



HEALTH PSYCHOLOGY | REVIEW ARTICLE

Association between coffee consumption and different types of cancers: A review of meta-analysis

Charlotte R. Kennedy and Sam Abraham

Cogent Psychology (2017), 4: 1392230



Received: 26 June 2017
Accepted: 10 October 2017
First Published: 17 October 2017

*Corresponding author: Sam Abraham,
School of Nursing, Bethel College, 1001
Bethel Circle, Mishawaka, IN 46545, USA
E-mail: abrahams383@att.net

Reviewing editor:
Cornelia Duregger, Webster University,
Austria

Additional information is available at
the end of the article

HEALTH PSYCHOLOGY | REVIEW ARTICLE

Association between coffee consumption and different types of cancers: A review of meta-analysis

Charlotte R. Kennedy¹ and Sam Abraham^{2*}

Abstract: Coffee is one of the most popular beverages in today's society. Though coffee is consumed in many forms, in the selection of literature and studies, the beverage was not a regular brew. Cancer is one of the diseases that affect millions of people worldwide. In this review of the literature, studies, mostly meta-analysis, were reviewed that documented the association between consuming coffee and the risk of cancer. The meta-analyses were a combination of both cohort and case studies to form a larger picture of how cancer risk is associated with the consumption of coffee. Many forms of cancers were reviewed, including those with the highest rate of incidence. The consumption of coffee was found to greatly vary how it affects the different forms of cancer. Some forms of cancers were barely affected by coffee consumption while others seemed to be influenced greatly by the amount of coffee consumed. In conclusion, the association between coffee consumption and different types of cancers are inconsistent and inconclusive.

Subjects: Health & Society; Nursing; Medicine

Keywords: coffee; caffeine; cancer; carcinoma; coffee risks and benefits; coffee and cancer meta-analysis; coffee consumption



Charlotte R. Kennedy

ABOUT THE AUTHORS

Charlotte R. Kennedy works as an intensive care unit (ICU) nurse at Goshen Hospital, Indiana, USA. Prior to nursing, she received her BA degree in psychology and worked in Mental Health as well as Ophthalmology.

Sam Abraham completed his Registered Nurse program and received his Master of Science degree from Andrews University (AU), Berrien Springs, Michigan, and later taught psychiatric nursing at AU. He completed his Doctor of Health Administration (DHA) degree from the University of Phoenix, Arizona in 2012. His research focused on factors contributing to patient falls in psychiatric inpatient units. He is currently Assistant Professor of Nursing, 1001 Bethel Circle, Bethel College, Mishawaka, Indiana, 46545. He has also taught at Western Michigan University, Kalamazoo, Michigan. Abraham has reviewed manuscripts for multiple journals and also has 20 peer-reviewed publications in journals. Abraham is a member of Sigma Theta Tau International.

PUBLIC INTEREST STATEMENT

Coffee is one of the popular beverages in the world, and its use in the United States has passed the 50% population mark. The association between certain types of cancers and the consumption of coffee is somewhat astounding. A review of meta-analysis indicated that coffee consumption is associated with some of the most common forms of cancer including prostate, breast, liver, gastric, and malignant melanoma. Coffee contains anti-inflammatory properties as well as anti-tumor properties. Some of the studies specified that coffee contain anti-carcinogenic properties, which could be beneficial. These anti-cancer properties in a cup of coffee can help reduce the risk of certain cancers. However, it should be noted that the association between coffee consumption and different types of cancers are inconsistent and inconclusive. In conclusion, this meta-analysis indicated that drinking coffee seems to have positive effects on some forms of cancer.

1. Introduction

Coffee is one of the most popular beverages in today's society, and cancer is an ever-growing disease in the world. Coffee consumption is a part of the daily routine for many individuals. More than 54% of individuals in the United States alone drink coffee on a daily basis (Coffee by the Numbers, 2017). Coffee has been researched on its effect and association with cancer because of some of its properties. Liu et al. (2015) proposed that coffee contains antioxidants, anti-inflammatory properties as well as anti-carcinogenic properties that would make it worth studying in relation to cancer. Because of its properties, coffee may have the ability to lower the risk of certain cancers. An average cup of coffee contains between 80–100 mg of caffeine (Compounds in Coffee, 2017). Cancer is also an ever-growing disease that affects millions of people worldwide (American Cancer Society [ACS], 2017). The research question addressed in this review was, "What is the correlation between the consumption of coffee and the risk of cancer?" A review of meta-analysis was performed to determine the association between cancer and coffee consumption.

