CANCER AND DIET: NAVIGATING THE PATH TO RISK AND RESILIENCE

Dr. Ajaykumar B. Malle[1]*, Sachin D. Pawar[2], Pravinkumar S. Pal[3] and Sajid A. Mulani[4]

[1]Chief Executive Officer, CLINICA Research Solutions LLP, CBD Belapur, Navi Mumbai-400614, Maharashtra, India.

[2]Director-Operations, CLINICA Research Solutions LLP, CBD Belapur, Navi Mumbai-400614, Maharashtra, India.

[3]Head-Clinical Operations, CLINICA Research Solutions LLP, CBD Belapur, Navi Mumbai-400614, Maharashtra, India.

[4]Medical Writer, CLINICA Research Solutions LLP, CBD Belapur, Navi Mumbai- 400614, Maharashtra, India.

*Corresponding Author

Dr. Ajaykumar B. Malle

Chief Executive Officer,

CLINICA Research

Solutions LLP, CBD

Belapur, Navi Mumbai-

400614, Maharashtra, India.

ABSTRACT

The complicated and frequently fatal illness "cancer" continues to pose a significant threat to world health. Millions of people's lives are impacted by its increasing prevalence globally. The fight against cancer requires a thorough awareness of its underlying intricacies, risk factors, and possibilities for resistance in this day of medical developments and scientific discoveries. A strong and changeable element called nutrition sits at the crossroads of cancer's unrelenting march and our quest for resistance. Researchers, physicians, and people all have been enthralled by the connection between our daily diet and both our propensity to get cancer and our ability to survive its assault. This review embarks on a journey into the intricate and evolving landscape of "Cancer and Diet." It navigates the path where dietary choices interweave with the risk of cancer development and the potential for resilience in the face of this formidable adversary. Dietary elements may bolster the body's natural defenses, therefore lowering the chance of cancer formation and assisting those who are battling the disease. An indecorous diet, combined with life and behavioral options are directly linked to an increase in the threat of cancer. Every mess and salutary choice is a chance to lower the threat and boost adaptability, not just for us but also for unborn

generations. Still, the antithetical findings from epidemiological exploration make it delicate to give clear and harmonious evidence of how food and cancer threats interact. Thus, further epidemiological exploration will be needed in the future to exfoliate further light on this problem.

KEYWORDS: Antioxidants, Anticarcinogens, Carcinogens, Cancer, Diet.

BACKGROUND

The term "cancer" refers to a broad range of disorders that can develop in practically any tissue or organ of the body when abnormal cells grow out of control, infect nearby bodily components, and then migrate to surrounding tissues. Mutations that may be inherited, brought on by environmental variables, or the consequence of mistakes in the replication of DNA are what give rise to cancer. The primary threat determinant for the development of cancer in multicellular animal creatures, including human beings, is aging. The terms 'neoplasm' and 'malignant tumor' are similarly applied to define cancer. Cancer is the second-leading driver of mortality worldwide, accounting for 9.6 million deaths, or 1 in 6, in 2018, only behind cardiovascular illnesses. From 1990 till 2016, India's cancer death rate more than doubled. According to estimates, 1.15 million additional instances of cancer were diagnosed in the nation within 2018, and by the year 2040, only shifts in demographics alone are expected to cause the prevalence of cancer to nearly quadruple. According to estimations, cancer-related fatalities cost Indian residents 6.74 billion US dollars in 2012. Males are more prone to gain lung, prostate, colorectal, stomach, or liver sarcoma than females, as they are more prone to obtain breast, colorectal, lung, cervical, or thyroid sarcoma. The physical, psychological, as well as financial toll that malignancy influences on people, relatives, societies, as well as health systems all over the globe is still climbing. Numerous low- and middle-income nations' medical facilities are ill-equipped to handle this load, and numerous cancer survivors worldwide lack access to prompt, effective cancer detection and treatment. The availability of early identification, high-quality treatment, and survivorship care in nations with robust medical systems has improved the survival rates of several cancer forms.[1-5]

In-depth research into the grounds of malignancies has exposed those genetics merely account for over five percent of malignancies, whereas ecological variable quantity, which includes diet, lifestyle (tobacco, betel nut, alcoholic beverages, physical activity), and external stimuli (radiation, pollution, infections, etc.) to be key pillars, are accountable over

