

Anti-Cancer Diet: Eat Well To Live Longer

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ABSTRACT

The primary goal of treating cancer is to relieve suffering and improve the quality of life. Through studies, it has been estimated that 30-40% of all cancers can be prevented by changing the way of leading life and dietary measures. The connection between cancer, nutrition, and diet is now accepted and even there is enough epidemiological evidence to support that cancer can be prevented by modification of dietary habits. A diet that includes more fibres, fruits, vegetables, micronutrients, phytochemicals, and probiotics, has been proved to have an anti-cancer effect. Though there are conventional therapies that are used to treat cancer most of these cancer therapies come with unavoidable serious adverse effects. But on the other hand, nutritional therapies help to build up the body's anti-cancer defence. Hence, the primary objective of this paper was to review the role of diet and nutrition in the prevention of cancer.

Key words: Cancer, Diet, Nutrition, Micronutrients, Antioxidant, Phytochemicals, Flavonoids, Probiotics, Prebiotics, Phytosterols, Anti-cancer.

INTRODUCTION

Cancer is the general name for a group of diseases in which normal homeostatic cellular control is lost and cells grow constantly, invading and overwhelming the surrounding normal tissues. In layman terms, cancer, medically known as malignant neoplasm, is the uncontrolled growth and spread of cells. It can affect almost any part of the body. The growth often invades surrounding tissue and can metastasize to distant sites. Cancer cells are the result of multiple genetic defects resulting from exposure to environment,

dietary and infectious agents. Other important causes include improper diet, excess alcohol consumption, lack of physical activity, infections, genetic influence, hormonal factors and radiation.

About 30% of total cancers in western countries are caused due to nutritional factors.^[1] In today's world, one of the major causes of increase in mortality rates is cancer. In 2008, around 12.7 million cancer cases were diagnosed and out of which 7.6 million people died of cancer. This makes cancer the major cause of death in the developed countries, and second major cause of death in the developing countries.^[2] According to the study by American Institute of Cancer Research (AICR) and World Cancer Research Fund (WCRF), 30-40% cancers can be prevented by appropriate diets, physical exercise, and maintenance of appropriate body weight.^[3] Intake of nutrients in diet helps in decrease cancer risk by their antioxidant activity, reducing free radicals, regulation of gene expression, stimulation of the immune system etc.^[4] The hypothesis that dietary factors can influence cancer risk, particularly in certain high-risk groups, is also supported by both descriptive and analytic epidemiologic research. The results of epidemiologic and laboratory studies, therefore, provide a rationale for intensive research into the nature of cancer prevention by nutrient components and their synthetic analogues. Hence, the primary purpose of this paper is to introduce and review the concept of diet and nutrition to prevent cancer.

FACTS ABOUT CANCER

Globally, cancer is the second major cause of death and is responsible for an

approximately 9.6 million deaths in a year. About 1 in 6 deaths occur due to cancer. Around one third of deaths from cancer are because of five leading behavioural and dietary risk factors i.e. high body mass index, low fruit and vegetable consumption, lack of physical activity, tobacco use and alcohol consumption. Approximately 70% of deaths from cancer occur in low- and middle-income countries.^[5] More than 90% of high-income countries have reported to have treatment service available compared to less than 30% of low-income countries. In 2017, only 26% of low-income countries reported to have pathology services available in the public sector. The impact of cancer on economy also is significant and is increasing day by day. The total annual economic burden of cancer in 2010 was estimated approximately US\$1.16 trillion.^[6] Moreover, only 1 in 5 low- and middle-income countries have the necessary data to drive cancer policy.^[7]

UNDERSTANDING THE MECHANISM OF CARCINOGENESIS

A brief understanding of the mechanism of carcinogenesis would help in unravelling the complex interaction of the different factors involved in this process. For the development of malignant disease at the cellular level, somatic mutation must occur in the DNA following exposure to carcinogenic agents. This somatic mutation involves translocation and amplification of specific genes that translate to a distinct expression of the properties of the cells bearing such altered genes. These genes are known as proto-oncogenes. Following several cell duplication-cycles, the genetic damage generally becomes irreversible.

