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Analysis of the influence factors of coffee on human life

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Abstract. Coffee, as one of the world's most widely consumed beverages, has long held a prominent place in both daily enjoyment and scientific scrutiny. This study aims to comprehensively explore the multifaceted impact of coffee on the human body, with a particular emphasis on its influence on attention, the prevention of chronic diseases, and the potential associated risks. This article conducts a thorough analysis of coffee's primary constituents, encompassing caffeine and antioxidant compounds, and conducts an exhaustive review of pertinent research studies. The research findings unequivocally highlight that moderate coffee consumption can substantially enhance attention and significantly mitigate the risk of chronic diseases. However, it is imperative to acknowledge that excessive coffee intake may precipitate issues such as insomnia and gastrointestinal discomfort. Thus, this study underscores, with utmost clarity, the pivotal significance of temperate coffee consumption, laying a robust foundation for future investigations into the intricate interplay between coffee and human health.

Keywords: Coffee, Health, Caffeine.

1. Introduction

Coffee is a beverage with a rich history, serving not only as a daily pleasure but also sparking widespread scientific interest. In the rapidly evolving pace of society, coffee has become a common choice for enhancing alertness and attention, while also being considered to have an impact on health. This study aims to delve deeply into the effects of coffee on the human body, with a particular focus on three aspects: improving alertness, preventing chronic diseases, and potential risks. Firstly, the author will explore the constituents and mechanisms of coffee, with a special emphasis on the role of caffeine and the presence of antioxidants in coffee. Subsequently, the author will review prior research to reveal the benefits of coffee in enhancing attention and preventing chronic diseases. Finally, in the third section, the author will discuss the potential risks of excessive coffee consumption, including issues such as insomnia and gastrointestinal discomfort. By comprehensively examining these facets, the objective is to provide a thorough understanding of coffee consumption and underscore the importance of moderation.

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2. Introduction analysis of the influence factors of coffee on human life

2.1. Increased alertness and concentration

Nowadays coffee has become one of the main drinks in human society. This situation depends not only on the unique taste of coffee but also on the caffeine in coffee. Caffeine is found in its natural state within the fruit, leaves, and beans of coffee, cocoa, and guarana plants [1].

Caffeine is a common natural stimulant, and many people often drink coffee to ingest caffeine to keep their minds clear while working or doing things that require a high degree of concentration. Caffeine can be quickly digested in the intestinal tract, and this time usually only takes 15-20 minutes, People will feel its effects very quickly and stay awake or excited for 4-10 hours [2]. Caffeine antagonizes the action of adenosine (a neurotransmitter that makes you feel tired and need to rest), which makes people less tired and thus stay awake while also stimulating the brain to release more stimulants like dopamine and adrenaline neurotransmitter, which increases alertness, improves mood and enhances concentration [3].

People enjoy other benefits as well as the heightened concentration that coffee provides. Driving, as the main means of transportation in short and medium distances nowadays, requires drivers to keep a clear mind to deal with various emergencies. Drinking coffee can be used as a means for drivers to stay awake for a short period of time. In a 2013 report, researcher Lisa Sharwood said, the caffeine in coffee can significantly reduce the risk of a crash for long-distance commercial drivers [4].

There is also a study held at the Center for Sleep Research at the University of South Australia. In this study, one group of people consumed caffeine and the other group did not consume caffeine and took a driving test every 3 hours [5]. In the end the researchers found that the group that didn't consume caffeine started the phenomenon of accidents before the group that consumed caffeine [5].

2.2. Reduce the prevalence of chronic diseases

In recent years, a growing body of research has shown a strong relationship between moderate coffee consumption and a lower risk of certain chronic diseases. For example, drinking moderate amounts of coffee can help reduce the risk of diabetes and cancer. In addition, research on Parkinson's disease has also found that moderate coffee consumption is associated with a lower incidence of Parkinson's disease, which provides an easy and economical way to prevent neurodegenerative diseases. These findings demonstrate the importance of the possible positive health effects of moderate coffee enjoyment.

2.2.1. Coffee and diabetes. In contrast to the invigorating properties of coffee, the abundance of antioxidants found in coffee, including chlorogenic acid and ferulic acid, takes on even greater significance. These antioxidants have a substantial protective role at the cellular level, actively mitigating cellular damage induced by oxidative stress, thereby reducing the likelihood of diabetes. Incorporating data from 18 studies with 457,922 participants, research revealed log-linear link between coffee intake and diabetes risk, demonstrating a 7% decrease in excess relative risk of diabetes for each additional daily cup of coffee consumed [6].