95-% of malignancies. According to the testimony, tobacco habit accounts for approximately between 25% to 30% of fatalities instigated by cancer, dietary habits for up to 30%, contagions for about 15%, and numerous other variables comprising radiation, stress, physical activity, environmental pollutants, etc. for the remaining percentages. According to investigations on the impact of nutrition, a controllable risk variable on cancer incidence, 20% of instances may be attributed to alcohol consumption, whereas 30% of cases may be averted by dietary adjustment. The primary prevention of cancer should thus prioritize achieving a balanced and varied diet as one of the most significant modifiable risk factors.[6,7,8]

Dilatory factors in our everyday lives carry the power to tip the scales in this battle. The relationship relating to whatever we eat daily and our exposure to cancer, along with our capacity to tolerate its attack, has captivated researchers, clinicians, and individuals equally. Yet, the relationship between diet and cancer is complicated and riddled with nuances and scientific intricacies. It is a relationship that defies simplicity, where dietary choices can either heighten the risk of cancer or fortify our resilience against it. By aspiring to empower individuals with knowledge, offering practical insights and recommendations that can inform dietary choices and potentially reduce cancer risk. This review, guided by the latest research and evidence, strives to provide a comprehensive perspective on "Cancer and Diet." It aspires to empower individuals with knowledge, offering practical insights and recommendations that can inform dietary choices and potentially reduce cancer risk.

UNDERSTANDING THE LINK BETWEEN DIET AND CANCER

Scientists have been fascinated by the intricate and nuanced correlation between diet and disease over centuries. A broad range of chemicals, involving both potential carcinogens and anti-carcinogens, are comprised in dietary elements. Anti-carcinogens are elements that block or inhibit these tumor-promoting paths, whereas carcinogens are the elements that can produce cellular modifications that may result in disease. Dietary variables are concerned with a significant fraction of human malignancies. Instances of both anti-carcinogens and carcinogens embrace antioxidants and phytochemicals obtained from fruits and vegetables, as well as aflatoxins and polycyclic aromatic hydrocarbons (PAHs) respectively. The foremost way that people are subjected to PAHs, aflatoxins, and nitrosamines is through their food which is the main cause for malignancies due to diet. Grilled, barbecued, or smoked meat eating, can be a prevalent dietary source of polycyclic aromatic hydrocarbon (PAH)

carcinogens, which may foster the risk of incident cancer. Indian cuisines mainly include grilled, barbecued, or smoked meat like tandoori chicken or naan, chicken tikka, and grilled kebabs which can be alleged to foster the consequence of cancer in the nation.[9,10]

Eating habits can impact the probability of cancer via several important mechanisms such as oxidative stress or chronic inflammation. A discrepancy relating to the creation of free radicals or reactive metabolites, also known as reactive oxygen species (ROS), and their elimination by protective moieties, also known as antioxidants, is often referred to as oxidative stress. Important biomolecules and cells are damaged because of this imbalance, which might have an impact on the intact body. Oxidative stress has been related to the onset and development of cancer by pushing mutations in DNA or by causing harm to DNA, volatility of the genome, and cell proliferation. Biological, pharmacological, and physical variables can cause chronic inflammation, which in turn raises the likelihood of various malignancies in humans. Certain dietary selections, such as high eating of processed foodstuff along with trans fats, can foster chronic inflammation and oxidative stress in the body. Eating habits rich in antioxidant or anti-inflammatory foodstuffs or fruits like berries and fatty fish can allay these consequences.[11]

Several malignancies of the breast and prostate are associated with hormonal abnormalities. Cancer of the breast, as well as the prostate, have both been strongly linked to hormonal imbalance, especially including estrogen, progesterone, and some other steroidal hormones. Since certain dietary factors may help to cut down the risk whereas others can worsen it, dietary change is a fundamental part of cancer avoidance. Eating foods that with high in nutritious fiber obtained from fruits, vegetables, legumes, and whole grain foods may lower the chance of developing cancer along with its prognosis. Endogenous estrogen and other steroid hormone levels have been scientifically correlated to dietary factors such as alcoholic beverages, animal fats, animal-based protein, as well as soya isoflavones. Increased fiber ingestion is independently correlated with the fall in serum estradiol concentration this fall in estrogen levels in the blood may potentially reduce the chance of hormone-related cancers.[12,13,14]