2. Methods

Sources of data accessed for the literature review were mostly from the search engine EBSCOhost, the Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Medline databases. Current peer-reviewed studies were searched for consideration using certain guidelines. It was important to use meta-analyses to cover a broad scope of research. Keywords used in the search included *coffee*, *caffeine*, *cancer*, *carcinoma*, *risks or benefits*, *meta-analysis*, *consumption*, or in some combination thereof. Studies that were found to be eligible for selection covered a clear study of the association between coffee consumption and a form of cancer. The types of cancer were not limited, to allow for a broad perspective of how coffee has been studied in different cancer areas. The selection of studies for this literature review included prostate cancer, malignant melanoma, breast cancer, liver cancer, and gastric cancer to cover a general panel of cancers and the literature offered meta-analysis studies with a large number of participants in the studies.

3. Literature review

The ACS (2017) affirmed that approximately 1.7 million people in the United States will be diagnosed with cancer in the year 2017 and there would be more than 600,000 cancer-associated deaths. Many people, either themselves, or a family member have been affected by cancer in their lifetime. This disease is relevant to today's society. The focus of the literature review was on the association of coffee consumption with some of the most common forms of cancer including prostate, breast, liver, gastric, and malignant melanoma.

3.1. Prostate cancer

Prostate cancer is a common diagnosis among men. Typically, one in seven men will suffer from cancer in their lifetime (ACS, 2017). It is also the third leading cause of cancer deaths for men behind colorectal and lung cancer (Key Statistics for Prostate Cancer, 2017). Two meta-analysis studies were reviewed regarding the association between coffee use and the risk of prostate cancer. Zhong et al. (2014) observed that there have been studies that show coffee consumption can increase the risk while other studies have shown to decrease the risk of prostate cancer. Liu et al. (2015) noted in their meta-analysis that there was a reduced risk of prostate cancer with increased coffee consumption.

Zhong et al. (2014) in their meta-analysis incorporated 12 case-control studies and 12 cohort studies, which included 42,179 participants. By combining the available data, Zhong et al. sought to develop a clearer understanding of the association between prostate cancer and drinking coffee. Interesting differences were noted between the case-controlled studies and the cohort studies. The case-control studies indicated that there was no association between drinking coffee and the risk of prostate cancer. The cohort studies, however, found there was an association between drinking coffee and the risk of prostate cancer. In the cohort studies, the risk of prostate cancer was decreased by 7% for every 2 cups of coffee that was consumed by the participant per day. A further breakdown of the results found that coffee consumption could be associated with lowering the progression of prostate cancer (Zhong et al., 2014).

Zhong et al. (2014) affirmed that coffee consumption increases total testosterone as well as sex hormone-binding globulin concentrations. Free testosterone has been linked to a risk of advanced prostate cancer. Sex hormone-binding globulin has been shown to decrease the risk of prostate cancer in younger men. Thus, coffee consumption can be linked to a decrease in the risk of prostate cancer (Zhong et al., 2014). Some of the variability such as the cup size and the strength of the brew of coffee was not part of the study. It can be concluded that though there is a correlation, further studies need to be performed.

In a meta-analysis, Liu et al. (2015) included 13 cohort studies with 539,577 participants. Studies were excluded if they had coffee that included mixed beverages or did not categorize the coffee clearly or the coffee consumption adequately. Liu et al. classified the data to show the different levels of coffee consumption among the participants. The classification included: lowest, low, moderate, high and highest. The correlation of coffee consumption between advanced and non-advanced as well as fatal cases of prostate cancer was considered in the analysis.

Liu et al. (2015) concluded that the relative risk pointed to an inverse association between drinking coffee and the risk of prostate cancer. The risk of prostate cancer decreased by 2.5% for each 2 cups of coffee consumed per day. The study indicated that there was a correlation between drinking coffee and prostate cancer; however, Liu et al. (2015) believed that more studies are needed to further confirm the findings.

In their analysis, Zhong et al. (2014) and Liu et al. (2015) found a small correlation between drinking two or more cups of coffee to reduce the risk of prostate cancer. There was only a small reduction in the risk of prostate cancer noted in the meta-analysis studies. Both studies indicated the need for more research.

3.2. Malignant melanoma

ACS reports indicated that about 87,000 people in the US will be diagnosed with melanoma in the year 2017. Nearly 10,000 people will die from cancer in 2017. Melanoma will be 6% of new cancer diagnosis in males and 4% in females (Key Statistics for Melanoma Skin Cancer, 2017).