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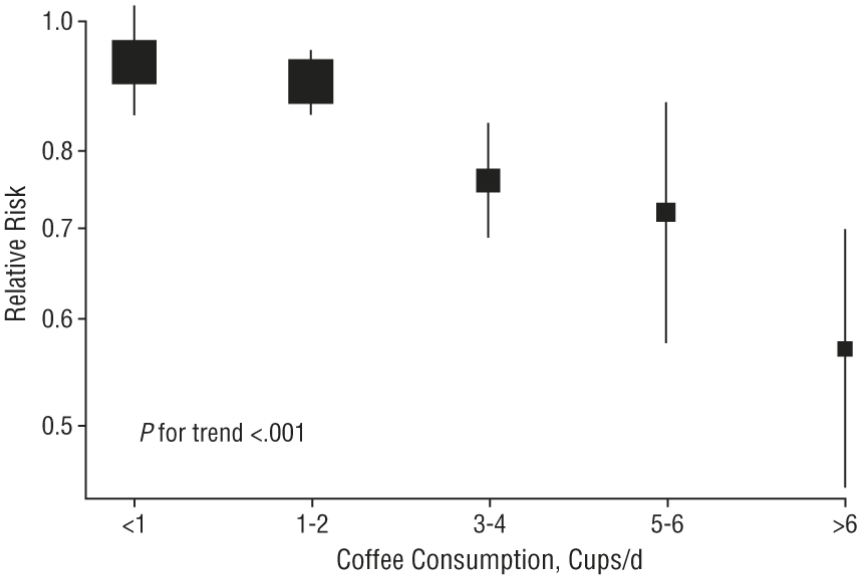

Figure 1. The relationship between coffee consumption and subsequent type 2 diabetes mellitus in different categories of coffee consumption [6].

Figure 1 shows the relationship between coffee consumption and subsequent type 2 diabetes mellitus in different categories of coffee consumption [6]. In the chart, it can clearly see that the prevalence of type 2 diabetes is highest when people consume less than one cup of coffee, reaching around 90%. Conversely, the likelihood of developing type 2 diabetes is lowest when people consume more than six cups of coffee, even falling below 60%. The overall trend in disease prevalence decreases as coffee consumption increases. This demonstrates a clear inverse relationship. This paper can conclusively deduce that drinking coffee can effectively reduce the risk of developing type 2 diabetes..

2.2.2. Coffee and cancers. Researchers Susan Gapstur and Marjorie McCullough conducted a study suggesting that coffee may have a potential role in reducing the risk of various types of cancer, including head and neck, colorectal, breast, and liver cancer, as well as diabetes [7]. Although the precise mechanisms behind the potential beneficial effects of coffee remain incompletely understood, roasted coffee contains hundreds of biologically active compounds, such as caffeine, flavonoids, lignans, and other polyphenols [7]. These compounds have been associated with increased energy expenditure, the inhibition of cellular damage, the regulation of genes involved in DNA repair, anti-inflammatory properties, and the potential to inhibit metastasis, among other functions [7]. Additionally, there is evidence to support that coffee consumption is linked to a reduced risk of insulin resistance and type 2 diabetes, conditions that have been correlated with a heightened likelihood of colorectal, liver, breast, and endometrial cancer incidence and mortality [7].

2.2.3. Coffee and Parkinson's disease. Coffee also provides significant assistance in lowering the incidence of Parkinson's disease, a chronic neurodegenerative disorder that primarily affects the central nervous system, particularly the motor nervous system. Symptoms of this condition typically manifest gradually, with early signs including tremors, limb rigidity, diminished motor skills, and altered gait patterns. Cognitive and behavioural challenges may also arise. Multiple research studies have demonstrated the potential of coffee consumption in diminishing the risk of developing Parkinson's disease.

