. The liver cytochrome P450 enzyme system breaks down caffeine [17].

2. Impact on Neurodegenerative Conditions of the Brain

Despite recent study improvements, our understanding of the environmental risk factors related with Alzheimer's disease, the most frequent form of degenerative dementia impacting our elderly population, is still limited. An environmental factor that is easily manipulated, caffeine, may reduce the risk of Alzheimer's disease development. The idea that caffeine [18], chlorogenic acid [19], or their combination [20] can guard against cognitive decline or the molecular features of Alzheimer's disease central nervous system [3] has been spurred by some encouraging results from experimental research.

Further research is necessary to ascertain whether caffeine consumption can have a significant protective effect on the development of Alzheimer's disease, even though epidemiological studies have suggested that regular coffee consumption appears to have a protective effect against Alzheimer's disease in Canadians [21]. deterioration in cognitive function [22-24]. Coffee use may help lower the incidence of Parkinson's disease, according to the findings of case control studies and a prospective study conducted on men. However, it is unclear what exactly is the active element in coffee. As explained by [25] examined the association between coffee and caffeine consumption and the risk of Parkinson's disease among patients in two ongoing cohorts, the Health Professionals Follow-up Study and the Nurses' Health Study, in order to support the theory that caffeine protects against the disease. 47,351 men and 88,565 women who were free of cancer, stroke, or Parkinson's disease at

baseline were included in the study. Participants filled out an extensive lifestyle and diet questionnaire at baseline, and they updated it every two to four years after that.

In the course of observation, 288 incident instances of Parkinson's disease were recorded (10 years for men and 16 years for women). Men in the top five of caffeine consumers had a 0.42 relative risk of Parkinson's disease compared to those in the bottom fifth, even when age and smoking were considered. The consumption of coffee and caffeine from non-coffee and tea sources was also found to be negatively correlated, but not with decaffeinated coffee. The relationship between caffeine or coffee consumption and the risk of Parkinson's disease in women was U-shaped, with moderate consumption that is, one to three cups per day, or the third quintile of caffeine consumption showing the lowest risk. The findings imply that caffeine in moderation may be able to lower the risk of Parkinson's disease. Both extensive and poor metabolizers of caffeine showed the same correlation between their use and the risk of Parkinson's disease [26]. This is consistent with experimental data from animal models showing that both caffeine and its main metabolite, paraxanthine, are neuroprotective. In a mouse model of AD, As conferred by [27] found that moderate caffeine consumption the human equivalent of 500 mg or five cups of coffee per day could either prevent or treat the disease. They also noted that caffeine may have therapeutic benefits against AD. Individuals.

3. Autonomic Nervous System Impact

This sympathetic nervous system is affected by a variety of drugs and/or experimental treatments [28-34]. As described by [35] investigated how coffee affected young, healthy adults' autonomic nerve systems. This study examined how a cup of espresso affected the heart rate variability (HRV) spectrum analysis, a technique used to measure the discharge of the sympathetic and parasympathetic nervous systems. The HRV power spectrum was assessed 150 minutes after consuming 75 mg of espresso coffee (caffeine) or 10 mg of decaffeinated coffee (caffeine) while the individuals were sitting and supine. The subjects were young, healthy, and sedentary. Low frequencies (LF) and high frequencies (HF) were used to summarize the spectrum values [36-40]. The parasympathetic and sympathetic lobes are measured by LF and HF spectra, respectively. Decaffeinated coffee has minimal effect on heart rate (HF) but coffee raises it when lying supine. HF is not affected by coffee, even decaffeinated coffee, when one is seated. There was no difference in LF at any point between coffee and decaffeinated coffee.

The experiment's findings demonstrate how coffee affects parasympathetic activation during stretches. According to [41] shown that whereas coffee activates the sympathetic nervous system and raises blood pressure in non-regular coffee users, it has no effect on blood pressure in habitual coffee drinkers. [42-43]. Decaffeinated coffee was found to raise blood pressure and sympathetic activity in nondrinkers in this experiment, suggesting that factors other than caffeine could be in charge of cardiovascular activation. Secondly, unlike habitual coffee drinkers, non-habitual coffee drinkers may experience an immediate rise in blood pressure and activation of the sympathetic nervous system when consuming coffee or caffeinated beverages. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of Hypertension (JNC 7) Seventh Report on Guidelines for the Management of Hypertension no longer recommends limiting coffee or caffeinated drinks. In fact, there isn't conclusive evidence linking coffee consumption to an increased risk of hypertension or myocardial infarction. According to the most recent research, regular coffee use not only has no health risks but also has a substantial positive impact on cardiovascular health.

