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Nutrition and Health Care for Cancer Care and Prevention

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Abstract: ***Nutrition and health care is a backbone of good health. Eating healthy foods with varieties of nutrients such as proteins, fats, carbohydrates, vitamins and minerals will boost our immune system and prevent us from chronic diseases including cancer. Cancers are the results of the interaction of genetics, epigenetics and environment of the individual. It is a chronic disease. Furthermore, healthy foods contain bioactive compounds which act as anti-oxidants, anti-carcinogenic, anti-tumour and immune system modulation which fight against cancer. Poor nutrition in a cancer patient cause malnutrition which leads to side effects such consequently increasing the risk of infection and eventually reducing chances of survival. On the other hand, by controlling diet and improving the life style, chances of cancer can be reduced up to 30 to 40 per cent The good nutrition and health care can contribute in improving the health of cancer patients whereas, poor nutrition and poor health care contribute towards mortality rate. There is a strong direct interrelation found between saturated fat intake and the incidence of breast, colon, and prostate cancers. It is found that chronic alcohol consumption is associated with increased risk of cancers of oral cavity, pharynx, esophagus, and larynx. Different physiologically functional components are found in the dietary materials which improve our immune system and prevent our body from chronic diseases. Therefore, food containing bioactive compounds should be included in our diet to avoid risk of chronic disease like cancer.***
Keywords: Bioactive compounds; Cancer; Nutrition; Health care; Cancer patients

I. INTRODUCTION

Nutrition and health care plays a vital role in treatment of cancer patient [1]. An honest nutrition is vital for a decent health and an improved immunity. Eating right diet before, during and after cancer treatment can help the patient to feels better maintain weight, lower chances of infection and stay stronger and more energetic. A healthy diet includes the correct quantity of foods and liquids that have all important nutrients like vitamins, minerals, protein, carbohydrates, fat, water and calories valuable for the body's rehabilitation [2]. When the body doesn't absorb the nutrient needed for health, it causes a condition, referred to as malnutrition. Anorexia and cachexia are the common causes of malnutrition during a cancer patient.

Poor nutrition of a cancer patient may cause malnutrition which can ends up in severe side effects, consequently increasing the danger of infection and eventually reducing chances of survival [3] Malnutrition could be a common problem in patient with cancer and result to potential significant adverse outcomes. Lack of appropriate nutrient increases the morbidity and mortality and reduces the standard of life. Cancer patients undergo tight treatment regimens and suffer pain which might affect them both physically and mentally.

On the opposite hand, by controlling diet and improving on life style, chances of cancer will be reduced up to 30 to 40 per cent [4]. The nice nutrition and health care can contribute the health of cancer patients whereas poor nutrition and health care contribute fatality rate to cancer patients. There's strong direct interrelations were found between saturated fat intake and also the incidence of breast, colon, and prostate cancers. It's reported that alcohol intake greater than 40 g per day is to be related with cancers of the oral cavity, pharynx, esophagus, and larynx, where alcohol interacts synergistically with smoking to extend risk. Great deal of dietary fibers and other dietary components related to high intake of whole grains, vegetables, and fruits significantly reduce the risks of carcinoma and to a lesser but definite extent of carcinoma. Insoluble grain fiber is more strongly related to decreased risk of cancer than soluble grain fiber. Vitamin A, C, E and trace minerals are involved in cancer protection. It's found that a low-density intake of phosphorus increases the plasma levels and this lower the chance of adenocarcinoma in ageing men. Vitamin D and calcium also are found to administer protection and chemoprevention against colorectal carcinoma. Retinoids can inhibit the method of malignant transformation in epithelial tissues and 1,3-Cis-Retinoic acid shows best end in the treatment of skin squamous-cell carcinoma and cervical cancer. The sort of food habit should be modified accordingly to save lots of populations from cancer. This criticism planning to open peoples mind about different types of cancers, their risk factors and therefore the role of nutrition and health care towards prevention of this chronic disease.

A. What is Cancer?

Cancer is the uncontrolled growth of abnormal cells anywhere within the body. These abnormal cells are termed as cancer cells, malignant cells or tumor cells. These cells can infiltrate normal body tissues. Many cancers and also the abnormal cells that compose the cancer tissue are further identified by the name of the tissue that the abnormal cells originated from (for example, breast cancer, lung cancer, and colorectal cancer). When damaged or unrepaired cells don't die and become cancer cells and show uncontrolled division and growth a mass of cancer cells develop. Frequently, cancer cells can break away from this original mass of cells, travel through the blood and lymph systems and lodge in other organs where they'll again repeat the uncontrolled growth cycle. This process of cancer cells leaving a section and growing in another body area is termed metastatic spread or metastasis. For instance, if breast cancer cells spread to a bone, it means the individual has metastatic breast cancer to bone.

