MANAGING CANCER AILMENT USING NUTRITIONAL FOOD: A REVIEW

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DOI: https://doi.org/10.33281/JTHS20129.2021.2.1

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Abstract
Cancer has become one of the deadly diseases in the word today. Scientists/researchers have been creating awareness on this disease and how one can live a healthy life to avoid cancer and other dangerous diseases affecting human generation. This paper examines causes of cancer, carcinogens in food and other food related risk factors. This paper equally highlights various forms of manifestation of cancer in human body and outlines nutritional guideline for cancer patients. The study, being a review made use of secondary data. Findings from the study shows that food nutrients can affect cancer by either promoting or preventing it, depending on the type of food and its method of preparation. The use of food additives and pesticides in food and food areas should be done with care and caution. The paper concludes that healthy diet rich in a variety of vegetables, fruits, legumes (beans) vitamins and low intake of red and processed meat can help mitigate cancer ailment, especially when the food items mentioned are prepared or handled professionally.
Keywords: *Cancer, carcinogens, ailment, nutrition.*

Introduction

Cancer is described as a group of disease characterized by unrestrained cell division and growth that can spread beyond the tissue in which it started. Cancer is said to be developed basically through a two-step process of mutation and metastasis. First an initiator such as x-ray, starts the sequence by altering the genetic material of a cell, the Deoxyribonucleic Acid (DNA) and causing mutation (Drummond, 2010). Often, these cells are repaired or replaced. When repair or replacement does not occur, promoters such as alcohol can advance development of mutated cell into a tumor, finally this tumor may leave the tissue for other sites, a process called metastasis. It can therefore be deduced that cancer can develop as a result of interaction between the environmental factors such as diet, smoking, alcohol, radiation and genetic factors. Research suggests that diet may play a role in the cause of certain cancer. A study reported that diet influences 30 to 40 percent of cancers in men, and 60 percent in women (Graham, 1987).

As the second leading cause of death in the United States of America (USA), following heart disease, cancer was responsible for approximately 472,000 deaths in 1986. Grant et al (2000) reported that most cancer patients

experience chemosensory alterations - lack of appetite, increased sensitivity to smell, weight loss, low energy intake, worse and unproductive quality of life. Cancer patients also report early satiety and food allusions, trauma and depression. The American Cancer Society (ACS) reported in 2016 that dietary interventions such as dietary counseling, flavor enhancement, oral supplementation or tube feeding have been found to lessen weight loss and improve the health status of cancer patient (Pacagnala & Clement, 2017).

There is need to better understand the relationship between treatment and diet among a larger, more diverse group of cancer patient to inform them about the development of dietary interventions that mitigate symptoms during cancer treatment and improve quality of life.

The objective of this study is to (i) determine the role of nutrition in cancer prevention and treatment. (ii) identify carcinogenic food substances capable of causing cancer. (iii) identify the various forms of cancer manifestation in the human body. (iv) highlight the menu plans, preparation and guidelines for preventing or lowering cancer risk.

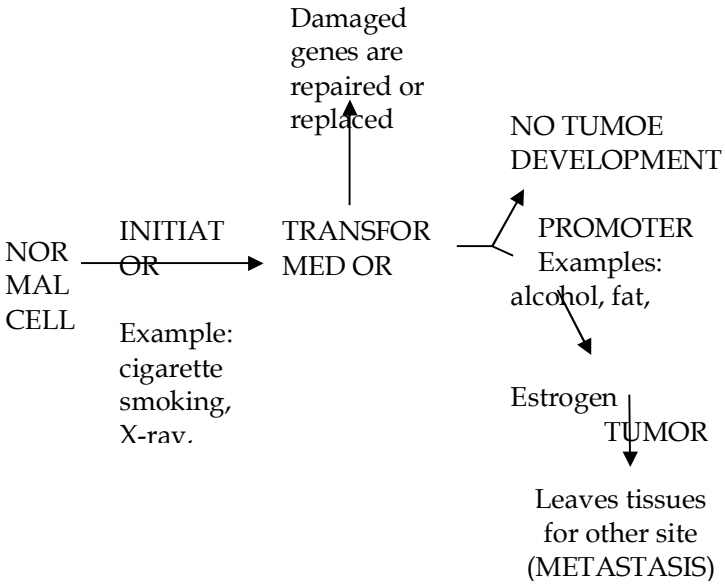
Research Method

This research work is purely a review, hence its heavy reliance on secondary data with information sourced from textbooks, magazines, newspaper publications, internet, online publications and journal articles.