DIETARY FACTORS THAT INCREASE CANCER RISK

Diet has been linked to a raised likelihood of developing several types of cancer, and it also serves a significant role in the progression of cancer. The use of processed meats like bacon, sausages, and deli meats, as well as red meats including beef, swine, and lamb, have been

associated with an elevated risk of numerous malignancies, most notably colon cancer. In recent years, the World Health Organization's International Agency for Research on Cancer (WHO-IARC) categorized eating red meat as "probably carcinogenic to humans" and eating beef that is processed as "carcinogenic to human beings." Nitrites, Nitrates, and Heme iron, or the carcinogenic constituents like heterocyclic amines, polycyclic aromatic hydrocarbons, and N-nitroso composites that are created in red and processed meats, are all suspected to be carcinogens.[15]

It has been demonstrated over the past few decades that diets high in saturated and trans fats are linked to an increased risk of numerous malignancies, including cancers of the breast and prostate. Investigations comparing the risk factors for colon and rectal cancer revealed a possible link between dietary animal-based fats and a greater probability of colon cancer. A high-fat diet (HFD) causes alterations in the microbiota of the digestive tract that activate pro-inflammatory mechanisms. Obesity, which results from overeating, exacerbates these changes by causing hormone imbalances, oxidative stress, and inflammation, all of which are known to increase the risk of cancer. Consuming plant monounsaturated fatty acids (MUFAs), especially from olive oil and other healthy fats like those in nuts, seeds, and fatty fish, has been linked to a lower chance of developing cancer.[16,17]

Elevated risk of obesity as well as type 2 diabetes, which are known risk factors for many malignancies, are associated with a high intake of sugary foods and beverages as well as diets with a high glycemic index. People who are obese or have type 2 diabetes (T2D), in which circulating insulin levels are often elevated, frequently exhibit insulin resistance. Recent epidemiological and clinical data support a connection among cancer and insulin resistance. Hyperinsulinemia, a defining feature of insulin intolerance, and the rise in bioavailable insulin-like growth factor I (IGF-I) appear to play a role in the beginning of tumors and development in insulin-resistant individuals, while the exact processes behind this link are unclear.[18]

Antioxidants may avert mutations in DNA by scavenging dangerous free radicals. An inadequate intake of fruits and vegetables, which are excellent providers of fiber, vitamins, and antioxidants, is linked to an increased risk of numerous malignancies, including esophageal, stomach, as well as lung tumors. Certain malignancies may be more likely to develop because of environmental toxins in the food supply, such as pesticides, herbicides, and industrial chemicals, as well as exposure to these elements through nutrition. Such

hazards can be reduced by being aware of the significance of food safety procedures and regulations. It is commonly known that drinking alcohol increases one's risk of developing several cancers, including those of the mouth, throat, esophagus, liver, breast, and colon area. Acetaldehyde is a chemical that causes cancer and interacts with DNA to create molecules that support malignancy. Additionally, certain pathways of alcohol metabolism can generate extremely reactive oxygen-containing compounds that may damage DNA and cause the emergence of tumors. Our bodies may also experience hormonal abnormalities that impact the amounts of estrogen and insulin. As a result, increased estrogen and insulin levels can promote cell division. Alcohol consumption may also increase the number of carcinoma stem cells, which influences the behavior, aggressiveness, and treatment responsiveness of neoplastic cells.[19,20]

Processed and ultra-processed foodstuffs habitually incorporate additives, preservatives, and high levels of salt, and sugar, along with unhealthy fats. The intake of ultra-processed foodstuffs has dramatically increased throughout many nations' diets throughout the past few decades. These food items are designed to be microbiologically safe, practical, extremely pleasant, and reasonably priced after undergoing several physical, biological, as well as chemical procedures. There are several aspects of ultra-processed meals that might contribute to illness, including malignancies.[21]

ANTI-CARCINOGENS AND DIET

A diet rich in fruit and vegetables has benefits not only for cardiovascular, chronic, or degenerative diseases but also for other pathologies including cancer, about which there have been written in many reports. Anti-carcinogenic substances found in fruits and vegetables comprise polyphenols, flavonoids, isoflavones, epigallocatechin-3-gallate, lycopene, diallyl trisulfide, isothiocyanates, resveratrol, selenium, beta carotenoids, vitamins E, C, and A, among others. These fruits and vegetables can lower the risk of carcinogenesis when consumed habitually.