B. The Development of Cancer (Pathogenesis: Initiation, Promotion, and Progression

Carcinogenesis may be a multistage process which caused by a cancer-producing agent (carcinogen) which doesn't result in the immediate production of a tumor. There are a series of changes after the initiation step induced by the carcinogen. The following stages tumor promotion could also be produced by the carcinogen or by other substances (promoting agents), which don't themselves "produce" tumors. Initiation is that the primary and essential step within the process which is extremely rapid but once the initial change has taken place the initiated cells may persist for a substantial time, perhaps the generation of the individual. The foremost likely site for the first event is within the genetic material (DNA), although there are other possibilities. The carcinogen is assumed to damage or destroy specific genes probably within the vegetative cell population of the tissue involved. A compound that reacts with DNA and somehow changes the genetic makeup of the cell is named a mutagen. The mutagens that predispose cells to develop tumors are called initiators and also the non-reactive compounds that stimulate tumor development are called promoters. A compound that acts as both an initiator and a promoter is noted as a 'complete carcinogen' because tumor development can occur without the application of another compound.

C. Initiation

Initiation is the initial stage in the two-stage model of cancer development. Initiators if not already reactive with DNA, are altered (frequently they're made electrophilic) via drug-metabolizing enzymes within the body and are then able to cause changes in DNA (mutations). Since many initiators must be metabolized before becoming active, initiators are often specific to particular tissue types or species. The consequences of initiators are irreversible; once a selected cell has been affected by an initiator it is susceptible to promotion until its death. Since initiation is that the results of permanent genetic change, any daughter cells produced from the division of the mutated cell will carry the mutation.

D. Promotion

Once a cell has been mutated by an initiator, it is prone to the results of promoters. These compounds promote the proliferation of the cell, giving rise to huge number of daughter cells containing the mutation created by the initiator. Promoters don't have any effect when the organism in question has not been previously treated with an initiator. Unlike initiators, promoters don't covalently bind to DNA or macromolecules within the cell. Many bind to receptors on the cell surface so as to affect intracellular pathways that result in increased cell proliferation. There are two general categories of promoters: specific promoters that interact with receptors on or in target cells of defined tissues and nonspecific promoters that alter organic phenomenon without the presence of a known receptor. Promoters are often specific for a selected tissue or species because of their interaction with receptors that are present in numerous amounts in several tissue types. While the danger of tumor growth with promoter application is dose-dependent, there's both a threshold and a maximum effect of promoters. Very low doses of promoters won't cause tumor development and intensely high doses won't produce more risk than moderate levels of exposure.

E. Progression

In mice, a repeated promoter application on initiator-exposed skin produces benign papillomas. Most of those papillomas regress after treatment is stopped, but some reach cancer. The frequency of progression suggests that the papillomas that achieve cancer have acquired an extra, spontaneous, mutation. The term progression, coined by Leslie Foulds, refers to the stepwise transformation of a benign tumour to a neoplasm and to malignancy. Progression is related to a karyotypic change since virtually all tumors that advance are aneuploid (have the incorrect number of chromosomes).

This karyotypic change is coupled with an increased rate of growth, invasiveness, metastasis and an alteration in biochemistry and morphology. Figure 1 below shows different stages of cancer development like initiation, promotion and propagation.

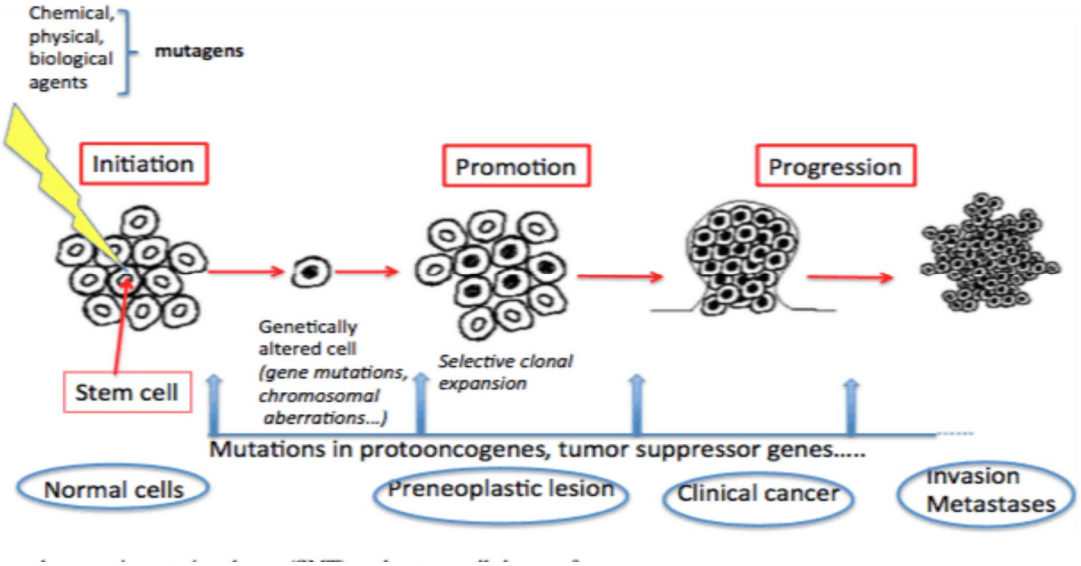

Figure 1: Development of cancer (pathogenesis): initiation, promotion, and progression

F. Metabolic and Nutritional Alterations in Malignancy

1) Abnormalities in metabolism.
2) Anorexia
3) Mal-absorption
4) Fluid-electrolyte imbalances
5) Anemia
6) Taste and appetite changes
7) Learned food aversions
8) Hypercalcemia
9) Osteomalcia

G. Abnormalities in Metabolism

The extreme weight loss and weakness is caused by abnormalities in glucose metabolism, within which cancer patients cannot produce glucose efficiently from carbohydrates and "feed off" their own tissue protein and convert it to glucose. Glucose intolerance occurs in cancer patients due to increased insulin resistance and due to inadequate insulin release. There's increased lipolysis, free fatty acids, and glycerol turnover and decreased lipogenesis and hyperlipidemia. Fat oxidation rates are higher. The rates of whole body catabolic rate exceeds that of synthetic rate, depletion of body protein occurs. Albumin is depleted in cancer.