Literature Review

Cancer develops as a result of interaction between environmental factors (such as diet, smoking, alcohol and radiation) and genetic factors. Research suggests that diet may play a role in the causes of certain cancers. Estimates of how much cancer is caused by diet varies. A study reported that diet influences 30 to 40 percent of cancers in men, and 60 percent in women, (Karen Drumond, 2010). Another study estimated that over 35 percent of cancers were influenced by diet. The scientific evidence indicating that diet and nutrition can affect the risk of developing cancer comes from two areas; experiments with laboratory animals and human epidemiological studies. The experimental studies have the potential to find if a component of the diet causes cancer; that is the manipulation of specific dietary components may be shown to influence the occurrence of cancer. Epidemiological studies involve testing the diet-cancer hypothesis on a certain population, (Karen Drumond, 2014).

Fig. 1: Cancer Development Process



Source: Drummond, K. E. (2010)

Carcinogens in Food

Carcinogens are substances causing cancer in living tissue. They are substances that have potential to cause cancer. They are discussed as they relate to food.

Food Additives

In its broadest sense, a food additive is any substance added to food. Legally, the term refers to "any substance, the intended use of which result or may reasonably be expected to result directly or indirectly in it becoming a component or otherwise affecting the characteristic of any food. Additives improve the nutritional value of certain food and make them more appealing by improving their taste, texture, consistency or colour. Additives are used in foods for five main reasons:

i. To maintain consistency
ii. To improve or maintain nutritional value
iii. To maintain palatability and wholesomeness
iv. To provide leavening or control acidity/alkalinity.
v. To enhance flavor or impart desired colour.

Additives that are Carcinogenic

i. **Saccharin**

Saccharin is an artificial no-nutritive sweetener that has been consumed for 100 years and used commercially for over 80 years. It is 30 times

sweeter than table sugar. Since 1960, it has been used in soft drinks, tabletop sweetener and some candies. Although, it causes bladder cancer in laboratory animals, it is still approved by the Food and Drug Administration (FDA) due to congressional intervention.

ii. **Nitrates and Nitrites**

These additives have been used since pre-historic times to preserve meat and fish and in particular, to prevent botulism in meat product. Nitrates and nitrites are used in the curing of cold cuts, frank-furters, bacon, and other cured meats. Nitrites can then be converted into nitrosamines (substance known to cause cancer) in the mouth, stomach, and colon. In 1978, the Agriculture Department ordered a reduction of nitrites added to cured meat.

iii. **Butylated Hydroxyanisole (BHA) and Butylated Hydroxytolulene (BHT)** Butylated Hydroxyanisole (BHA) and Hutylated Hydroxytolulene (BHT) are preservative and antioxidants. BHA prevents rancidity in fats and destruction of fat-soluble vitamin when used at relatively high levels, they have been found to cause cancer in rats.

Naturally Occurring Carcinogens

Food contains many naturally occurring substances that are known to be toxic, with a few being cancerous for instance, sassafras roots contain safrole, a flavoring ingredient that in high doses, causes liver cancer. Some edible mushrooms contain substances that are carcinogenic to laboratory animals' certain food such as celery, radishes, beets and leafy vegetables are good sources of nitrates, which are converted to nitrite by bacteria in the mouth or gastrointestinal tract substance that are known to be cancerous.

Carcinogens Produced by Cooking Food

Grilling, frying or boiling beef, pork, lamb, chicken and fish produces substances called heterocyclic aromatic amines (HAAS), substances that have caused cancer in laboratory animals. The longer the cooking time, the more HAA are produced. For HAAS to form, the meat must be heated above 212 degrees for cooking food by charcoal boiling or any method in which fat drips into the heat source can cause contamination of the food with benzopyrene, a known carcinogen.

To limit the carcinogens that may form when cooking meat, do not overcook meat and trim it well before cooking, baking, roasting, stewing, poaching or microwaving rather than grilling, frying or boiling. If grilling, put a hammer between the head source and the meat.

Food Contaminants

They include substances such as molds, heavy metals like mercury and lead (found in polluted water and fish) micro-organisms, polychlorinated biphenyls (PCBs – also found in polluted water) and pesticides, among others.

Aflatoxin, a mycotoxin, is a hazardous mold found in foods stored under warm, humid conditions. It is a very strong human carcinogens, most commonly found in peanuts, corn, cotton seed, possibly wheat and rice.

Pesticides are chemicals used to control insects, diseases, weeds, fungi, mold, and other pest on plants, vegetables, fruits and animals. Example of insecticides (designed to kill insects) pesticide is normally applied to crops as a spray, fog or dust to protect the crop from damage and increase in their yields.

The EPA (Environmental Protection Agency) over the years has banned the use of a wide variety of carcinogenic pesticides, and it continues to study others to determine their safety.

