

The Effect of Coffee and Tea Consumption on Cancer

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Tea and coffee have been consumed for generations and appear to be a significant part of cultural customs and community interactions. They are utilized at work or school to improve concentration and performance.^[1] They are also top sources of polyphenols and caffeine which are the components that play a crucial role in tumor formation and tumor prevention.^[2] It is impossible to talk about a common judgment for types of cancer that occur in various parts of the body. These chemicals' modes of action produce varied outcomes in different tissues and organs. Therefore, the impact of coffee and tea consumption on cancer should be assessed separately for each form of cancer. The association between various types of cancer and tea and coffee consumption was examined in this review article. Considered cancer types, esophageal, melanoma, breast, stomach, colon, ovarian, and rectal.

COFFEE AND CAFFEINE

Coffee contains thousands of active chemicals that have the potential to generate tumorigenic effects. Since coffee intake is more frequent in Northern European countries, the great majority of cohort studies are from Sweden, Finland, and Norway.^[2-6]

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ABSTRACT

Coffee and tea are the most popular beverages after water. Tea and coffee consumption are also observed in nearly every age group and geographic location. The amount consumed has an impact on an individual's health. These beverages, which are manufactured in various parts of the world and fully prepared for consumption using various techniques, have been the subject of ongoing research. Several cohort studies have been conducted in many countries around the world to evaluate the impact of coffee and tea on cancer. In this review, we focused on how coffee and tea intake causes cancer, the genetic disease that most people are afraid of and that threatens their lives. The correlation between these beverages and breast cancer, colon cancer, ovarian cancer, and melanoma is particularly impressive.

Keywords: Caffeine, cancer, coffee, polyphenols, tea

Coffee is generally safe for health when drunk in moderation on a daily basis. Coffee drinking, as well as the caffeine it contains, may cause neurological, cardiovascular, and cancer diseases.^[7]

Caffeine is a central nervous system stimulant that belongs to the methylxanthine class. It is allowed all around the world, even though it is a psychoactive drug. It can be derived from a range of African, East Asian, and South American plants' seeds and leaves. The most well-known source of caffeine is the coffee bean, which is the seed of the coffee plant.^[8]

TEA AND POLYPHENOLS

Tea is also mostly consumed beverages all around the world. There are different flavors of tea, so their effectiveness in different diseases changes. Green tea, for example, is one of the healthiest of the tea varieties made from *Camellia sinensis* leaves.^[9] It is an effective drink not only for cancer, but also for obesity, diabetes, and infectious diseases. Green tea's major polyphenol is epigallocatechin gallate (EGCG).^[10,11]

Epigallocatechin gallate is a chemical that has been shown in cohort studies to have anti-carcinogenic properties.

CANCER

Cancer is one of the most common causes of death in our time, and it requires significant treatment. Each year, cancer threatens the lives of thousands of people. It is impossible to avoid the onset of this condition, and it may even become incurable in rare circumstances. Tumors, which are malignant cells in diverse shapes, can develop in a variety of body parts, and the sickness can be treated with chemotherapy, radiotherapy, or surgical treatments.^[12,13] It is necessary to develop new treatment approaches or enhance existing ones at this time. Knowing the origins and subtypes of cancer formation gives you an advantage when it comes to deciding the proper options for treatment. Daughter cells, as we know, are generated by mature cells, then proliferate and died in a cycle.^[14] Senescence or apoptotic phases are predicted in aging cells. A malfunctioning step in the cell cycle can result in cancerous cells that multiply uncontrolled, occupy their territories, and potentially migrate towards other tissues and organs either through the blood or lymphatic system. This is referred to as "metastasis".^[15] During this procedure, there could be some errors or damages. In such circumstances, the cell has a number of regulatory systems in place to repair damaged DNA or kill it if the damaged cell somehow doesn't recover. Tumor development can be identified if these issues are not resolved and cell death does not occur. On this basis, cancer cells can be considered to be formed up of normal cells.^[16] Cancer is a disease that is caused by a genetic mutation. Since our cells are regulated by genes, mutations interrupt the regular cell cycle and result in the formation of malignant cells. The following are some of the causes of cancer: mutations in cell division, acquired from parents genetically, infections with agents, radiation exposure, aging, tobacco and alcohol intake, obesity, and diet.^[17-19]

Numerous cohort studies have demonstrated no relationship between coffee and caffeine intake and cancer development.^[20-22] According to previous studies, coffee drinking may reduce the incidence of breast cancer, melanoma, and prostate cancer.^[23-25] In contrast to them, there is a relationship between coffee drinking and an increased risk of ovarian cancer and hepatocellular carcinoma. Caffeinated coffee has a tremendous impact on carcinogenesis, while decaffeinated coffee, remarkably, has a similar

effect. There were other characteristics like medical history, smoking, and genetic and environmental variables including sex, age, and race taken into consideration throughout numerous examinations.^[26] Therefore, the outcomes make it impossible to get a perfect result.