H. Anorexia

The anorexia is usually in the course of depression or discomfort from normal eating. This contributes further to a limited nutrient intake at the time the disease process causes an increased rate and nutrient demand. This imbalance of decreased intake and increased demand creates a negative balance resulting in "cancer cachexia". Loss of appetite can occur due to the systemic effect of the metastatic tumor. Anorexia ends up in weight loss and malnutrition.

I. Malabsorption

This can occur due to blind loop syndrome. The associated overgrowth of bacteria within the upper small bowel may lead to steatorrhea and vitamin B12 deficiency. Resulting abnormalities of the intestinal epithelium also cause malabsorption. Protein-losing enteropathy can occur in intestinal lymphoma, gastric carcinoma and tumors arising outside the digestive tract (malignant melonoma).

Biliary obstruction due to malignancy can produce deficiency of prothrombin, resulting in blood coagulation problems and deficiency of bile flow. This successively interferes with normal digestion and absorption causes further decreased calcium absorption and metabolism with subsequent osteomalacia. Protein and electrolyte absorption and other nutrients might also be diminished by solid tumor infiltration of the small intestine or dissemination to lymph nodes. Abdominal tumors can also cause either gastrolic or jejunocolic fistulas. This leads to a bypass of the tiny intestine and contributes to the next mal-absorption. Diarrhea and steatorrhea furthermore as protein loss follow. Extensive protein can also be lost in exudates related to various gastrointestinal enteropathies.

J. Fluid-electrolyte Imbalances

Gastrointestinal lesions leading to general malabsorption can contribute to fluid and electrolyte losses. Vomiting and diarrhea bring loss of water and loss of water-soluble vitamins. Villous adenoma and adenocarcinomas of the colon can contribute to severe electrolyte imbalance.

K. Anemia

Anorexia with curtailment of dietary nutrients required for hemoglobin synthesis, iron, protein, folic acid, vitamin B12, and vitamin C as well as malabsorption of these materials can be the underlying cause of anemia. Increase hemolysis, bleeding of ulcerated lesions or presence of gastrointestinal fistulas can also be the contributory factors of anemia.

L. Taste and Appetite Changes

These may be due to psychosomatic factors, fear, pain and side effects of medications. Chemotherapy or head and neck radiation may cause taste blindness and inability to distinguish the basic tastes of salt, sweet, sour or bitter with consequent food aversions.

M. Learned Food Aversions

The fear and uncertainty engendered by the diagnosis of cancer and its uncertain outcome and the stress of diagnostic procedures are exacerbated by the physiologic and metabolic effects of various antitumor interventions. Those stresses can cause learned food aversions. This behavior is the unconscious association of the consumption of a particular food with a concurrent or subsequent unpleasant reaction such as nausea and vomiting. The result is subsequent avoidance of that food.

N. Hypercalcemia

It is the most common metabolic complications of cancer. Approximately, 20 to 40 per cent of patients with breast, squamous, bladder, and renal carcinoma develop hypercalcemia at some point in their disease.

1) *Osteomalcia:* Certain tumors reduce plasma calcitriol concentration in conjunction with hypophosphatemia, thereby inducing an oncogenic osteomalcia. Gastrointestinal malabsorption of calcium and phosphate has been observed.

II. DIFFERENT TYPES OF CANCERS AND THEIR RISK FACTORS

A. Oesophageal Cancer

There are two styles of oesophageal cancer: epithelial cell carcinoma and adenocarcinoma. The squamous form predominates in most of the universe, whereas adenocarcinoma is comparatively common only in Western countries, where rates have recently increased. Obesity is a longtime risk factor for adenocarcinoma, probably partly due to reflux of stomach contents into the oesophagus [1,5]. Alcohol increases the chance of epithelial cell carcinoma but not of adenocarcinoma [6]. Smoking increases the chance of both types, with a bigger effect for epithelial cell carcinoma [6]. Oesophageal cancer incidence rates are very high in parts of eastern and southern Africa, Linzhou (China), and Golestan (Iran) [7-6]. People in high risk populations have often consumed a restricted diet, low in fruit, vegetables, and animal products, so deficiencies of micronutrients are postulated to elucidate the high risk. Despite several observational studies and a few randomised trials, however, the relative roles of varied micronutrients aren't yet clear [6,8,9,10]. In Western countries early case-control studies indicated a protective role for fruit and vegetables [11-12], but more recently published prospective studies show weaker associations which could result to residual confounding from smoking and alcohol consumption [5]. Consumption of drinks like tea and mate when scalding hot is related to an increased risk of oesophageal cancer [13-15]. Drinking beverages above 65°C is assessed by International Agency for Research on Cancer (IARC) as probably carcinogenic to humans [16]