Other Food- Related Risk Factors

i. **Food Processing:** Food processing has both positive and negative effect on cancer risk. Freezing and canning can promote bioactivity in fruits and vegetables which decrease risk of certain cancers. However, refined grains have removed the dietary fibre that helps to lower cancer risk and preserved meat with added salt and nitrites are higher in carcinogens, a known cause of cancer.

ii. **Microbial Food Safety:** Involves food irradiation to reduce microbial contamination and food processing although radiation is a known carcinogen, it does not have the same effect on food as it does on a living person.

iii. **Organic Foods:** These are not supported by evidence to be a better or worse choice than conventional food, so, continue making vegetables, whole grains, and fruits, the focus of all are meals or snacks regardless of growth method.

Nutrient and Cancer

Nutrients can affect cancer by either promoting or preventing it. On one hand a high intake of certain nutrient such as calories or fat is considered a cancer risk factor. On the other hand, some nutrients may act as anti-carcinogens to prevent cancer initiation or growth. Through the years, students have pointed to a protective role for a diet rich in fruit and vegetables. People who eat the most fruit and vegetables tend to have the lowest death rates from many common types of cancer- lung, breast, prostate and colon. Studies show a strong link between some antioxidants and some cancers, for example, people with a higher level of beta-carotene in their diet consistently have a lower risk of lung cancer. Also, people with more vitamin C in their diet have a lower risk of stomach cancer.

The main nutrients to focus on during cancer treatment are protein, carbohydrates, fat, water, vitamins and minerals. Protein needs often increase to support muscle strengthening and maintenance for resisting infections, recovering from illness, and repairing tissue. Carbohydrate source are essential in choosing whole grains and complex carbohydrates. Every empty

carbs and sweet promotes sustainable energy and nutrient- dense food. Fat sources of healthy mono and poly unsaturated fat over healthy saturated and trans-fat promote heart health and cholesterol management. Water is vital, especially if experiencing vomiting or diarrhea. Vitamin and mineral needs may also increase, especially if experiencing decreased appetite Kirsten Haubrich oudin, ASN's dietetic intern.

Cancer Manifestation in Human Body

1. **Skin Cancer:** Skin cancer is divided into the non-melanoma and melanoma categories. Non-melanoma (based cell and squamous cell skin cancer) is the more common form with over 2,000,000 cases were diagnosed in America in 2012. Most of these forms of cancer are curable. Melanoma, on the other hand, is a more serious type of skin cancer.
2. **Lung Cancer:** Lung cancer accounts for about 28 percent of all cancer death. An estimated 260,340 deaths were expected to occur from lung cancer in 2020 cigarette, smoking is the most important risk factors for lung cancer.
3. **Prostate cancer:** It is estimated that 1 in 6 men in the U.S and part of the world will be diagnosed with prostate cancer in their lifetime. It is the most commonly diagnosed cancer among men and the second most common cause of death in the world.
4. **Breast Cancer:** Breast cancer is the most frequently diagnosed cancer among women. Breast cancer ranks second as a cause of cancer death in women after lung cancer.
5. **Colorectal Cancer:** Colorectal cancer doesn't discriminate- It is the third most common cancer in both men and women. Colorectal cancer was expected to account for nine percent of all cancer death in 2012.
6. **Kidney (Renal) Cancer:** The American Cancer Society estimated 64,770 new cases of kidney (renal) cancer in 2012. Tobacco is a strong risk factor for kidney cancer, as well as obesity and hypertension.
7. **Bladder Cancer:** Blood in the urine is a common symptom of urinary bladder cancer. An estimated 73,510 new cases of this cancer were expected in 2022.
8. **Thyroid Cancer:** Three out of four cases of thyroid cancer occur in women. Perhaps surprisingly it is the fastest growing cancer in both men and women. A lump in the neck is the most common symptom of thyroid cancer.
9. **Endometrial Cancer:** Cancer of the uterine corpus usually occurs in the endometrium (uterus lining). Abnormal bleeding is often an early sign of this type of cancer. Treatment can include surgery, radiation chemotherapy or hormonal methods, depending on the stage of the cancer.

10. **Non-Hodgkin's Lymphoma:** As you may know, one of the common symptoms of non-Hodgkin's lymphoma (NHL) is swollen lymph nodes.