A specific agent that induces mutations and DNA damage in a cell system is labelled genotoxic. Almost all human carcinogens are genotoxic, with a potential cancer risk, if given in appropriate doses and adequate duration of exposure. Each human cancer has specific genotoxic carcinogens as causative factors. The genotoxic factors associated with human cancers include aflatoxin, and hepatitis viral

infection for hepatocellular carcinoma, alcohol and tobacco smoking for carcinoma of the mouth, pharynx, esophagus and larynx, smoking, asbestos, and polycyclic hydrocarbons for cancer of the lung, and aromatic amines and smoking for bladder cancer. A genotoxic can be direct-acting, procarcinogen or an agent that can lead to DNA changes through alteration in replication. Direct-acting genotoxic chemicals are organic compounds such as ethyleneamine that interact with the nuclear DNA. Procarcinogens, on the other hand require conversion through metabolic activation into direct-acting compounds. These include chemicals such as vinyl chloride, 2-naphthylamine, 2-amino-3-methyl-imidazo-quinoline, nickel, dimethyl nitrosamine, chromium. Some inorganic carcinogens are not directly genotoxic, but can change the DNA by selective alteration in DNA replication. Though genetic changes occur after exposure to genotoxic factors, progression to malignancy is not inevitable. These genetically-altered cells require specific agents to 'promote' and induce 'progression' to overt and invasive malignancy. Promoters do not interact with DNA, yet they enhance the process of carcinogenesis. They operate, under a variety of conditions, by promoting the mechanism of carcinogenesis or through other unknown mechanisms. A promoter is not genotoxic or carcinogenic, but it enhances the effect of the direct-acting and the procarcinogen agents. It cannot cause cancer without a preceding cell change. Its action requires their presence at high levels over a long period. Its effect is reversible, and is often tissue-specific. Recognized examples are the bile acids as promoters of colon cancer, and saccharin as promoter for cancer of the urinary bladder. Other agents acting as inhibitors of post-genetic-alteration carcinogenesis operate in animal models and most likely in some forms of human cancer. Delineating the role of each genotoxic carcinogen, co-carcinogen, promoter or inhibitor in the overall carcinogenic process for a specific cancer

by uncovering the action mechanisms, may form the basis for risk assessment and eventual prevention.^[8,9,10]

ANTI-CANCER DIET

Diet plays a very important role in prevention of many chronic and systemic diseases including cancer. Anti-Cancer diet refers to such a diet which, when consumed, helps to reduce the risk of cancer. To reduce the risk of various types of cancer, as well as other diseases, a diet must contain fruits, vegetables, nuts, beans, and whole grains. On the other hand, consumption of processed and fried foods, sugars and refined carbs should be limited. In management of cancer, anti-cancer diet complements the conventional approaches and it is seen that body tends to become weak with time due to conventional therapies but nutritional therapies build up the body's anti-cancer defence mechanism system.^[11] According to research, a large percentage of deaths are directly linked with the choice of leading life such as smoking, alcohol consumption, lack of physical exercise and unhealthy diet. Having a proper and healthy diet, getting regular exercise, avoiding cigarettes and avoiding or limiting alcohol consumption can lead to a great start to an anti-cancer lifestyle.^[12]

DIETARY FACTORS THAT HELPS TO FIGHT CANCER

Multiple human epidemiologic studies have established a relationship between fruits, vegetables and cancer, and the evidences for a protective effect of greater vegetable and fruit consumption is consistent for cancers of almost all the human organs such as stomach, oesophagus, lung, oral cavity, pharynx, endometrium, pancreas and colon etc.^[13]

Allium vegetables: Garlic, onion, shallots, leeks and chives are known as Allium vegetables due to their Sulphur containing property. Garlic contains an inert compound known as Allicin, which acts as an antioxidant, helps to prevent cell mutations that give rise to cancer. Studies have shown that garlic might help to protect against

cancers of colon, prostate, esophagus, larynx, ovaries and kidneys.^[14]