B. Stomach Cancer

Stomach cancer is the fifth commonest cancer worldwide, with the very best rates in eastern Asia [7]. Eating large amounts of salted foods like salt preserved fish is related to an increased risk [17] Takachi *et al*., 2010; this may be caused by the salt itself or by carcinogens derived from the nitrites in many preserved foods. Salted food might increase the chance of Helicobacter pylori infection (an established explanation for stomach cancer) and act synergistically to market development of the disease [18-19]. Some evidence indicates that eating large amounts of pickled vegetables increases the danger of stomach cancer due to the assembly of N-nitroso compounds by mould or fungi, which are sometimes present in these foods [20-21]. The chance of stomach cancer can be decreased by diets high in fruit and vegetables and for people with high plasma concentrations of vitamin C [22]. A trial in Linzhou, China, showed that supplementation with β carotene, selenium, and α tocopherol resulted in an exceedingly significant reduction in stomach cancer mortality [8] Other trials have indicated enhanced regression of precancerous lesions with the employment of supplements of antioxidant, β carotene, or both [23-24]. Prospective studies in Japan have also shown an inverse association between stomach cancer risk and green tea consumption in women (the majority of whom are non-smokers), perhaps associated with polyphenols [25]. These studies indicate a protective role of antioxidant micronutrients or other antioxidant compounds, but these associations need clarification.

C. Colorectal/colon Cancer

Colorectal cancer is the third commonest cancer within the world [7]. Overweight and obesity increase risk [26-28] as do alcohol and smoking [29]. Ecological analyses show striking positive correlations between eating meat and colorectal cancer rates [30-31]. In 2015 IARC classified processed meat as carcinogenic to humans and unprocessed meat as probably carcinogenic [32-33] partly supported a meta-analysis reporting a rise in risk of 17per cent for every daily 50 g increment in consumption of processed meat and 18 per cent for every 100 g increment in consumption of meat [32]. More modern systematic reviews have reported smaller increases in risk for unprocessed red meat [26-27]. The chemicals used to preserve processed meat, like nitrates and nitrites, might increase exposure of the gut to mutagenic, N-nitroso compounds [32]. Both processed and unprocessed red meat also contain haem iron, which could have a cytotoxic effect within the gut and increase formation of N-nitroso compounds. Cooking meat at high temperatures can generate mutagenic heterocyclic amines and polycyclic aromatic hydrocarbons [32].Whether any of those putative mechanisms explain the association between eating red and processed meat and risk for colorectal cancer is unclear [31-32]. Higher consumptions of milk and calcium are related to a moderate reduction in risk of colorectal cancer [26]. The research by [34-36] revealed that calcium may well be protective by forming complexes with secondary bile acids and haem within the intestinal lumen. Higher circulating concentrations of vitamin D are related to a lower risk [37], but this might be confounded by other factors such as physical activity. Mendelian randomization studies of genetically determined vitamin D have not supported a causal relation [38-39]. In 1970s Burkitt suggested that the low rates of colorectal cancer in parts of Africa were caused by the high consumption of dietary fibre [40]. Prospective studies have shown that consuming 10 g more total dietary fibre on a daily basis is related to a mean 10% reduction in risk of colorectal cancer; further analyses suggest that cereal fibre and whole grain cereals are protective, but not fibre from fruit or vegetables [41-42]. High dietary folate intake has been related to reduce risk of colorectal cancer, and adequate folate status maintains genomic stability [26] but high folate status might promote the expansion of colorectal tumours [43]. Whether folate or folic acid has any material impact on the danger of colorectal cancer is uncertain. Most randomised trials of folic acid supplementation have found no effect, [44-45] and although studies of the gene for methylenetetrahydrofolate reductase has indicated that lower circulating folate is related to a rather lower risk, the interpretation of those genetic data isn't uncomplicated [46]

D. Liver Cancer

Alcohol is that the main diet related risk factor for liver cancer, probably through the development of cirrhosis and alcoholic hepatitis [29]. Overweight and obesity also increase risk [26]. Aflatoxin, a mutagenic compound produced by the fungus Aspergillus in foods like grains, nuts, and edible fruit when stored in hot and humid conditions, is classified as a carcinogen by IARC and is a very important risk factor in some low income countries (for people with active hepatitis virus infection) [47]. The key non-dietary risk factor is chronic infection with hepatitis B or C viruses. Some studies indicate an inverse association between coffee drinking and risk of liver cancer [26]. Coffee may need a real protective effect because it contains many bioactive compounds [48-49], but the association could be influenced by residual confounding, additionally as by reverse causation if subclinical disease reduces appetite for coffee.

E. Pancreatic Cancer

Obesity increases risk of pancreatic cancer by about 20 per cent [26].Diabetes is additionally related to increased risk, and a Mendelian randomization analysis indicates that this is often because of raised insulin instead of diabetes itself [50].Studies of dietary components and risk are inconclusive [26].