Nutrition Guideline During Cancer Treatment

Here are some nutritional foods recommended for people receiving cancer treatment:

i. Maintain a healthy weight: For many people, this means avoiding weight loss by getting enough calories every day. For people who are obese, this may means losing weight. Ask your health care team if you should try to lose weight during treatment. If you do try to lose weight during treatment, it should be moderate, meaning only about a pound a week.
ii. Get essential nutrients: These include protein, carbohydrate, fats and water.
iii. Be as active as you can: For example, take a daily walk. If you sit or sleep too much, you may lose muscle mass and increase your body fat, even if you are not gaining weight.

Ways To Get Essential Nutrients and Manage A Healthy Weight

Nutrition counseling may help people with cancer get essential nutrients. For nutrition counseling, it is important to visit a qualified professional. This means a Registered Dietitian (RD) or a Registered Dietitian Nutritionist (RDN). Dietitians and another nutrition expert can help you create a diet that meets your specific nutritional needs. Their recommendation may include:

i. Vitamins or minerals that you are not receiving enough of.
ii. Liquid nutritional supplements and snacks to help reach your goal.
iii. Feeding tubes or nutrition support appropriate for your body.

Side Effect and Nutrition in Cancer Management

Cancer treatment often causes side effect such as diarrhea, nausea, mouth sores, and taste changes. These side effects may make it difficult to eat or drink. Follow these tips to help you get the nutrition you need.

i. If water tastes unpleasant to you, take in more liquid through food and other drinks. For example, eat soup or watermelon and drink tea, milk or milk substitutes. A sport drink is another option.
ii. If food taste bland, try seasoning it with flavour spices, for example, try using lemon, garlic, or curry. If your mouth is sore, you may need to choose non-acidic and non-spicy foods until it heals.
iii. Eat 6 small meals throughout the day instead of 3 large meals. Make sure you reach your calories goal with these small meals.
iv. If meat is no longer appealing, get protein from other foods. For example, try fish, eggs, cheese, beans, nut or high protein smoothies or shakes.

v. If you have a metallic taste in your mouth, suck on mints chew gums, or try fresh citrus fruits.
vi. If you have mouth sores, or gum, infection, use a blender or food processor to make the texture of vegetables and meat smooth.

The Use of Dietary Supplement

Low-dose dietary supplements, such as multivitamins, may be helpful for people with cancer who are not able to get all of their nutrients through food. Multivitamins are a dietary product that contain most of the required daily vitamins, minerals, and trace elements. They also contain some minerals such as calcium, magnesium, or iron. They are typically taken by mouth as- a pill, capsule tablet, liquid or powder. High doses of specific nutrients supplement can be harmful. It is unknown if some of these could affect your treatment, so, talk with your doctor before taking any supplements.

Food Safety and Hygiene Guide

People having cancer treatment should be aware of food safety. A food-borne infection happens when harmful bacteria, viruses, or fungi, contaminate food and make you sick. Here are some basic food safety tips to reduce the risk of infection.

i. Wash your hands before and while you handle and prepare food.
ii. Rinse vegetables and fruit thoroughly before eating them.
iii. Handle and store food safely.
iv. Eat fully cooked food, for example, do not eat eggs that are not cooked solid and do not eat raw fish.
v. Do not eat or drink unpasteurized foods. This include beverages such as unpasteurized cider, raw milk and fruit juices.
vi. Make sure food purchased for consumption are not expired and follow directions on proper storage.

2016 American Cancer Society (ACS) Guideline

Choosing foods and beverage in amounts that help achieve and maintain a healthy weight.

1. Read food labels to become more aware of portion sizes and calories consumed. Be aware that low-fat or nonfat does not necessarily means low calories.
2. Eat smaller portion of high- calorie food.
3. Choose vegetables, whole fruit and other low-calories food instead of calorie dense foods such as French fries, chips, ice-cream, doughnuts and other sweets.
4. Limit consumption of sugar sweetened beverages (soft, spirits, and fruit-flavoured drinks).
5. If eating out, select food lower in calories, fat and added sugar and avoid large portion sizes.

Menu Planning Guide for Lowering Cancer Risk

Many factors are involved in developing cancer, and diet is just one of them. The American Cancer Society (ACS) and the National Academy of Science (NAS) have both developed dietary guidelines for reducing the risk of cancer, and their suggestions serve as the basis for the following menu planning guidelines:

i. ***Offer Items lower in total Fat:*** Saturated fat, and cholesterol. For example:
   - Serve smaller entree portion and larger vegetable and starch side dishes.
   - Use poultry (without skin) and fat in entrée dishes. Fatty fish such as tuna and salmon are fine to use.
   - Offer lean cuts of meat and trim visible fat
   - Use wine, herbs, lemon juice, or flavored vinegars rather than flavored poultry and seafood dishes.
   - Boil, roast, stir fry, or poach meat, fish, and poultry instead of pan- frying or deep-fat frying. Pan frying can be acceptable when using the non-sticky pan and little or no fat. Basting with wine, broth or lemon or tomato juice prevents dryness, give good flavor, and avoid using fats.
   - Make sauces base on vegetable purees
   - Avoid cream soups and instead offer clear soups with vegetable.