Polyphenolic compounds: A decrease in several chronic, cardiovascular, and cancer disorders is correlated to regular ingesting of polyphenols from fruits, vegetables, and specific plants. These substances influence a few metabolic pathways, including cytochrome-P450 and signal pathways mediated by MAP-kinases, PI3-kinases, and ROS, implicated in both normal and pathological cell activity, in addition to their direct antioxidant action. Phenolic compounds help to avoid tumor angiogenesis, cell migration, and adhesion

activities. Their inhibitory action at early, advanced, or metastatic malignancy stages can be used to investigate their therapeutic impact. Resveratrol found in red grape shows activity against lung, breast, and prostate cancers, hepatocellular carcinomas, melanomas, or glioblastomas; Curcumin and its derivatives are the dietary pigments in turmeric and turmeric are widely used as a spice and coloring agent in food which has activity against lung cancer, breast cancer, prostate, melanoma, and glioma. Blueberry, blackberry, strawberry, plums, grapes, and mango contain gallic acid, which shows activity against gastric cancer along with gliomas; chlorogenic acid is mostly found in carrots, kiwi fruit, pears, potatoes, and apples and can prevent hepatocellular carcinomas and fibroblastic sarcomas; caffeic acid is a substance that is widely present in all plants, including vegetables, fruits, herbs, coffee beans, plant-based spices and others that we eat and drink can prevent the risk of hepatocellular carcinomas along with prostate and lung cancers; Epigallocatechin-3-gallate is a chief polyphenol found in green tea shows defensive action for malignant diseases; Lycopene is good for prostate cancer which is typically found in tomatoes, apricots, melons, papayas, grapes, peaches, watermelons.[22]

Sulfur compounds: Diallyl trisulfide (DATS), a distinctive component of garlic and other closely related veggies including onion, leek, chive, etc., possesses antioxidant and anti-diabetic properties. DATS has been studied as a chemo-preventive as well as an anti-cancer agent. It is abundantly clear from investigational investigations that DATS controls several key cancer hallmark processes, including the cell cycle, apoptosis, angiogenesis, invasion, and metastasis. DATS has hypolipidemic and hypoglycaemic activity, which may lower the cancer risk brought on by obesity, and hormonal imbalances due to cholesterol, hindering oncogene creation, and angiogenesis. It also improves metabolic pathways for cancer-causing agents' detoxification and cell apoptosis induction.[23,24]

Vitamins: Micronutrient antioxidants including vitamin E, carotenoids, and vitamin-C combat free radicals and shield cells from the oxidative damage that contributes to carcinogenesis. Peanut butter, sunflower seeds, nuts, avocado, salmon, and other foods include lipid-soluble antioxidant vitamin E, which is made up of a combination of tocopherols. Various orange or yellow fruits, pumpkin, carrots, and vegetables like broccoli and spinach all contain carotenoids. Citrus fruits, kiwis, cruciferous vegetables, strawberries, white potatoes, tomatoes, broccoli, and bell peppers are the main sources of vitamin C (ascorbic acid), a water-soluble antioxidant.[25]

Isoflavones: Isoflavones might be found in nuts like almonds and pistachios, soy among its derivatives, and legume seeds including lentils, beans, or dates. They can also be found in milk and dairy products, cereals, potatoes, as well as dates. They exhibit anti-estrogenic action by vying for β-estrogen receptors in particular, actions in the inner cell metabolism of steroids via blocking enzymes alleged to be involved in the alteration of androgen to estrogen, making them the main cause of breast cancer in men, and anti-proliferative, anti-angiogenic, and pro-apoptotic activities in tumor cells. Both males and females are protected from breast cancer by isoflavones.[26,27]

DIETARY FACTORS THAT ENHANCE CANCER RESILIENCE

While certain dietary choices can elevate the risk of cancer, other dietary factors have been associated with resilience against malignancy. Certain dietary elements and practices may help lower the risk of cancer or improve the prognosis for those with cancer. Our bodies produce reactive oxygen and nitrogen species (ROS) and free radicals because of a variety of endogenous systems and exposure to multiple pathological or physiochemical situations. Free radicals cause oxidative stress, which negatively affects lipids, proteins, and DNA and leads to the growth of cancer. These free radicals are neutralized by antioxidants, which lowers oxidative stress. Antioxidants, which are included in many foods including berries, citrus fruits, and leafy greens, are essential for scavenging dangerous free radicals therefore guarding against cell deterioration.[28]

Plant-based diets are rich in phytochemicals such as flavonoids, polyphenols, as well as carotenoids. Numerous health advantages, such as anticancer, antioxidant, anti-inflammatory, and antiviral characteristics, are provided by these phytochemicals. cruciferous vegetables, green tea, and turmeric, all of which have the ability to strengthen resistance to cancer. Dietary fibers, which are mostly included in fruits, vegetables, whole grains, and legumes, are essential for preserving digestive health. A lower risk of colorectal cancer has been linked to dietary fiber. By increasing stool size, diluting potential carcinogens in the diet, and speeding up colon transit, fiber is considered to lower the risk of intestinal cancer. Omega-3 is a polyunsaturated fatty acid (PUFA) that is frequently found in fatty fish like salmon, flaxseeds, as well as walnuts. It has anti-inflammatory characteristics, is regarded as an immuno-nutrient, and is frequently utilized in nutritional therapy for the management of cancer. By lowering inflammation or delaying the growth and division of cancer cells as well

as their ability to produce new blood vessels, it may be able to stop or delay the onset of cancer.[29,30,31]