F. Lung Cancer

Lung cancer is the commonest cancer in the world, and heavy smoking increases risk around 40-fold [7, 29]. Prospective studies have indicated that diets higher in fruits and vegetables are related to a slightly lower risk of lung cancer in smokers [51-52]. The weak inverse association of fruit and vegetables with carcinoma risk in smokers might perhaps indicate some true protective effect, but it would simply ensue to residual confounding by smoking. Trials that tested supplements of β carotene (and retinol in one trial) to prevent lung cancer showed an unexpected higher risk of lung cancer in participants within the intervention group [53-54]

G. Breast Cancer

Breast cancer is the second most cancer in the world [7] Reproductive and hormonal factors are key determinants of risk [55]. Obesity increases breast cancer risk in postmenopausal women, probably by increasing circulating oestrogens, which are produced by aromatase in fatty tissue [56]. Most studies have shown that obesity in premenopausal women is related to a discount in risk, perhaps because of lower hormone levels associated with an increased frequency of an-ovulation [57]. Alcohol increases risk by about 10 per cent for every drink consumed daily [26, 58] the mechanism might involve increased oestrogens. Much controversy has surrounded the hypothesis that a high fat intake in adulthood increases breast cancer risk. Early case-control studies supported this hypothesis, but prospective observational studies have overall been null, [26] and two randomised controlled trials of a reduced fat diet were also null [59-60].Studies of other dietary factors including meat, dairy products and fruit are generally inconclusive [26]. Some recent studies have indicated an inverse association between vegetable intake and risk of oestrogen receptor negative breast cancer [26,61,62] and between dietary fibre and overall risk [26,63]. Isoflavones, largely from soya, are related to a lower risk of breast cancer in Asian populations [64]. These associations are potentially important and will be investigated for causality.

H. Dietary fat and Breast Cancer

Current information links nutrition and dietary factors to the chance of developing carcinoma, similarly on survival and outcomes after a diagnosis of carcinoma. Epidemiological and other data suggest that foods rich in saturated fat and lower in fibers are related to the high incidence of carcinoma. Several pilot intervention studies are performed in women with breast cancer by providing decreased amount of dietary fat. Other studies suggest that weight gain after breast cancer is usually found, which can be detrimental for survival. These reports suggest that further studies are essential for better understanding the connection between nutritional factors and also the breast cancer [65]. A hospital-based study in Northern Italy and Southern France on host-related risk factors and breast cancer reported that High Density Lipoprotein (HDL)-cholesterol levels should be specially checked in women who are quite 59 years old or in premenopausal women presenting an occasional basal rate, or in postmenopausal women with an early menopause as HDL-Cholesterol level appears to be associated with estrogen metabolism [66].The strong direct interrelations were found between saturated fat intake and also the incidence of breast, colon, and prostate cancers and between intakes of total polyunsaturated fatty acids and also the occurrence of breast and prostate cancers. Not only could the quantity of fat, but also the type of fat consumed also be a very important risk considers cancer development. Taking of the longer chain, highly polyunsaturated omega-3-fatty acids found in certain sea fishes may give protection against cancer. This finding has been proved by studies of populations like Greenland Eskimos who are at low risk for cancer, including carcinoma, as they consume a substantial amounts of fat derived from sea fish [67]. The vegetable oil, which contains great amount of the monounsaturated fatty acid, tends to possess an inhibitory action on tumor growth in animals [68]. The study conducted in the university of Nebraska centre Omaha, the skin tumour promotion will be inhibited by restriction of fat and carbohydrate calories in Sencar mice [69]. Again, Nutrition and Endocrinology, American Health Foundation, Valhalla, suggests that diets rich in omega-6-polyunsaturated fatty acids stimulate the growth and metastases of transplantable mammary carcinomas in rodents, whereas fish-oil containing diets, rich in fatty acids, suppress the growth of those mammary tumor cells [70]. From an in vitro invasion assay system, the consequences of polyunsaturated fatty acid, an omega-6-fatty acid, and 2-omega-3-fatty acids, omega-3 fatty acid (EPA), and decosahexaenoic acid (DHA) on human breast cancer cells, it's suggested that the results of those fatty acids are mediated through eicosanoid biosynthesis [71].

I. Prostate Cancer

Prostate cancer is the fourth most typical cancer within the world [7]. The only well-established risk factors are age, case history, black ethnicity, and genetic factors [70]. Obesity probably increases the chance for more aggressive varieties of prostate cancer [26]. Lycopene, primarily from tomatoes, has been related to a reduced risk. Some studies have indicated that risk may well be reduced with higher levels of other micronutrients including β carotene, vitamin D, vitamin E, and selenium, but the findings from trials and mendelian randomization analyses are overall null or inconclusive [37,72,73,74]. Isoflavones, largely from soya foods, are related to a reduced risk for prostate cancer in Asian men, [75] and plasma concentrations of the isoflavone equol could be inversely related to prostate cancer risk in men in Japan [76]. Substantial evidence shows that prostate cancer risk is increased by high levels of the hormone insulin-like growth factor 1, which stimulates cellular division, and further research is required to see whether dietary factors, like animal protein, might influence prostate cancer risk by affecting production of this hormone.