4. Impact on the Mind

Coffee acts on the brain's prefrontal cortex, which improves short-term memory. As discussed by [44] employed functional magnetic resonance imaging (fMRI) to ascertain the specific brain regions that are activated by coffee. The candidates were given either a cup of coffee with 100 milligrams of caffeine or a placebo drink without caffeine, and they were instructed to fast for four to six hours and refrain from caffeine and nicotine for at least twenty-four hours before the test. Following a 20-minute period, each subject completed a memory and focus test concurrently with an fMRI scan. A few days later, the identical conditions of the first experiment were repeated, but a new drink was given to each candidate. In the memory tests, participants saw a fast-moving sequence of capital letters, after which they were asked to determine in a split second if the letter they were seeing at on the screen was the one that had occurred at the penultimate place in the preceding sequence. In order to respond, they had to hit "Y" for yes or "N" for no. The working memory region of the brain was activated in the healthy group, but the anterior cingulate area of the prefrontal lobe, which is part of the brain that receives caffeine, exhibited noticeably higher activation in this group. Planning, attention, concentration, and "executive memory" are all impacted by these regions. According to fMRI signal changes in a network of brain areas related to executive and attentional functions during the execution of memory processes, these results imply that caffeine modifies neuronal activity.

5. Impact on the Processes of Prediction

According to [45] used single-task blocks (AAAA, BBBB) and mixed-task blocks (AABB), in which participants switched reliably between two tasks, to investigate the effects of moderate dosages of coffee on task switching and task maintenance. Longer response durations during job transition

processes (e. g., AB) compared to work repetition procedures (e. g., BB) are referred to as switching costs; longer response times during task repetition trials compared to single-task trials are referred to as mixing costs. In a double-blind study, 18 coffee consumers received a placebo and two dosages of caffeine (3 and 5 mg/kg of body weight). When compared to a placebo, switching costs were lowered by both caffeine dosages. Trials, which had evolved in the preceding interval. This alteration was exacerbated by caffeine. The findings imply that coffee improves overall task-switching effects related to non-specific (as opposed to task-specific) prediction processes, which in turn improves task-switching performance. Caffeine's effects could be mediated by dopaminergic alterations in the anterior cingulate cortex or striatum.

6. Impact on the Homeostasis of Glucose

According to epidemiological research, drinking coffee is strongly linked to a decrease in the prevalence of type 2 diabetes (T2D). Additional scientific data indicates that caffeine reduces insulin sensitivity throughout the body and promotes acute postprandial hyperglycemia. This indicates that the health benefits of coffee drinking are caused by something other than caffeine. This study explores particular chemicals in coffee responsible for the effects of coffee on diabetes mellitus 2, as well as the possible physiological processes of its operation. Several distinct chemicals are produced by Maillard reactions in high-temperature roasting of green coffee. A portion of the antioxidant chlorogenic acid, which is produced during roasting, is converted into quinidine chemicals, which are known to change blood glucose levels. Intestinal peptides (glucose-dependent insulinotropic polypeptide and glucagon-like peptide-1) and hormones involved in satiety regulation and insulin production can also be regulated by coffee drinking. Coffee may affect digestion, alter the flora in the intestines, and have prebiotic qualities. In summary, it is evident that further investigation into the role of coffee in the onset and mitigation of type 2 diabetes (T2D) may lead to the identification of novel therapeutic targets and nutraceutical formulations for the condition [46].

7. Impact on the Hepatic System

A study was conducted by certain researchers to examine the relationship between liver illnesses and coffee use. The data collected was homogeneous, and the results showed an inverse relationship with serum gamma-glutamyl transferase activity and alanine aminotransferase activity. Although there is an inverse relationship between coffee drinking and liver cirrhosis, there is no evidence to support the idea that coffee can protect the liver from harm. Research conducted on animal models and cell cultures demonstrates that some coffee components, such as cafestol and kahweol diterpenes, can function as blocking agents by altering specific enzymes involved in carcinogenic detoxification. By suppressing N-acetyltransferase and promoting glutathione-S-transferase enzymes, these compounds also alter xenotoxic metabolism. Coffee's beneficial effects on liver cancer can be ascribed to its inverse association with cirrhosis; however, this link cannot be entirely explained by considering the clinical history of cirrhosis. It is plausible to suggest using animal models of liver injury in research to investigate the effects of coffee and/or components extracted from this beverage in order to assess the coffee's potential causal role as well as its mode of action. Additionally, prospective double-blind clinical trials are required [47-51]. In light of the research's findings, it is now crucial to suggest studies using animal models of liver injury and evaluate the effects of coffee and/or substances extracted from this beverage in order to determine the exact function and mode of action. Additionally, two prospective clinical investigations have been carried out [47].