Cruciferous vegetables: Vegetables like Cauliflower, Cabbage and Broccoli are known as cruciferous vegetables. They contain sulforaphane, an antioxidant which helps the liver to break down and destroy cancer-causing toxins. It also helps in increasing the liver enzyme activity which in return helps to get cancerous substances out of the body. Broccoli sprouts which contain fifty times more sulforaphane than that found in regular broccoli, also have shown to fight against *Helicobacter pylori*, an important causative bacterium for gastric carcinoma.^[15] A study done by Zhang et al. revealed that high intake of cruciferous vegetables (five or more servings per week compared to less than two servings) reduces the chances of cancer by 33%.^[16] Another study of similar kind also showed that having three or more servings of cruciferous vegetables per week, compared to less than one serving of cruciferous vegetables per week, resulted in decrease in prostate cancer risk by 41%.^[17]

Green leafy vegetables: Spinach and other green vegetables, like chard and collard greens, are rich in antioxidants which help to protect cells from the damage that can cause cancerous mutation. According to the study published in the Journal of Agricultural and Food Chemistry, spinach was given the highest 'bioactivity index' ranking of vegetables due to its capability to fight against cancer.^[15]

Tomato: Tomatoes are rich in Lycopene, an antioxidant which is mostly absorbed from cooked tomatoes (like tomato juice, tomato sauce or tomato soup), are well known to fight against prostate cancer. Watermelon and Guava also contain some amount of Lycopene and thus possess anti-cancer property.^[14,15]

Turmeric: It contains Curcumin, the most efficient natural anti-inflammatory agent which helps in inhibiting cancer cell growth by not only reducing the inflammation but also by inducing cancer cell death (apoptosis), slowing down the growth of

new blood vessels required for tumor expansion (angiogenesis), and by increasing the efficacy of chemotherapy.^[18]

Fish: Intake of cold water fishes in diet, like Sardines, Salmon, Mackerel and Trout, two to three times a week reduces the cancer risk as it contains Omega-3 fatty acids, specifically Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA). Studies have shown that deficiency of dietary consumption of Omega-3 fatty acids leads to breast, colon, pancreatic and stomach cancers.^[15,19]

Phytochemicals: Phytochemicals are biologically active, naturally occurring chemical compounds found in plants which, when consumed, have protective or disease preventive properties. Evidence suggests that intake of dietary phytochemicals can reduce the risk of cancer. A prospective study showed an inverse relationship between the consumption of flavonoids and the incidence of all sites of cancer combined.^[20] 70% of Cocoa is present in Dark Chocolate and Flavonoids content in cocoa helps in fighting cancer.^[21] Pomegranate flavonoids is effective on breast, prostate, colon, cutaneous and lung cancers, as revealed in a study.^[22] Intake of Quercetin in apples was found to be inversely related to lung cancer risk.^[23] A study showed that increased plasma levels of Quercetin following a meal of apples were accompanied by increased resistance to strand breakage by lymphocyte DNA and decreased levels of some oxidative metabolites in the urine.^[24] There is also evidence from animal studies to support the anti-carcinogenic and anti-mutagenic effects of Capsaicin, the pungent ingredient present in red pepper and ginger.^[25] Genistein (4',5,7-trihydroxyisoflavone) is one of the isoflavonoids in soy and it has anti-proliferative effects on mitogen-stimulated growth in human breast cancer cell in culture. Soy isoflavonoid conjugate have chemo-preventive activity in carcinogen-induced rat models of breast cancer.^[26] According to the studies, phytochemicals present in common fruits

and vegetables can have anti-carcinogenic property via modulation of detoxifying enzymes, scavenging of oxidative agents, stimulation of immune systems, regulation of gene expression in cell proliferation and apoptosis, hormone metabolism, antibacterial and antiviral effects.^[27,28]