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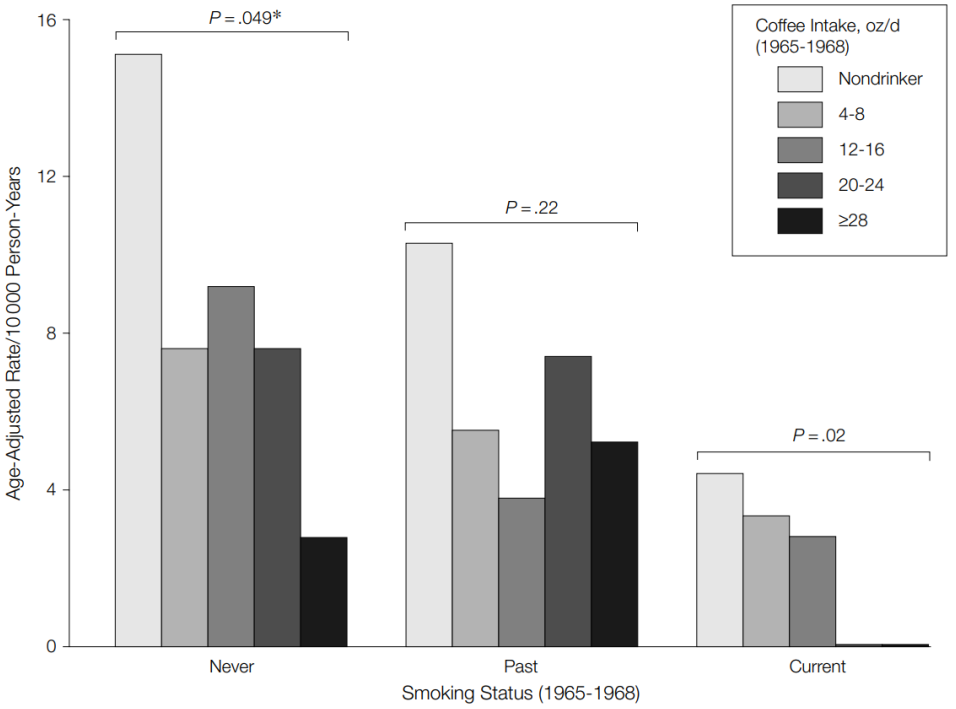

Figure 2. Incidence of non-smokers, past and present smokers [8].

Figure 2 shows that incidence rates, adjusted for age and observed over a span of 30 years after 8004 participants' enrolment in the study (1965-1968), were examined based on their coffee consumption habits categorized as never, former, and current cigarette smokers. An asterisk denotes the presence of a trend test [8]. From Figure 2, it can clearly see that the incidence of Parkinson's in people who never drink coffee is significantly higher than that in people who drink coffee, regardless of whether they smoke or not. In contrast, it can easily say that drinking coffee is beneficial in reducing the risk of Parkinson's disease.

2.2.4. Coffee and cardiovascular diseases. Partaking in coffee consumption can also contribute to a decreased risk of individuals developing cardiovascular diseases. Historically, over 75% of medical practitioners advised patients with cardiovascular conditions to abstain from coffee [9]. However, recent research in recent years has been dispelling this misconception [9]. Be it instant coffee or freshly brewed, when you consume 2-3 cups of caffeinated coffee, it can significantly lower the risk of both the onset and mortality associated with cardiovascular diseases [9]. This encouraging finding underscores the potential benefits of moderate coffee intake for heart health. Furthermore, scientists are delving into more in-depth investigations to decipher the exact mechanisms by which coffee can confer its protective benefits on the heart. This quest for knowledge is paving the way for more customized guidelines and recommendations. As our comprehension of coffee's impact on heart health advances, it becomes progressively apparent that it can be an integral component of a well-rounded strategy for mitigating the risk of cardiovascular diseases.

A study provides a dynamic interplay between coffee consumption and ischemic heart disease within the International Ecology Study, spanning the period from 1990 to 2018 [10]. The comprehensive global dataset consistently portrays a declining trend in the incidence and mortality rates of ischemic heart disease as coffee consumption rises. A closer examination of the diverse data points within the figure underscores a discernible pattern: increased coffee consumption aligns with a concurrent reduction in both the occurrence and fatality of ischemic heart disease. It is noteworthy that while sporadic increases in incidence rates may occur in specific regions, these trends tend to reverse as coffee consumption gradually escalates, ultimately contributing to a decreased burden of ischemic

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heart disease. These findings not only illuminate the inverse correlation between coffee intake and ischemic heart disease but also underscore the potential global health advantages associated with coffee consumption. As this research delves further into comprehending these patterns, it becomes increasingly apparent that coffee may present a pragmatic and accessible avenue for alleviating the prevalence of ischemic heart disease, particularly when incorporated into a holistic strategy for enhancing heart health.