J. Brain Cancer

Primary brain tumors originate in the brain itself or in tissues close to it, such as in the brain-covering membranes (meninges), cranial nerves, pituitary gland or pineal gland. Primary brain tumors begin when normal cells acquire errors (mutations) in their DNA. These mutations allow cells to grow and divide at increased rates and to continue living when healthy cells would die. The result is a mass of abnormal cells, which forms a tumor. In adults, primary brain tumors are much less common than are secondary brain tumors, in which cancer begins elsewhere and spreads to the brain. Many different types of primary brain tumors exist. Each gets its name from the type of cells involved. Examples include:

1) *Gliomas:* These tumors begin in the brain or spinal cord and include astrocytomas, ependymomas, glioblastomas, oligoastrocytomas and oligodendrogliomas.
2) *Meningiomas:* A meningioma is a tumor that arises from the membranes that surround your brain and spinal cord (meninges). Most meningiomas are noncancerous.
3) *Acoustic Neuromas (Schwannomas):* These are benign tumors that develop on the nerves that control balance and hearing leading from your inner ear to your brain.
4) *Pituitary Adenomas:* These are mostly benign tumors that develop in the pituitary gland at the base of the brain. These tumors can affect the pituitary hormones with effects throughout the body.
5) *Medulloblastomas:* These are the most common cancerous brain tumors in children. A medulloblastoma starts in the lower back part of the brain and tends to spread through the spinal fluid. These tumors are less common in adults, but they do occur.
6) *Germ Cell Tumors:* Germ cell tumors may develop during childhood where the testicles or ovaries will form. But sometimes germ cell tumors affect other parts of the body, such as the brain.
7) *Craniopharyngiomas:* These rare, noncancerous tumors start near the brain's pituitary gland, which secretes hormones that control many body functions. As the craniopharyngioma slowly grows, it can affect the pituitary gland and other structures near the brain.
8) *Cancer that Begins Elsewhere and Spreads to the Brain:* Secondary (metastatic) brain tumors are tumors that result from cancer that starts elsewhere in your body and then spreads (metastasizes) to your brain. Secondary brain tumors most often occur in people who have a history of cancer. But in rare cases, a metastatic brain tumor may be the first sign of cancer that began elsewhere in your body. In adults, secondary brain tumors are far more common than are primary brain tumors. Any cancer can spread to the brain, but common types include: breast cancer, colon cancer, kidney cancer, lung cancer and melanoma. The signs and symptoms of a brain tumor vary greatly and depend on the brain tumor's size, location and rate of growth. General signs and symptoms caused by brain tumors may include new onset or change in pattern of headaches, headaches that gradually become more frequent and more severe, unexplained nausea or vomiting, vision problems, such as blurred vision, double vision or loss of peripheral vision, gradual loss of sensation or movement in an arm or a leg, difficulty with balance, speech difficulties, confusion in everyday matters, personality or behavior changes, seizures, especially in someone who doesn't have a history of seizures and hearing problems. The risk factors for brain cancer include
9) *Exposure to Radiation:* People who have been exposed to a type of radiation called ionizing radiation have an increased risk of brain tumor. Examples of ionizing radiation include radiation therapy used to treat cancer and radiation exposure caused by atomic bombs blast
10) *Family History of Brain Tumors:* A small portion of brain tumors occurs in people with a family history of brain tumors or a family history of genetic syndromes that increase the risk of brain tumors.

K. Leukemia/blood Cancer

Leukemia could be a cancer of the blood or bone marrow. Bone marrow produces blood cells. Leukemia can develop due to a problem with blood production. It always affects the leukocytes, or white blood cells. Leukemia is possibly to affect people over the age of 55 years, but it's also the foremost common cancer in those aged below 15 years. The National Cancer Institute estimates that 61,780 people will receive a diagnosis of leukemia in 2019. They also predict that leukemia will cause 22,840 deaths within the same year. Acute leukemia develops quickly and worsens rapidly, but leukemia gets worse over time. There are several differing types of leukemia, and also the best course of treatment and a person's chance of survival depend on which kind they need. Leukemia develops when the DNA of developing blood cells, mainly white cells, incurs damage.

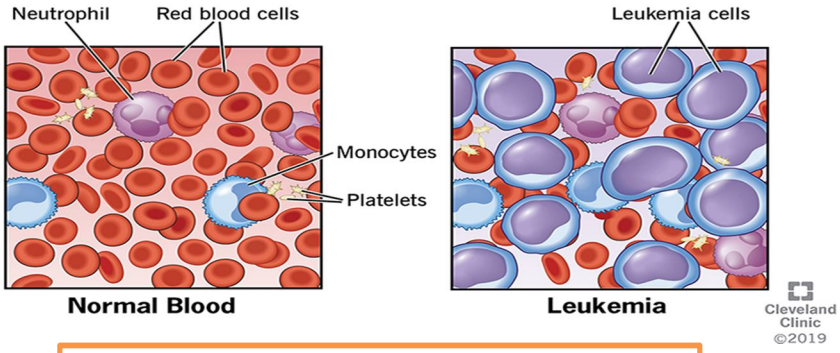

Figure 2: Normal blood cells vs. leukemia

III. THE ROLE OF DIET (FUNCTIONAL FOODS) IN CANCER PREVENTION

The risk of cancer may be influenced by certain type of diet such as heterocyclic amine produced during charcoal smoking of meat or sausages, acrylamide compound from French fries, toasted beads etc. On other hand, cancer can be prevented by consumption of varieties of fruits and vegetables, red wine and food supplements. Research findings have been elucidated the effects of bioactive compounds present in foods and cancer protection. The different bioactive compounds present in foods have been shown the capability of lowering, preventing and cure certain types of cancers including colon, prostate, breast etc. The table 1 below summarizes the different bioactive compounds present in various foods and their role in ameliorating cancer risks.