Probiotics: Probiotics are nothing but living microorganisms which, when administered in large amounts, results beneficial for the health of the host. Examples of probiotic bacteria are *Lactobacillus*, *bifidobacterium*, etc. According to the report, substances produced by *Lactobacillus bulgaricus* were active to fight against development of tumor.^[29] The anti-carcinogenic properties of *Lactobacilli* fall in three groups i.e. Inhibition of tumor cells,^[30] suppression of bacteria which produced enzymes such as β -glucuronidase, nitroreductase and azoreductase, responsible for the release of carcinogens^[31] and destruction of carcinogens such as nitrosamines.^[32] Examples of some food which contains probiotics are yogurt, sauerkraut, tempeh, miso, pickles, buttermilk, soy sauce and kefir. Consumption of fermented or culture containing dairy products in diet have been reported to decrease the risk of colon cancer.^[33] But these findings may vary and may depend in part on factors like strain of bacteria used in dairy products. A study reported that frequent consumption of yogurt was related with protection against colon cancer.^[34] A human study demonstrated *Lactobacillus acidophilus* supplements to cause decrease in activities of faecal bacterial β -glucuronidase, nitroreductase and enzymes that convert procarcinogen to a potential carcinogen.^[35,36] Study also reveals *Bifidobacterium* present in human gut micro-flora has beneficial effect on health as it helps to maintain equilibrium of colonic micro-flora.^[37] In the year 1899, the protective effect of *Bifidobacterium* was first given and Japan was the first country to include it in their diet due to its therapeutic effect. Another animal study also showed that the

presence of *Lactobacillus acidophilus* and *Bifidobacterium bifidum* in the intestine decreased the rate of formation of gut tumor by other intestinal organisms.^[38] Inhibition of formation of aberrant crypt foci by probiotics was also proved in some of the studies.^[39,40] Research and study on probiotics is still enhancing day by day as there is huge range of health benefits in various strains of probiotic bacteria. The field of probiotics will gain its limelight with development of new methods of selecting and screening probiotics.

Vitamin C: Apart from the commonly known functions of Vitamin C such as tissue repair, collagen synthesis, antimicrobial activities, protein synthesis and wound healing, it also has cancer preventing properties.^[41] Acerola cherries, chilli peppers, guavas, blackcurrants, thymes, parsley, kiwis are some of the food items that are rich in Vitamin C content. Low blood level of ascorbic acid tends to cause harm to health.^[42] and at higher concentrations ascorbic acid is toxic to carcinogenic cells. There is evidence from a study that intake of large dosage Vitamin C in multiple divided oral doses or intravenously, has good effects in cancer treatment.^[43] but intravenous administration of Vitamin C is more effective than oral multiple divided dose. A study showed, Vitamin C at a dose of 1.25g administered orally produced mean peak plasma concentrations of 135 ± 21 $\mu\text{mol/L}$ compared with 885 ± 201 $\mu\text{mol/L}$ for intravenous administration.^[44] and hence it can be believed that intravenous administration of Vitamin C is more efficient than orally administered Vitamin C in preventing cancer.

Vitamin D: Anticancer properties are present in active hormonal form of Vitamin D.^[45] Some sources of food that are rich in Vitamin D are fatty fish (salmon, tuna), herring, cod liver oil, egg yolks, soymilk etc. Studies discovered that different types of normal and cancerous tissues, including prostate cells,^[46] colon tissue,^[47] breast, ovarian and cervical tissue,^[48] pancreatic

tissue and lung cancer cell line^[49] all have the capability to transform the major circulating form of Vitamin D, 25(OH)D, into the active hormonal form Calcitriol, 1,25(OH)₂D. Hence, there is a local mechanism in many tissues of the body for transforming the form of Vitamin D in the body into a hormone having anticancer property. Studies have shown that Calcitriol inhibits the cancerous growth of colonic epithelial cells, primary prostatic epithelial cells, and pancreatic cells.^[50,51]