Maintaining a healthy weight requires a balanced diet that contains a range of foods in the right amounts. A surplus of estrogen produced by fat tissue has been linked to a higher risk of developing breast, endometrial, ovarian, and other malignancies. Obesity frequently elevates insulin and IGF-1 levels in the blood, which may encourage the growth of colon, kidney, prostate, and endometrial cancers. So, keeping a healthy weight will lower your chance of developing diseases linked to being obese, such as pancreatic, colorectal, and breast cancer. By maintaining a regular diet in balance, a healthy weight may be sustained. Having a healthy diet is essential for cancer patients who have already been diagnosed. Cancer patients receiving chemotherapy and radiation therapy might encounter difficulties including lack of appetite and nutritional inadequacies that make their bodies weak. Food that is nutritious can help cancer survivors be resilient in their response to therapy.

DIET, PHYSICAL ACTIVITIES, AND CANCER
Diet and physical activities covering lifestyle and behavioral choices encompass a range of factors that can significantly influence cancer risk.

Physical Activity and Exercise
Regular exercise and physical activity have been associated with a lower chance of developing numerous cancers, including breast, colon, and prostate cancer. Regular exercise and physical activity aid in better digestion while lowering the amounts of growth factors as well as genital hormones like estrogen, which have been scientifically linked to the onset and spread of cancer. By lowering inflammation, enhancing immune system performance, changing the metabolism of bile acids, and reducing exposure of the gastrointestinal tract to these suspected carcinogens, avoiding high blood levels of insulin, which have been correlated with cancer development and progression, also lowers the likelihood of carcinogenesis. It mainly works by assisting in the fight against obesity, which causes cancer.[32]

Obesity and Weight Management
A number of malignancies, like those of the breast, colon, kidney, and pancreas, are known to be at increased risk due to obesity. Extra body fat raises the risk of cancer by encouraging inflammation, resistance to insulin, and hormonal imbalances. To maintain a healthy weight

and lower the chance of developing cancer, proper eating practices are essential. These include mindful eating and portion management. Low-fat, lower-carb, moderate- and higher-protein and macronutrient-targeted diets are only a few examples of the many energy-restricted dietary strategies for weight loss. Weight control via diet can be aided by limiting intake of less healthy fats, maintaining total fat intake to less than 25% of the diet's energy, and increasing the amount of low-energy-dense foods, such as vegetables and fruits (9-12 servings per day) and low-fat dairy products.[33]

Stress Management and Mental Health

Chronic stress along with poor mental health can have an adverse effect on general health and may increase the risk of cancer. Through the neuroendocrine system, prolonged stress affects bodily hormones. Recurrent anxiety and restlessness are common over the course of the disease and treatment in cancer patients, which exacerbates the condition and reduces the effectiveness of the therapy. In order to manage stress, it might be helpful to consume milk combined with herbal teas, dark chocolate, whole grains, avocado, fish, nuts, citrus fruits, probiotics, nutraceuticals, or herbs like Ashwagandha, which can lessen issues like chronic stress and poor mental health.[34,35]

Alcohol and tobacco Consumption

Numerous malignancies, particularly those affecting the mouth, throat, esophagus, liver, breast, and colon area, are at risk due to alcohol intake. Cytosolic alcohol dehydrogenase (ADH) is primarily responsible for oxidizing ethanol into acetaldehyde (ACH). Then, aldehyde dehydrogenase (ALDH) in the mitochondria converts ACH to acetate. ACH disrupts the balance of hormones, produces mutations that fuel the formation of cancer, and starts the carcinogenesis process by creating adducts against proteins and DNA. Because tobacco contains carcinogens like nicotine, which may directly affect cellular DNA, smoking can result in cancer in a similar way as alcohol intake does.[36]

Impact of Agricultural Practices on Dietary Choices

Various chemicals and agents have been introduced into our food supply chain because of modern farming techniques, which may have an impact on cancer risk and have a big impact on dietary decisions. To increase crop yields, chemical fertilizers are frequently employed in agriculture. Nevertheless, their use has sparked worries about the possibility of nitrate contamination of food and water supplies. Nitrogen-based chemicals called nitrates and nitrite are found in fertilizers and have the potential to seep into the soil and groundwater.