Table 1: Sources function and effect of different functional foods in cancer prevention

Functional foods	Dietary Sources	Function	Effects	References
α-Carotene	Yellow-orange and dark-green vegetables	Antioxidant, anti-cancer, improve vision, improve immune	In moderate dose increase enhance gap junctional intercellular communication	[77]Rutovskikh *et al*., 1997
β-Carotene	Green leafy vegetables and orange and yellow fruits and vegetables	Antioxidant, anti-cancer, anti- cholesterol, free radicals scavenging activity, improve vision, improve immune system	In moderate dose increase enhance gap junctional intercellular communication, prevent lung cancer,	[77-84]
Lycopene	Tomatoes, water melon, apricot, peaches, pink grapefruit, tomato ketchup	Antioxidant, anti-cancer, improve heart health,	Lycopene is more potent than α and ß-carotene in inhibiting the cell growth of various human cancer cell lines	[85-86]
Lutein	Dark green leafy vegetables	Antioxidant, anti-cancer, anti- inflammatory, anti-cholesterol, improve immune system, skin health and vision	Lutein is efficient in cell cycle progression and inhibit growth of a number of cancer cell types	[87]

β-Cryptoxanthin	Orange fruits	Antioxidant, anti-cancers	Lutein is efficient in cell cycle progression and inhibit growth of a number of cancer cell types	[87]
Astaxanthin	Green algae, salmon, trout	Antioxidant, anti-cancer	The modification of gap junction communications	[89]
Canthaxanthin	Salmon, crustacean	Antioxidant, ant cancers	Free radical scavengers and potent quenchers of reactive oxygen species	[88]
Fucoxanthin	Brown algae, heterokonts	Antioxidant, anti- cancer and anti- inflammatory	Anti-cancer and anti-inflammatory	[90]
Isothiocyanates, glucosinolates, isothiocyanates, indoles, dithiolthiones and sulfonates	Broccoli, cauliflower, cabbage, kale, brussels sprout, bokchoy and kale	Antioxidant, anti-cancers, inhibits cell proliferation in vitro, detoxification of carcinogens from cigarette smoke.	Lowering risk of lung, breast, liver, esophagus, stomach, small intestine and colon cancers	[91-92]
Flavonoids	Synthesize in plants	Antioxidant, anti-cancers, anti-viral, anti-bacteria, prevent LDL oxidation hence ant-cholesterol, inhibit platelet aggregation, reduce risk of CVDs, BP regulation due to vasodilatory effect, anti-inflammatory, improve endothelia function, free radicals scavenging property,	Efficient in prevention or treatment of many types of cancers such as bowel cancer, pancreas cancer, bladder cancer, breast cancer etc.	[93-100]
Probiotics	Yoghurt and fermented foods	Antioxidant, anti-cancers (colorectal), ant-diarrhoea, anti-lactosemia, improve immune systems, enhance mineral absorption, promote appetite, improve gastro intestinal truck health.	Alleviating symptoms of cancer and prevent colorectal cancers	[101]
Phyto-estrogens (genistein and daidzein)	Soya and Phyto-estrogens rich foods	Anti-cancer (breast and prostate)	Compete with endogenous estrogens for binding to estrogen receptor	[102]
Fiber	In most foods (vegetable and cereals and etc.)	Lowering cholesterol, ant-cancer, ant-constipation, prevent overweight and obesity balance intestinal pH, nourish colon microflora,	Lowering colon and prostate cancer	[103-107]
Omega-3 fatty acid	Fish or fish oil	Lowering cholesterol, prevent CVDs, anti-cancer,	Lowering breast and prostate cancer	[108-109]
Retinoids	Liver, egg yolk and other animal products	Anti- malignant transformation, anti-cancers	Prevent risk of skin cancer, cervical cancer, leukemia cancer	[110-112]

IV. CONCLUSION

Nutrition and health care is a key determinant of good nutrition and protector of chronic diseases including cancer. Bioactive compounds present in different foods including fruits and vegetables have shown positive association with cancer prevention. This potentially cancer-inducing oxidative damage might be prevented or limited by dietary bioactive compound found in fruit and vegetables. Studies to date have demonstrated that bioactive compounds in common fruit and vegetables can have complementary and overlapping mechanisms of action, including modulation of detoxification enzymes, scavenging of oxidative agents, stimulation of the immune system, regulation of gene expression in cell proliferation and apoptosis, hormone metabolism, antibacterial and antiviral effects. This review recommends the following guidelines in order to prevent chronic diseases including cancer.