Phytosterols: Phytosterols are plant-derived sterols which have similar structure like cholesterol but with little modifications and these modifications involve the side chain and include the addition of a double bond or methyl or ethyl group. The commonest Phytosterols are β -Sitosterol, Campesterol, Stigmasterol and Cycloartenol. Vegetable oils including corn oil,^[52] seeds, nuts (like peanuts, cashew nuts, almonds),^[53] legume (such as sesame, chickpeas, lentils), cereal grains (like millet, rye, corn)^[54] are some of the best sources of dietary phytosterols. It has been seen in a study, that phytosterols inhibit the production of carcinogens, cancer-cell growth, invasion and metastasis, and promote apoptosis of cancerous cell.^[55] According to the evidences suggested by the studies, phytosterols possess anti-cancer effects against lung cancer,^[56] stomach cancer,^[57] ovarian cancer,^[58] and oestrogen dependent human breast cancer.^[59] Study showed chemically induced colon cancer may be prevented with dietary β -Sitosterol.^[60] In an animal study, β -Sitosterol resulted in decrease of the proliferative compartment of the crypt and cell proliferation, in rats fed with cancer inducing chemical carcinogens, like methylnitrosourea.^[61] In an in-vitro study, giving 16 $\mu\text{mol/L}$ β -Sitosterol supplementation for 5 days in an established human tumor cell line showed its inhibitory effect on tumor growth of HT-29 cells, a human colon cancer tumor cell line.^[62] Maximum dose of β -Sitosterol within its solubility and physiologic range in blood, i.e. 4-70 $\mu\text{mol/L}$, was used

here.^[63] Hence, the results obtained from these studies suggest that phytosterols has a protective and beneficial role in treatment of cancer.^[64]

Folic Acid: Folic acid has an important role in DNA methylation and synthesis, and it works in conjugation with Vitamin-B6 and Vitamin-B12 in the single carbon methyl cycle. Many studies have revealed more consumption of folic acid and their related nutrients (Vitamin B6 and Vitamin B12) decreases the rate of colon, rectal and breast cancer.^[65,66,67] Citrus fruits (like oranges, lemons, grapefruit), Brussels sprouts, kohlrabi, papaya, kale are rich in folic acid. Genetic polymorphisms in the methylene-tetra-hydrofolate reductase and the methionine synthetase genes which increases the relative amount of folate available for DNA synthesis and repair also decreases the risk of colon cancer.^[68,69] According to the most of the breast cancer studies, folate was found to have a protective effect among the women who consumed alcohol.^[70,71] So, consumption of alcohol or alcoholic beverages highly enhances the risk of cancer of the patients with low folate diet.

Carotene: Food substances such as carrot, sweet potatoes, cantaloupe, apricots, squash, lettuce contains Carotene. Studies have been done to see if α and β -carotene along with other carotenoids, can reduce the chances of cancer risk. According to a study, β -carotene is proved to be a cancer protective agent.^[72] The two significant properties of β -carotene showing its potential to prevent cancer are- (a) it has the ability to trap certain organic free radicals,^[73] (b) it has the capacity to deactivate excited molecules, particularly excited of singlet oxygen,^[74] which is generated as a by-product of many normal metabolite process. Experiments have been performed on mice and rats, where protective effects of large amount of β -carotene containing diet (e.g., 90mg/kg) have been reported.^[75] According to another study, direct relationship between dietary carotene and cancer risk of esophagus was

found.^[76] Hence intake of carotene containing foods is recommended.

Selenium: Selenium is a mineral which has anti-cancer properties and studies through several years have proved selenium to be capable of protecting against some forms of cancer.^[77,78] Food items such as milk, oatmeal, cashew, banana, chicken, egg, mushroom, cottage cheese, and baked beans contains selenium. Studies have revealed that both men and women having higher level of selenium was protected from lung cancer and colon cancer.^[79] So, in that note, if a person is having low selenium level and decrease in other antioxidant defences, chances of cancer risk increases.