The International Agency for Research on Cancer (IARC) states that these pollutants can produce nitroso compounds (NOCs), particularly N-nitrosamines, after ingestion. NOCs are unquestionably carcinogenic to humans. By washing vegetables, peeling them when appropriate, and considering organic agricultural produce which often has lower nitrate levels due to restricted fertilizer use we can safeguard ourselves from malignancies.[37]

Fruit ripening agents are widely used by the fruit business to hasten the ripening process and guarantee that fruits reach consumers in the best possible shape. Calcium carbide and ethylene gas are two frequently used ripening agents. While calcium carbide, a chemical used to accelerate the ripening of fruits, has been linked to health dangers, including the possibility of cancer, ethylene gas is a natural plant hormone whose artificial application may impact the fruit's nutritional content and might impact customer preferences. To make decisions that are in line with their dietary and health preferences, people should be aware of the fruit ripening procedures used in their regions, choose naturally ripened fruits wherever feasible, and seek information about the source and treatment of fruits.[38]

CONCLUSION

In the drive to reduce cancer risk and strengthen resistance in the face of this strong foe, the complex link between nutrition and cancer has been the focus of extensive scientific investigation. Red and processed meats, high-fat diets, overindulgence in sweets, a deficiency in fruits and vegetables, alcohol, and processed foods have all been implicated in raising the chance of developing cancer. Individuals are better equipped to make thoughtful decisions that support their health objectives when they are aware of these risk factors. Inflammation, oxidative stress, and hormonal variables are all influenced by carcinogens and anti-carcinogens. Anti-carcinogens in the diet play a crucial part in navigating the route to cancer risk and resilience. By lowering free radicals and preventing DNA mutation, eating a diet rich in anti-carcinogens on a regular basis can halt the spread of many different cancers. Foods high in antioxidants, phytochemicals, fiber, and omega-3 fatty acids assist to keep weight under control and combat free radicals, which have become friends in the battle against cancer. These dietary elements may bolster the body's natural defenses, therefore lowering the chance of cancer formation and assisting those who are battling the disease. An improper diet, combined with lifestyle and behavioral decisions are directly linked to an increase in the risk of tumor formation and cancer. Because of this, maintaining a healthy weight, quitting smoking, and using alcohol, as well as engaging in regular physical exercise, are all essential

to preventing and fighting cancer. Every meal and dietary choice is a chance to lower risk and boost resilience, not just for us but also for future generations. However, the contradictory findings from epidemiological research make it difficult to provide clear and consistent proof of how food and cancer risk interact. Therefore, further epidemiological research will be required in the future to shed more light on this problem.

REFERENCES

1. Hausman, D. M. What is cancer? Perspectives in Biology and Medicine, 2019; 62(4): 778–784. https://doi.org/10.1353/pbm.2019.0046.

2. Gilbertson, R. J. Mapping Cancer origins. Cell, 2011; 145(1): 25-29. https://doi.org/10.1016/j.cell.2011.03.019

3. Smith RD, Mallath MK. History of the Growing Burden of Cancer in India: From Antiquity to the 21st Century. J Glob Oncol, 2019; 5: 1-15. doi: 10.1200/JGO.19.00048. PMID: 31373840; PMCID: PMC7010436.

4. WHO: Global Cancer Observatory, International Agency for Research on Cancer. https://gco.iarc.fr/

5. Nagai H, Kim YH. Cancer prevention from the perspective of global cancer burden patterns. J Thorac Dis., 2017; 9(3): 448-451. doi: 10.21037/jtd.2017.02.75. PMID: 28449441; PMCID: PMC5394024.

6. Irigaray P, Newby JA, Clapp R, Hardell L, Howard V, Montagnier L, Epstein S, Belpomme D. Lifestyle-related factors and environmental agents causing cancer: an overview. Biomed Pharmacother, 2007; 61(10): 640-58. doi: 10.1016/j.biopha.2007.10.006. Epub 2007 Nov 20. PMID: 18055160.

7. Brennan SF, Cantwell MM, Cardwell CR, Velentzis LS, Woodside JV. Dietary patterns and breast cancer risk: a systematic review and meta-analysis. Am J Clin Nutr., 2010; 91(5): 1294-302. doi: 10.3945/ajcn.2009.28796.