V. RECOMMENDATIONS

A. Maintain or achieve a healthy weight (BMI). Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
B. Limit added sugars and solid (saturated) fats in your diet.
C. Choose long chain polyunsaturated fatty acid such as fish oil and olive oil
D. Limit the amount of fat in your meals by choosing a lower-fat cooking method like baking, steaming or boiling.
E. Include vegetables, fruits and whole grains in your diet. Eat at least $2\,^{1}/_{2}$ cups of vegetables and fruits each day.
F. Try for a variety of colours when choosing your vegetables and fruits.
G. Try substituting a couple of meals with plant-based foods.
H. Focus on plant proteins (pulses and legumes)
I. Avoid or limit alcohol (2 glasses of red wine is recommended per day)
J. Choose functional foods first for your preparation of balanced diet
K. Limit consumption of processed meats and red meats. If you choose to eat red meat, select lean cuts and eat smaller portions.
L. Choose 100% juice if you drink vegetable or fruit juices.
M. Choose whole grains instead of refined-grain products. Limit consumption of refined carbohydrate foods including pastries, candy, sugar-sweetened breakfast cereals, and other high-sugar foods.
N. Finally, remember to include all forms of maintaining good health in the life in your wellness program like physical activity such as exercise, good nutrition, sleep, mediation, and mindfulness to stay strong and healthy

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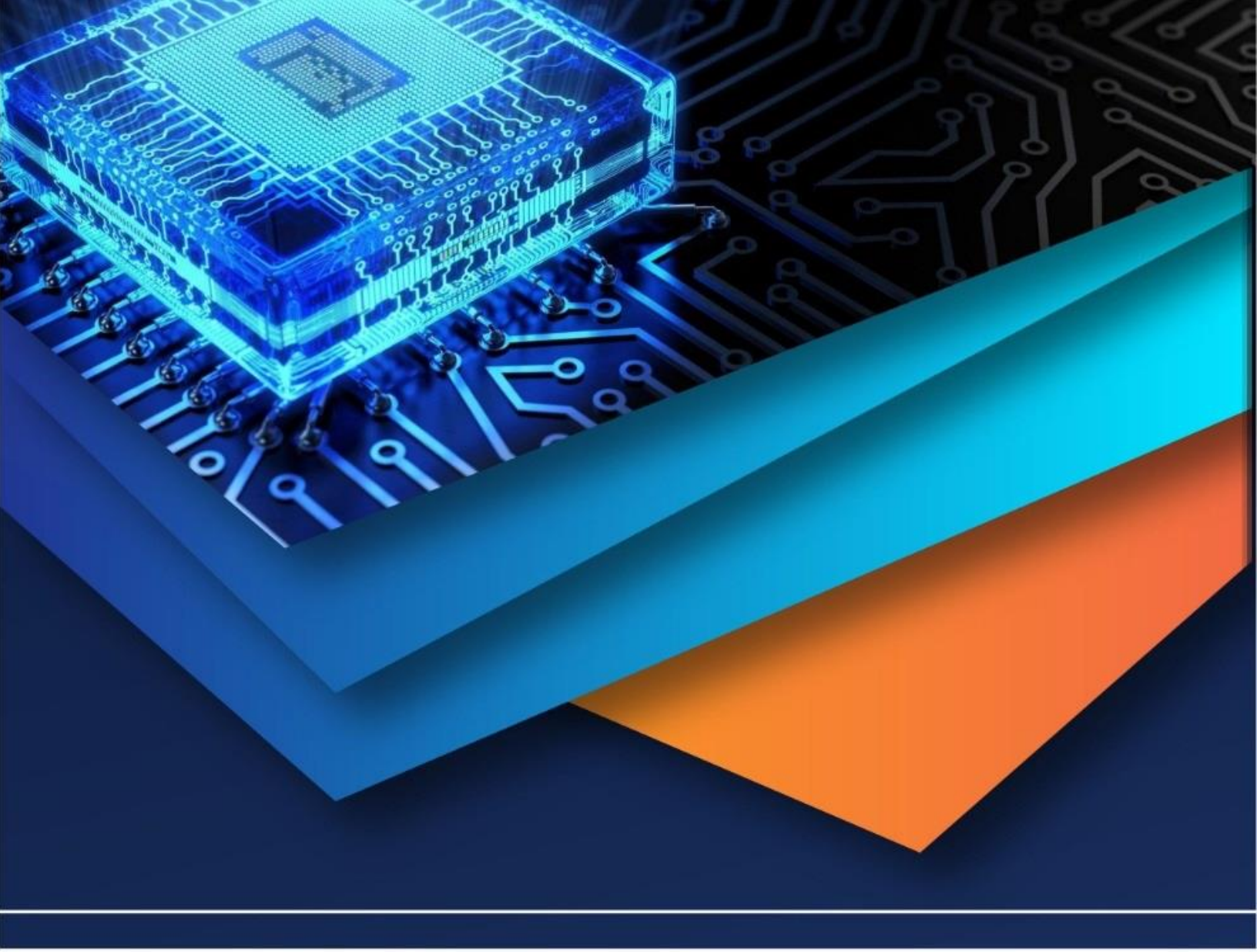

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