2.3. Disadvantages of excessive coffee intake

2.3.1. Coffee and insomnia. Caffeine, a stimulant affecting the central nervous system, is widely found in beverages like coffee and tea, as well as in foods such as chocolate. It is frequently employed to boost alertness and enhance mood. However, excessive caffeine consumption can bring about various adverse consequences, among them being insomnia. Insomnia is a prevalent sleep disorder characterized by challenges in falling asleep and frequent night-time awakenings. Simultaneously, the heightened alertness and insomnia stemming from excessive caffeine consumption can induce symptoms like disruptions in the circadian rhythm and profound fatigue. Caffeine's stimulating properties stem from its capacity to antagonize adenosine receptors, thereby heightening alertness and diminishing the sensation of weariness [11]. A study has unveiled that the consumption of caffeine in the evening can lead to difficulties in initiating sleep, awakenings during the night, and superficial sleep. This phenomenon is ascribed to the biological half-life of caffeine, which denotes that its effects endure within the body for 2-12 hours, disrupting typical sleep patterns [11].

According to the latest research findings, it becomes increasingly evident that caffeine-induced disruptions in enhancing REM sleep tend to occur more frequently when individuals intentionally delay their sleep patterns, notably during unconventional hours, such as on weekends or while working shifts [12]. These modifications in REM sleep brought about by caffeine may ultimately result in a decline in the quality of wakefulness, thereby perpetuating a cycle of increased caffeine consumption throughout the day [12]. This reinforces the importance of understanding how caffeine impacts sleep, particularly in scenarios where sleep schedules are deliberately shifted or disturbed. It highlights the necessity for individuals to be mindful of their caffeine intake and consider strategies to maintain a healthy sleep-wake cycle, even when faced with altered sleep patterns.

2.3.2. Coffee and gut disease. Caffeine, a prominent constituent of coffee, can trigger an increase in stomach acid production, potentially leading to symptoms such as acid reflux, heartburn, and stomach discomfort. For individuals already grappling with gastroesophageal reflux disease (GERD) or gastric ulcers, excessive coffee intake could exacerbate their existing symptoms [13]. Furthermore, coffee possesses a mild laxative effect, attributed to specific chemical compounds within it that have the capacity to stimulate bowel activity. Consequently, some individuals may encounter gastrointestinal discomfort, diarrheal, or abdominal cramps following coffee consumption [13]. This phenomenon is primarily associated with coffee's gentle laxative properties and exhibits notable variability among individuals.

It's noteworthy that a study conducted in 2015 examined patients with Crohn's disease and ulcerative colitis to gauge their perceptions of coffee and its potential influence on their symptoms. The findings revealed that 73% of participants regularly consumed coffee, with 45% of those with Crohn's disease believing that coffee had an adverse impact on their symptoms [13]. Conversely, only 20% of ulcerative colitis patients reported experiencing discomfort when consuming coffee [13]. This underscores the idea that individual responses to coffee can vary contingent on their specific gastrointestinal health conditions. While coffee may induce discomfort for some, its effects may differ for others.

Nonetheless, it's not entirely a negative scenario. A comprehensive scientific review encompassing 194 published studies concluded that moderate coffee consumption, defined as up to 3 cups per day, does not yield detrimental effects on the digestive organs [13].

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3. Conclusion

Considering the discussions presented above, coffee, a beverage widely consumed, presents notable potential advantages and drawbacks. Moderate coffee intake has demonstrated its ability to heighten alertness and attentiveness, along with a decreased susceptibility to chronic illnesses. Conversely, excessive consumption of coffee can result in sleep disturbances and gastrointestinal discomfort. This study emphasizes the intricacies of coffee consumption and the significance of practicing moderation. Personal lifestyles, metabolic rates, and health conditions all exert an influence on the magnitude of coffee's effects. Hence, individuals are advised to strike a balance between their individual needs and lifestyle choices when partaking in coffee consumption, adhering to the tenet of moderation. Further research is required to delve deeper into the correlation between coffee and health, especially when considering variances and outcomes within diverse populations. This will contribute to a more comprehensive comprehension of the repercussions of this highly favored beverage on the human organism. In summation, prudent and moderate coffee consumption remains pivotal in preserving health and minimizing the potential for adverse consequences.

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