Calcium: Food items like milk, cheese, sardines, fortified soymilk, waffles, raisin bran, corn flakes, turnips are rich in calcium content. Consumption of dietary calcium may decrease the risk of colorectal cancer, possibly by forming complexes with secondary bile acids in the intestinal lumen,^[3] or by inhibiting hyper-proliferative effects of dietary haem.^[80] Consumption of calcium supplements also has protective effect on the recurrence of colorectal adenomas.^[81]

Dietary Fibres: Whole grains are one of the major sources of variety of nutrients, such as dietary fibres, vitamins, resistant starches, oligosaccharides, trace elements and other compounds which help in prevention of various diseases, including cancer.^[82] Grain contains endosperm (containing 80% of the whole grain), germ and bran. Some examples of major grains are wheat, rice and corn, while minor grains include oat, rye, barley and sorghum.^[83] Short chain fatty acids are one of the fermented products of dietary fibres. Acetate, Propionate and Butyrate are the three most common short chain fatty acids. These short chain fatty acids help in decreasing the intestinal pH, which prevents the conversion of primary bile acids to secondary bile acids, and at low pH, the solubility of bile acids is reduced, decreasing their availability for carcinogenic activity.^[84] Out of these different fatty acids, Butyrate, is proven to have an inhibitory

effect on colon carcinogenesis. As one of the studies suggests, wheat bran, which contains insoluble dietary fibres, ferments slowly resulting in more concentration of Butyrate in distal colon.^[85] In an animal study, effects of three types of dietary fibres on fermentative production of butyrate in the distal colon to their effects on tumor mass in a rat model of bowel cancer was studied, where guar gum, wheat bran and oat bran was the choice of dietary fibres. They concluded that wheat bran fed rats had the lowest tumor numbers and mass and did not have the falling caeco-fecal gradients in butyrate concentration as seen with other products.^[84] According to another study, butyrate is the main fuel of colonocytes and it is used mostly over other short chain fatty acids.^[86]

Prebiotics: Prebiotics are defined as a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or more beneficial bacteria in the colon, and thus improves the host health.^[87] Over the years, prebiotic activity is featured in many food component, mainly Carbohydrates (oligosaccharides and polysaccharides). But it should be kept in mind that not all dietary non-digestible carbohydrates are prebiotics.^[87] Food items such as onions, asparagus, chicory, soybeans, burdock, contains oligosaccharides, whereas food items such as wheat, barley, brown rice, beans, peas, lentils, contains polysaccharides. Intake of non-digestible carbohydrates can decrease the concentration of certain biomarkers for cancer. Probiotics and prebiotics when combined together can result in synergistic effects on gastrointestinal function.

Polyphenolic Compounds: Regular intake of polyphenols by consuming fruits, vegetables and certain plants has been proven to be related to decrease of chronic diseases like cardiovascular diseases and cancer.^[88] These compounds, with their direct antioxidant action, affect several

metabolic pathways of the cancer cells.^[89] Peaches, pears, pomegranate, plums, raspberries, strawberries, blackberries, black and red currants, red chicory, red lettuce, shallots, tofu, almonds, flax seeds are some of the food items are rich in polyphenols. Recently, a study has found several novel polyphenolic compounds i.e. Resveratrol, Gallic acid, Chlorogenic acid and Caffeic acid. Resveratrol, found abundantly in red grapes, has protective activity against cancer of lung, breast, prostate, hepatocellular carcinomas, melanomas or glioblastomas whereas Gallic acid has action against gastric cancer and gliomas. Chlorogenic acid has protective action against hepatocellular carcinomas and fibroblastic sarcomas whereas Caffeic acid has preventive action against hepatocellular carcinomas and prostate and lung cancer.^[90]