Liu, Shen, Shi, and Cai (2016) established that caffeine inhibits UV-induced skin cancer growth and development. Caffeine use has also been noted to reduce the growth of melanoma tumor cells as well as enhance radiosensitivity of tumor cells. Because coffee contains high amounts of caffeine, coffee may have skin cancer preventative properties. Previous studies had found little to no association between coffee consumption and malignant melanoma, therefore Liu et al. (2016) sought out further studies.

In the meta-analysis, Liu et al. (2016) had included both case studies and cohort studies. A total of 844,246 participants were included in the study. It was established that participants with more caffeine intake may have a reduced risk of melanoma. The study results indicated that caffeinated beverages might have some chemo-preventative effects in relation to melanoma. Decaffeinated coffee did not have those benefits. Even one cup of caffeinated coffee a day was shown to decrease the risk of melanoma.

3.3. Breast cancer

ACS estimated that there will be 316,000 new breast cancer diagnoses in the year 2017. Around 40,000 people will die of breast cancer in 2017. Breast cancer will account for 30% of the new diagnosis of cancers among women in 2017 (How Common is Breast Cancer?, 2017). The link between the consumption of coffee and breast cancer has been studied for at least 30 years. A gene that takes part in caffeine metabolism is CYP1A2. So far, the research has remained inconclusive regarding its connection (Lowcock, Cotterchio, Anderson, Boucher, & El-Sohemy, 2013).

Lowcock et al. (2013) reviewed cases specific to the CYP1A2 genome. A total of 3,062 participants were recruited. Other considerations in the research included possible association with estrogen receptors, menopausal, and smoking status. The daily average intake of coffee was taken into consideration. A limitation to the study was that the term “coffee” was not well defined. Caffeine could also have been consumed from other sources such as green tea, energy drinks, or even some medications used by the cancer patients.

The results showed that there was a reduction in breast cancer risk among women who consumed greater than five cups of caffeinated coffee a day. There was a noticeable difference between smokers and non-smokers. The only significant findings were noted with those that consumed greater amounts of coffee. Lowcock et al. (2013) warned it is still unclear if there is a true connection between coffee consumption and breast cancer. There is a positive association, but more studies are needed to confirm link between the two and how much it can affect the CYP1A2 genome through coffee consumption.

3.4. Liver cancer

In the United States, liver cancer will affect nearly 41,000 people in 2017. It will account for 3% of the new cases of cancer in the male population. Liver cancer is one of the leading cause of cancer-related deaths worldwide (Key Statistics About Liver Cancer, 2017). The diagnosis of liver cancer has tripled since the 1980's. The ACS reports indicate there are many health conditions that can put one at a higher risk of developing cancer. Those diseases include: diabetes type 2, tobacco abuse, cirrhosis, fatty liver, obesity, and hepatitis B and C. All of these can contribute to the possibility of a person developing liver cancer in their lifetime (Key Statistics About Liver Cancer, 2017).

In a meta-analysis, Sang, Chang, Li, and Jiang (2013), studied the link between coffee consumption and liver cancer. Coffee contains components which may have some anti-tumor properties. Some studies (see Appendix A) have shown that caffeine can help to prevent deoxyribonucleic acid (DNA) damage. Caffeine also has very strong antioxidant properties. Some of the possible chemicals in coffee that could be beneficial include caffeine, cafestol, kahweol, and chlorogenic acids. Cafestol and kahweol have both shown to have anti-carcinogenic property. Chlorogenic acids have been shown to have anti-tumor effects (Sang et al., 2013).

Sang et al. (2013) included both cohort and case-control studies in their meta-analysis. The results indicated that there were statistically significant reductions of 50% of liver cancer in those that consumed the greatest amount of coffee compared to those that nearly never or almost never drank the beverage. A risk reduction of 43% was found in those that drank more than two cups of coffee per day. However, Sang et al. (2013) had concerns about the meta-analysis, suggesting further analysis to confirm the findings.

3.5. Gastric cancer

Gastric, or stomach cancer, is a commonly diagnosed disease. The ACS projected that 28,000 people will be diagnosed with stomach cancer in 2017 and about 11,000 people will die from it in the same year. Those at highest risk for this form of cancer are older adults above 69 years of age. Heredity, obesity, history of *H. pylori* infection, tobacco abuse, and even just a history of stomach issues can put one at a higher risk of stomach cancer at a later stage in life (What Are the Key Statistics About Stomach Cancer?, 2017).