ESOPHAGEAL AND RECTAL CANCER

For years, researchers have studied the effects of coffee and tea on cancer growth *in vivo* and *in vitro* in numerous studies. Coffee can be served hot or cold during the summer and winter seasons. In the summer, people like iced coffee, but in the winter, they prefer hot coffee to keep warm. Aside from the effects of caffeine and polyphenols on the human body, drinking beverages that are excessively hot or iced might harm our bodies. Hot coffee, for example, can promote esophageal cancer by damaging esophageal cells.^[27] The malignant cells in the esophagus tissue in the human body produce esophageal cancer which is also linked to consuming alcohol and smoking.^[28] Iced coffee drinking can raise the risk of rectal cancer in addition to esophageal cancer. The rectum tissue, which is located at the end of the intestines, has the potential to develop into a malignant tumor.^[29] Consumption of herbal tea reduces the incidence of colon cancer, according to the other study.^[30] Coffee and tea include a variety of chemical components that may influence cancer pathway steps. Examining these elements will reveal the potential outcomes.

BREAST AND OVARIAN CANCER

Breast cancer is one of the most frequent cancers among women, with a high mortality rate.^[31] Coffee, tea, and caffeine consumption were not linked to breast cancer in Canadian cohort research. Only higher coffee consumption during the premenopausal period was linked to an increased risk of breast cancer. The risk of ovarian cancer was discovered to be reduced. Caffeine-free coffee and tea were shown to be risk-free. While no correlation was found between coffee and ovarian cancer, it was hypothesized that drinking more coffee before menopause raised the risk of breast cancer in women of normal weight. Ovarian cancer is the polar opposite of this. The production method of coffee, as well as what is added to it, has an impact on the risk.^[32] Caffeinated and decaffeinated coffee has adverse effects on cancer formation. In the case of decaffeinated coffee, the risk of ovarian cancer is reduced due to a case-control study.^[33] Another meta-analysis showed

that caffeine and coffee may be connected with a lower incidence of breast cancer in postmenopausal women by mutating the BRCA1 gene which has a role in breast cancer.^[34]

COLON CANCER

A cohort study of Norwegian men and women also examined 7-8 cups of coffee per day for 10 years in males and 4-5 cups of coffee in females according to their consumption. Colon cancer was identified in 1.2% of males and 0.8% of women.^[35] Since this ratio is really low, it's safe to assume that the probability of cancer is equally low.

Coffee drinking is associated with smoking, alcohol consumption, and inactivity, as well as perhaps higher fat and cholesterol intake, all of which raise the risk of colon cancer.^[36] Bile acids are now recognized as complicated metabolic integrators and signaling agents, rather than merely lipid emulsifiers and basic controllers of bile-acid homeostasis. It is not unexpected, then, that a variety of bile-acid-activated signaling pathways have emerged as possible appropriate treatment options for metabolic various diseases. They have a significant role related to cancer.^[37] Considering as bile acids promote colon carcinogenesis, a biological assessment of coffee's involvement in preventing large-bowel cancer has been proposed in terms of a decrease of cholesterol, bile acid, and neutral sterol deposition in the colon by coffee chemicals.^[38]

STOMACH CANCER

Stomach cancer, commonly known as gastric cancer, is a primary digestive system organ that is greatly influenced by the foods and liquids consumed. Some of the case studies looked into the correlation between coffee consumption and stomach cancer. Between 1987 and 2005, 61,433 Swedish women took part in a study investigating the relationship between coffee drinking and the risk of stomach cancer in Sweden. Coffee has been related to an increased risk of stomach cancer. According to Swedish cohort research, every additional cup of coffee raises the chance of developing stomach cancer by 22%. According to the findings of this cohort research, those who drink four or more cups of coffee per day had an 86% increased risk of cancer.^[39]

MELANOMA

Melanoma, often known as skin cancer, is on the rise in recent years. The skin, which is the greatest

organ that surrounds our body, is affected by the loss of ecological balance and increased exposure to UV light on the planet. At this moment, it's also a mystery how tea and coffee affect this exposure. According to *in vitro*, *in vivo*, and human research, one of the polyphenols contained in tea has been proven to protect against UVB-induced melanoma in one of the investigations in the United States. Tea polyphenols, for example, repair damaged DNA, decrease oxidative stress and inflammation, block UVB-induced signal transduction, and reverse epigenetic changes generated by UVB exposure.^[40,41]

Polyphenols are largely known for their antitumorigenic properties. They're frequently utilized to treat cancer cells. Polyphenols are responsible for essential biological processes.

Polyphenols have both negative and positive effects on cancer. It has cancer prevention or cancer development consequences depending on the pathways they participate in. They take a part in gene expression, cell cycle arrest, protein activation, transcription factors, apoptosis, cell signaling, receptors, and epigenetic changes.^[42]

In conclusion, there is no solid evidence that tea and coffee drinking directly causes cancer. Cancer is also influenced by an individual's medical history, genetic predispositions, smoking, and physical activity. It may be stated that the active chemicals in tea and coffee, which are effective in cellular pathways involved in cancer development, have a favorable influence on cancer formation in general. According to recent research, they can help lessen the risk of certain diseases such as cancer. Tea and coffee have been demonstrated in this research to alleviate inflammation produced by being potent antioxidants, assist in the repair process for DNA damage, as well as to aid in immunological setups.

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