8. Anand P, Kunnumakkara AB, Sundaram C, Harikumar KB, Tharakan ST, Lai OS, Sung B, Aggarwal BB. Cancer is a preventable disease that requires major lifestyle changes. Pharm Res., 2008; 25(9): 2097-116. doi: 10.1007/s11095-008-9661-9.

9. Orony, D. N. A., Lalah, J. O., & Jondiko, I. O. Determination of Carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs), Aflatoxins, and Nitrosamines in Processed Fish from the Winam Gulf Area of Kenya and Estimated Potential Exposure in Human. Polycyclic Aromatic Compounds. 2015; 36(4): 295–317. doi:10.1080/10406638.2014.980433.

10. Humberto Parada, Susan E Steck, Patrick T Bradshaw, Lawrence S Engel, Kathleen Conway, Susan L Teitelbaum, Alfred I Neugut, Regina M Santella, Marilie D Gammon. Grilled, Barbecued, and Smoked Meat Intake and Survival Following Breast Cancer. JNCI: Journal of the National Cancer Institute, 2017; 109(6): djw299, https://doi.org/10.1093/jnci/djw299.

11. Reuter S, Gupta SC, Chaturvedi MM, Aggarwal BB. Oxidative stress, inflammation, and cancer: how are they linked? Free Radic Biol Med., 2010; 49(11): 1603-16. doi: 10.1016/j.freeradbiomed.2010.09.006.

12. Satpathi S, Gaurkar S S, Potdukhe A, et al. Unveiling the Role of Hormonal Imbalance in Breast Cancer Development: A Comprehensive Review. Cureus, 2023; 15(7): e41737. DOI 10.7759/cureus.41737.

13. Chen FZ, Zhao XK. Prostate cancer: current treatment and prevention strategies. Iran Red Crescent Med J., 2013; 15(4): 279-84. doi: 10.5812/ircmj.6499. Epub 2013 Apr 5. PMID: 24082997; PMCID: PMC3785898.

14. Guinter MA, McLain AC, Merchant AT, Sandler DP, Steck SE. A dietary pattern based on estrogen metabolism is associated with breast cancer risk in a prospective cohort of postmenopausal women. Int J Cancer, 2018; 143(3): 580-590. doi: 10.1002/ijc.31387.

15. Diallo, A., Deschasaux, M., Latino-Martel, P., Herçberg, S., Galán, P., Fassier, P., Allès, B., Guéraud, F., Pierre, F. H., & Touvier, M. Red and processed meat intake and cancer risk: Results from the prospective NutriNet-Santé cohort study. International Journal of Cancer, 2017; 142(2): 230–237. https://doi.org/10.1002/ijc.31046.

16. Othman R. Dietary lipids and cancer. Libyan J Med. 2007; 2(4): 180-4. doi: 10.4176/070831. PMID: 21503242; PMCID: PMC3078250.

17. Bojková B, Winklewski PJ, Wszedybyl-Winklewska M. Dietary Fat and Cancer-Which Is Good, Which Is Bad, and the Body of Evidence. Int J Mol Sci., 2020; 21(11): 4114. doi: 10.3390/ijms21114114.

18. Arcidiacono B, Iiritano S, Nocera A, Possidente K, Nevolo MT, Ventura V, Foti D, Chiefari E, Brunetti A. Insulin resistance and cancer risk: an overview of the pathogenetic mechanisms. Exp Diabetes Res., 2012; 2012: 789174. doi: 10.1155/2012/789174.

19. Wang Y, Xu M, Zhang K, Luo J. Cellular and molecular mechanisms underlying alcohol-induced aggressiveness of breast cancer. Pharmacological Research. 2017; 115: 299-308. https://doi.org/10.1016/j.phrs.2016.12.005

20. Seitz HK, Becker P. Alcohol metabolism and cancer risk. Alcohol Res Health, 2007; 30(1): 38-41, 44-7. PMID: 17718399; PMCID: PMC3860434.

21. Fiolet T, Srour B, Sellem L, Kesse-Guyot E, Allès B, Méjean C, Deschasaux M, Fassier P, Latino-Martel P, Beslay M, Herçberg S, Lavalette C, Monteiro C A, Julia C, Touvier M. Consumption of ultra-processed foods and cancer risk: results from NutriNet-Santé prospective cohort. BMJ, 2018; k322. https://doi.org/10.1136/bmj.k322.

22. Weng C-J, Yen G-C. Chemopreventive effects of dietary phytochemicals against cancer invasion and metastasis: phenolic acids, monophenol, polyphenol, and their derivatives. Cancer Treat Rev., 2012; 38: 76–87.