In a meta-analysis, Xie, Huang, He, and Su (2016), attempted to find the link between coffee consumption and gastric cancer. Diet plays a role in gastric cancer. The incidence of stomach cancer is extremely high in Asia because of the prevalence of the *H. pylori* infections caused by a diet that is rich in fermented foods. However, a diet that is rich in vegetables and fruits will have a lower incident of gastric cancer. Coffee does contain many anti-inflammatory properties, and these can be beneficial on a cellular level (Xie et al., 2016).

In the analysis, Xie et al. (2016) used 22 case-control studies with more than 1,000,000 participants. They found a strong association between drinking coffee and a reduction in risk for gastric cancer. An increase in the consumption of coffee showed that there was a decrease in gastric cancer risk; so patients who consumed just one cup had a risk reduction but not as high as those participants who drank higher amounts. Xie et al. (2016) concluded that the study should be viewed with caution and further studies should be conducted to validate the findings of meta-analysis.

4. Summary of research evidence

The studies used in this review of literature contained both case studies and cohort studies to form a well-rounded analysis of the association between coffee consumption and the risk of cancer. Cancer affects so many people globally; therefore, it was important to assure the literature also included an international population. Most of the participants in the selected studies were Asian, European, and North American.

The meta-analysis studies indicated that coffee contains components that can be beneficial to reduce the risk of cancer. Coffee contains anti-inflammatory properties as well as anti-tumor properties. Some of the studies specified that coffee contain anti-carcinogenic properties, which could be beneficial.

Certain types of cancers seem to have greater risk reduction in the consumption of coffee than others. For example, the conclusion of the liver cancer showed a 50% risk reduction with the increased consumption of coffee. However, for prostate cancer, the reduction was only 2.5% to 7%, depending on the study. The review of the literature indicated that coffee consumption seems to have positive effects on some forms of cancer.

5. Recommendation and conclusion

The types of cancers discussed in this literature include prostate cancer, malignant melanoma, breast cancer, liver cancer, and gastric cancer. It should be noted that the association between coffee consumption and different types of cancers are inconsistent and inconclusive. However, based on the review, there is an association between coffee consumption and different forms of cancer to varying degrees. This is an area of research that could potentially be worth further study as coffee is a highly consumed beverage in the United States and in some other parts of the world. Understanding the full potential of a cup of coffee can be beneficial for so many who are struggling with cancer, or as a possible risk reduction for cancer. The literature review has touched on the surface of the beneficial properties that coffee that can offer in relation to cancers. There are many beneficial properties that have been found to be in a cup of coffee that can help reduce the risk of certain cancers. There are many anti-inflammatory properties, anti-carcinogenic properties and certain other properties of coffee that have shown to be effective when battling the risk of cancer. Further studies should be performed to find possible links between coffee and cancer. A further breakdown of coffee and its components should also be included in future studies to better understand what ingredient in coffee makes it a possible benefit to those at risk for cancer.

Funding

The authors received no direct funding for this research.

Competing Interest

The authors declare no competing interest.

Author details

Charlotte R. Kennedy¹

Sam Abraham²

E-mail: abrahams383@att.net

ORCID ID: <http://orcid.org/0000-0002-5635-0769>

¹ Intensive Care Unit, Goshen Hospital, Goshen, IN, USA.

² School of Nursing, Bethel College, 1001 Bethel Circle, Mishawaka, IN 46545, USA.

Citation information

Cite this article as: Association between coffee consumption and different types of cancers: A review of meta-analysis, Charlotte R. Kennedy & Sam Abraham, *Cogent Psychology* (2017), 4: 1392230.

Cover image

Source: Author

References

American Cancer Society. (2017). *Cancer facts & figures 2017*. Atlanta: Author. Retrieved from <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2017/cancer-facts-and-figures-2017.pdf>

Coffee by the Numbers. (2017). *Harvard public school of health*. Retrieved from <https://www.hsph.harvard.edu/news/multimedia-article/facts/>

Compounds in Coffee. (2017). *Coffee and health, the institution for scientific information on coffee*. Retrieved from <http://coffeeandhealth.org/all-about-coffee/compounds-in-coffee/>

How Common is Breast Cancer?. (2017). *American cancer society*. Retrieved from <https://www.cancer.org/cancer/breast-cancer/about/how-common-is-breast-cancer.html>

Key Statistics About Liver Cancer. (2017). *American cancer society*. Retrieved from <https://www.cancer.org/cancer/liver-cancer/about/what-is-key-statistics.html>

Key Statistics for Melanoma Skin Cancer. (2017). *American cancer society*. Retrieved from <https://www.cancer.org/cancer/melanoma-skin-cancer/about/key-statistics.html>