GLYCEMIC INDEX AND ITS RELATIONSHIP WITH CANCER

Glycemic index is defined as blood glucose response measured as area under the curve (AUC) in response to a test food consumed by an individual under standard conditions expressed as a percentage of area under the curve (AUC) following consumption of a reference food consumed by the same person on a different way.^[91] Initially the standard food was glucose, but recently according to a study, it has been shifted to white bread.^[92] Based on classification of Glycemic Index, foods are categorised as Low (<55), Medium (55-69) or High (>70).^[93] Diets with high Glycemic index might increase the risk of cancer through high circulating blood glucose, increased insulin demand, and bioavailability of insulin like growth factor-1.^[94] Many studies reveal people with low Glycemic index diet have reduced chances of certain cancers. A study, done in Harvard University, observed 30% to 40% reduction in colon or rectal cancer with diet of low Glycemic index.^[95] In another study, there was also reduction of 70% in the risk of developing ovarian cancer.^[95]

Table 1: NUTRITIONAL RISK FACTORS FOR CANCERS [96]

Site of Cancer	High Risk Factors	Low Risk Factors
Stomach	<ol style="list-style-type: none"> 1. Salty Food 2. Salted or dried fish 3. Large amount of rice 4. Hot drinks and food 5. Irregular meals 	<ol style="list-style-type: none"> 1. Milk and dairy products 2. Raw vegetables 3. Fruits
Colorectum	<ol style="list-style-type: none"> 1. High-fat diet 2. Low-fibre diet 3. Beer (rectal cancer) 4. Cholesterol 	<ol style="list-style-type: none"> 1. High-fibre diet (grains and pulses) 2. Protein rich diet (cheese, beef)
Oesophagus	<ol style="list-style-type: none"> 1. Alcoholic beverages 2. Hot drinks and foods 3. Diet poor in protein, vitamins and minerals 	<ol style="list-style-type: none"> 1. Vegetables and fruits 2. Diet rich in proteins, vitamins, and minerals
Breast	High fat or calorie diet	-
Lung	Cholesterol	<ol style="list-style-type: none"> 1. Green-yellow 2. Vegetables 3. Carotene 4. Vitamin A

CANCER SPECIFIC DIETARY RECOMMENDATION

Given by World Health Organisation (2003), [97] this recommendation includes:

- To maintain weight among adult, such that Body Mass Index (BMI) is in the range of 18.5- 24.9 kg/m² and to avoid gaining weight (>5kg) in adult life
- Intake of alcoholic beverages is not recommended.
- Regular physical activity: The primary goal must be to do physical activity almost regularly. Sixty minutes per day of moderate intensity activity, for example, walking may be needed to maintain healthy body. More active activity, such as fast walking, may be beneficial in preventing cancer
- Consumption of Chinese style fermented fish should be minimal, especially in childhood.
- Overall intake of salt and salt-preserved food should be moderate.
- Exposure to aflatoxin in foods should be minimum.
- Diet should include 400 grams of fruits and vegetables, daily.
- Consumption of very hot (scalding hot) food or beverages is not recommended.
- Minimal consumption of preserved meat (such as sausages, salami, bacon, ham) are recommended.

CONCLUSION

Cancer is a worldwide problem that is caused by a variety of different factors increasing over a number of years. It is likely that more than a single factor is needed to produce such a malignancy. Researched showed that 1/3 of all cancer-related deaths were caused by incorrect human behaviours such as smoking, consumption of alcohol, poor diet quality and physical inactivity. The role of macro and micro-nutrients in the causation of cancer and eventually in its prevention is complicated by their combined distribution in food products. Intensive research into the nature of cancer prevention by nutrient components and their synthetic analogues is still in its infancy. As cancer induction, promotion and progression is a slow mechanism that could take many years, it is uncertain what time-period of dietary intake is most relevant. Currently, recommended prevention strategies include choose more/choose less approach, through emphasizing a shift away from high fat, low-fiber foods that may increase cancer risks, toward foods low in fat and rich in fibre and nutrients. Diet plays an important role by providing cancer preventing nutrients, reducing oxidative stress and inflammation can improve the overall way of leading life. It is now widely accepted that cancer is a preventable disease. Having a proper diet will not only reduce cancer risk but also improve other systemic and chronic diseases. According to a study,

neither conventional nor alternative therapies does magic in cancer treatment, but when both are combined at their best possible methods to beat cancer, that makes logical sense for the patient.

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