8. Impact on the Gallbladder Condition

In the US, gallbladder disease affects over 20 million persons and is a major cause of morbidity. Although the exact causes of gallbladder disease are unknown, coffee is linked to a lower chance of getting the condition. Men who consistently drank at least two cups (473 ml) of coffee per day were at least 60% less likely than men who did not consume coffee to experience symptoms of gallbladder disease [40, 52-54].

9. Coffee Drinking and cancer Risk

Many studies have revealed an inverse link between coffee drinking and the incidence of malignancies such as colorectal cancer. Studies on coffee chemoprevention are supported by animal research. To determine which ingredients in coffee are responsible for its health benefits, research was done. The diterpenes cafestol and kahweol (C + K) have been demonstrated to cause a variety of biochemical responses in animal models and cell culture systems, which lead to a reduction in the genotoxicity of many carcinogenic The induction of conjugation enzymes, increased expression of proteins involved in cellular antioxidant defense, and inhibition of cytochrome P450 activity and/or expression, which is implicated in the activation of carcinogens, are some of the processes that appear to be involved in these chemoprotective effects. The stimulation of conjugated and antioxidant enzymes in the liver, gut, and renal tissues of animal models has been seen through the C + K pathway.

It was established that transcriptional activation reliant on Nrf2 was responsible for these inductions in the small intestine. Studies conducted in vitro using human-derived cell cultures suggest that the mechanisms and effects seen in animal test systems using C + K are most likely applicable to people. C + K treatment reduced AFB (1)-DNA interaction in human liver

epithelial cell lines transfected to express AFB (1)-activating P450s. An increase in GST-mu, an enzyme known to be involved in AFB detoxification, was linked to this protection (1). French Furthermore, it was discovered that P450 2B6, one of the human enzymes in charge of AFB (1) activation, was inhibited by C + K. A reasonable theory to account for some of the anticancer effects of coffee seen in human epidemiological research and animal tests is supported by the body of information regarding the biological effects of C + K [55]. According to the results of a new meta-analysis, coffee consumption may help lower the incidence of cancer overall and may even be negatively correlated with some cancer types. Generally speaking, a 3% lower risk of cancer was linked to an increase in coffee consumption of one cup per day. According to the subgroup analysis, drinking coffee was directly linked to a lower incidence of colorectal, endometrial and cervical, bladder, breast, oral and pharyngeal, liver, leukemia, pancreas, and prostate cancers [56]. Coffee and potential health hazards. The lipid portion of coffee that contains kahweol and cafestol raises blood cholesterol levels, which may contribute to the development of coronary disorders such cerebral and myocardial infarction, sleeplessness, and cardiovascular problems. The majority of caffeine's biological effects are produced by blocking all adenosine receptors; in coffee addicts, this antagonistic effect is linked to muscle soreness and other related issues upon withdrawal. Research on women who are pregnant or have gone through menopause suggests that coffee should be avoided since it may interact with oral contraception or postmenopausal hormones.

10. Conclusion

The most researched ingredient in coffee is caffeine. After being separated from coffee beans for the first time in 1820, it underwent extensive pharmacological study and had its first clinical use. The general consensus on coffee's health effects has shifted from one of mostly negative effects to one of potential benefits. The very evident advantages of liver protection, the lower risk of Parkinson's disease, or recent findings on global mortality provide evidence in favor of this upbeat viewpoint. Ultimately, coffee should only be viewed as an extra component of a comprehensive health promotion approach, in which physical activity and a balanced diet still play crucial and indispensable roles. It should not be viewed as a replacement. In summary, there is mounting evidence from epidemiological research showing coffee drinking is generally associated with health benefits and a negative correlation with the risk of a number of disorders. Randomized controlled trials are necessary to examine the relationship between caffeine consumption and specific diseases and to examine patterns of consumption in relation to health outcomes, as association does not imply causality.

Abbreviations

DNA	Deoxyribonucleic Acid
fMRI	Functional Magnetic Resonance Imaging
CQA	Chlorogenic Acid
AD	Alzheimer's Disease
LF	Low Frequencies
HF	High Frequencies

Author Contributions

Meseret Degefa Regassa is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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Research Fields

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