ii. ***Offer Lower-fat Menu Items:*** These foods, which are also high in fat, include anchovies, bacon, corned beef, dried chipped beef, herring, pastrami, processed lunch meats such as bologna and hot dogs, sausage such as salami and pepperoni, and smoked meats and cheeses. Conventionally, smoked meats and fish contain tans that are thought to be carcinogenic due to the smoking process. Nitrites are known carcinogens.

iii. ***Offer High-fiber foods:*** For example:
   - Use beans and peas as the basis for entrees, or add them to soups, stews, casseroles, and salads. Nuts and seeds are highly fibre but also contain a significant amount of fat and calories, so use them sparingly.
   - Serve whole-grain breads, rolls, crackers, cereals, and muffins. Bran or wheat germ can be added to some baked goods to increase the fibre content.
   - High-fibre grains such as brown rice and bulgur (cracked wheat) can be used as side dishes instead of white rice.
   - Leave skins on potatoes, fruits, and vegetables as much as possible.
   - Offer salads using just fresh fruits and vegetables. Omit shredded cheese, chopped eggs, and bacon bits, which all contribute to fat in the diet.

iv. ***Include lots of vegetable especially cruciferous vegetables:*** Cruciferous vegetables include broccoli, Brussels sprouts, cabbage, cauliflower, bok choy, kale, collards, kohlrabi, mustard, rutabagas, spinach, and watercress.

v. ***Offer foods that are good sources of beta carotene and vitamins C and E:*** Excellent sources of beta carotene include broccoli, cantaloupe, carrots, spinach, squash, and sweet potatoes. Good sources include apricots, beet greens, Brussels sprouts, cabbage, nectarines, peaches, tomatoes, and watermelon. Excellent sources of vitamins C include citrus fruits and juices, any other juices with vitamin C added, strawberries, tomatoes, and broccoli. Good vitamin C sources include berries, Brussels sprouts, cabbage, melons, cauli-flower, and potatoes. Vitamin E is found in vegetable oils and margarines, whole-grain cereals, wheat germ, soybeans, leafy greens, and spinach.

vi. ***Offer alternatives to alcoholic drinks:*** Heavy drinkers are more likely to develop cancer in the gastrointestinal tract, such as cancer of the esophagus and stomach.

Conclusion

Cancer has been considered as one of the leading causes of death worldwide, with rising incidence, it has now even replaced cardiovascular diseases as the most common cause of death in some countries. Thus, cancer and other non-communicable diseases (NCDS) constitute a huge burden, not only for affected people, but also for their family and care givers as well as the society at large, as the disease constitute enormous economic costs.

The field of investigation of the role of nutrition in the cancer process is very broad. It is becoming clearer as research continues, that nutrition plays a major role in cancer. It has been estimated by the American Institute for cancer research and the World Cancer Research Fund that 30-40 percent of all cancers can be prevented by appropriate diets, physical activity, and maintenance of appropriate body weight. However, almost half of all cases of cancer could be prevented through a healthy lifestyle. A Healthy diet such as vegetables, fruits, legumes (beans), vitamins and low intake of certain nutrients and especially processed meat can fight cancer.

Nutrients can affect cancer by either promoting or preventing it. Carcinogen substances that cause cancer in living tissue should be avoided, on the other hand, some nutrients may act as anti-carcinogens to prevent cancer initiation or growth. Eating the right kinds of foods before, during and after cancer treatment can help the patient feel better and stay stronger. A healthy diet includes eating and drinking enough of the foods and liquids that have important nutrients (vitamins, minerals, protein, carbohydrates, fat and water) the body needs. It must be reiterated that prevention of cancer and other NCDs therefore requires urgent policy action on the part of stake holders in the health sector. The World Cancer Research Fund (WCRF) cancer prevention recommendations help to protect health by promoting physical

activity and balanced nutrition as well as healthy drinking and eating behavior including the maintenance of a normal weight.

A general guide for the prevention of cancer to all persons includes the following:

1. Always take healthy diet.
2. Intake of Vitamins C and E. is important in preventing cancer due to their antioxidant properties. Fibre and calcium intake may also play roles in preventing cancer.
3. Avoid being obese and limit high intake of dietary fat.
4. Washing of hands before and after you handle and prepare food.
5. Rinse vegetables and fruit thoroughly before eating them.
6. Handle and store food safely.

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