23. Puccinelli MT, Stan SD. Dietary Bioactive Diallyl Trisulfide in Cancer Prevention and Treatment. Int J Mol Sci., 2017; 18(8): 1645. doi: 10.3390/ijms18081645.

24. Zhai B, Zhang C, Sheng Y, et al. Hypoglycemic and hypolipidemic effect of S-allyl-cysteine sulfoxide (alliin) in DIO mice. Sci Rep., 2018; 8: 3527. https://doi.org/10.1038/s41598-018-21421-x.

25. Victoria A Kirsh, Richard B Hayes, Susan T Mayne, Nilanjan Chatterjee, Amy F Subar, L Beth Dixon, Demetrius Albanes, Gerald L Andriole, Donald A Urban, Ulrike Peters. On behalf of the PLCO Trial, Supplemental and Dietary Vitamin E, β-Carotene, and Vitamin C Intakes and Prostate Cancer Risk. *JNCI: Journal of the National Cancer Institute,* 2006; 98(4) 15: 245–254. https://doi.org/10.1093/jnci/djj050.

26. Nagata C. Factors to consider in the association between soy isoflavone intake and breast cancer risk. J Epidemiol, 2010; 20(2): 83-9. doi: 10.2188/jea.je20090181. Epub 2010 Feb 20. PMID: 20173308; PMCID: PMC3900805.

27. Cable JK, Grider MH. Physiology, Progesterone. In: StatPearls [Internet] (ed): StatPearls Publishing, Treasure Island, FL., 2023.

28. Lobo V, Patil A, Phatak A, Chandra N. Free radicals, antioxidants and functional foods: Impact on human health. Pharmacogn Rev., 2010; 4(8): 118-26. doi: 10.4103/0973-7847.70902.

29. Ranjan A, Ramachandran S, Gupta N, Kaushik I, Wright S, Srivastava S, Das H, Srivastava S, Prasad S, Srivastava SK. Role of Phytochemicals in Cancer Prevention. Int J Mol Sci., 2019; 20(20): 4981. doi: 10.3390/ijms20204981.

30. Zeng H, Lazarova DL, Bordonaro M. Mechanisms linking dietary fiber, gut microbiota and colon cancer prevention. World J Gastrointest Oncol, 2014; 6(2): 41-51. doi: 10.4251/wjgo.v6.i2.41.

31. Freitas RDS, Campos MM. Protective Effects of Omega-3 Fatty Acids in Cancer-Related Complications. Nutrients, 2019; 11(5): 945. doi: 10.3390/nu11050945.

32. Physical activity and cancer fact sheet. (2020, February 10). National Cancer Institute. Available: https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity-fact-sheet#:~:text=These%20include%3A,Reducing%20inflammation

33. Smethers AD, Rolls BJ. Dietary Management of Obesity: Cornerstones of Healthy Eating Patterns. Med Clin North Am., 2018; 102(1): 107-124. doi: 10.1016/j.mcna.2017.08.009. PMID: 29156179; PMCID: PMC5726407.

34. Palliyaguru DL, Singh SV, Kensler TW. Withania somnifera: From prevention to treatment of cancer. Mol Nutr Food Res., 2016; 60(6): 1342-53. doi: 10.1002/mnfr.201500756. Epub 2016 Jan 29. PMID: 26718910; PMCID: PMC4899165.

35. Rdn, R. F. M., September 11, 2023; 10 best foods to fight Stress. EverydayHealth.com. https://www.everydayhealth.com/diet-nutrition-pictures/how-to-reduce-stress-with-diet.aspx.

36. Macke AJ, Petrosyan A. Alcohol and Prostate Cancer: Time to Draw Conclusions. Biomolecules, 2022; 12(3): 375. doi: 10.3390/biom12030375.

37. Picetti R, Deeney M, Pastorino S, Miller M R, Shah A, Leon D A, Dangour A D, Green R. Nitrate and nitrite contamination in drinking water and cancer risk: A systematic review with meta-analysis. Environmental Research, 2022; 210: 112988. https://doi.org/10.1016/j.envres.2022.112988.

38. Akolade R. Oladipupo et. al. The Use of Calcium Carbide in Fruit Ripening: Health Risks and Arsenic Index as a Quantitative Marker for Calcium Carbide Residue. Progress in Chemical and Biochemical Research, 2022; 5(2): 125-132. DOI: 10.22034/pcbr.2022.320724.1206.