Key Statistics for Prostate Cancer. (2017). *American cancer society*. Retrieved from <https://www.cancer.org/cancer/prostate-cancer/about/key-statistics.html>

Liu, H., Hu, G., Wang, X., Huang, T., Xu, L., Lai, P., ... Xu, Y. (2015). Coffee consumption and prostate cancer risk: A meta-analysis of cohort studies. *Nutrition & Cancer*, 67(3), 392–400. doi:10.1080/01635581.2015.1004727

Liu, J., Shen, B., Shi, M., & Cai, J. (2016). Higher caffeinated coffee intake is associated with reduced malignant melanoma risk: A meta-analysis study. *PLoS One*, 11(1), 1–14. doi:10.1371/journal.pone.0147056

Lowcock, E. C., Cotterchio, M., Anderson, L. N., Boucher, B. A., & El-Soheemy, A. (2013). High coffee intake, but not caffeine, is associated with reduced estrogen receptor negative and postmenopausal breast cancer risk with no effect modification by CYP1A2 Genotype. *Nutrition & Cancer*, 65(3), 398–409. doi:10.1080/01635581.2013.768348

Sang, L., Chang, B., Li, X., & Jiang, M. (2013). Consumption of coffee associated with reduced risk of liver cancer: A meta-analysis. *BMC Gastroenterology*, 13(34), doi:10.1186/1471-230X-13-34

What Are the Key Statistics About Stomach Cancer? (2017). *American cancer society*. Retrieved from <https://www.cancer.org/cancer/stomach-cancer/about/key-statistics.html>

Xie, Y., Huang, S., He, T., & Su, Y. (2016). Coffee consumption and risk of gastric cancer: An updated meta-analysis. *Asia Pacific Journal of Clinical Nutrition*, 25(3), 578–588. doi:10.6133/apjcn.092015.07

Zhong, S., Chen, W., Yu, X., Chen, Z., Hu, Q., & Zhao, J. (2014). Coffee consumption and risk of prostate cancer: An up-to-date meta-analysis. *European Journal of Clinical Nutrition*, 68(3), 330–337. doi:10.1038/ejcn.2013.256

Appendix A

Research evidence summary table

Author/s	Type of study	Number of subjects	Major findings	Conclusions
1. Liu et al. (2015) <i>Nutrition & Cancer</i>	“Coffee Consumption and Prostate Cancer Risk: A Meta-Analysis of Cohort Studies.” <i>Quantitative research</i>	13 cohort studies 539,577 participants	“Coffee consumption may be associated with a reduced risk of prostate cancer”	More studies with larger samples size are needed to confirm findings
2. Liu et al. (2016) <i>Plos One</i>	“Higher Caffeinated Coffee Intake Is Associated with Reduced Malignant Melanoma Risk: A meta-analysis study.” <i>Quantitative research</i>	2 case control studies (846 melanoma patients, and 843 control patients), 5 cohort studies 844,246 participants	“Caffeinated coffee might have chemo-preventative effects against Melanoma but not decaffeinated coffee”	Larger studies are needed to confirm these findings of the meta-analysis. There were a limited number of studies used, and more could be used before confirmation of conclusion
3. Lowcock et al. (2013) <i>Nutrition & Cancer</i>	“High Coffee Intake, but not Caffeine, is associated with reduced estrogen receptor negative and postmenopausal breast cancer risk with no effect modification by CYP1A2 genotype. Meta-analysis of studies and case control studies.” <i>Quantitative research</i>	Participants 3062 and controls 3427 for the studies	“High coffee consumption but not caffeine may be associated with reduced risk of ER-and post-menopausal cancers, independent of the CYP1A2 genotype”	Further investigation is warranted, to replicate findings
4. Sang et al. (2013) <i>BMC Gastroenterology</i>	“Consumption of coffee associated with reduced risk of liver cancer: A meta-analysis.” Case controlled studies. <i>Quantitative research</i>	16 cases, 3622 participants	“The results of the meta-analysis suggests an inverse association between coffee consumption and liver cancer”	There may be a connection, but more study needs to be conducted
5. Xie et al. (2016) <i>Asia Pacific Journal of Clinical Nutrition</i>	“Coffee Consumption and risk of gastric cancer: An updated meta- analysis, and case controlled studies.” <i>Quantitative research</i>	1,019,693 participants	“Coffee consumption might be associated with a decreased risk of gastric cancer”	“More studies are needed to assess the potential protective association between coffee consumption with gastric cancer”



© 2017 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.



Cogent Psychology (ISSN: 2331-1908) is published by Cogent OA, part of Taylor & Francis Group.

Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com

