

NUTRITIONAL SUPPLEMENTS IN CANCER THERAPY

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ARTICLE INFO

Article History:

Received 20th December, 2017

Received in revised form 18th

January, 2018 Accepted 05th February, 2018

Published online 28th March, 2018

Key words:

Cancer, Chemotherapy, Nutritional Supplements, Exercise.

ABSTRACT

People with cancer often need to follow some diets which are different from healthy diet plans of normal individuals. There are different types of cancers, which affect various parts of the body. For most people undergoing chemotherapy, a healthy diet includes: protein, fibre and antioxidant rich foods like fruits, vegetables and whole grain. Foods to be completely avoided are fat, sugar, alcohol and salt. The proper nutrition is taken in order to overcome the side effects of the chemotherapy. Some foods may stop the metastasis of the cancer cells also. The quantity of food we take, the quality time exercise we do determine how effective our chemotherapy treatment would be. If you have trouble chewing and swallowing, you may need to add sauces and gravies. Sometimes, you may need to eat low-fibre foods instead of those with high fibre. Here are some of the nutritional supplements, misconceptions about them and some contraindicated foods during cancer chemotherapy.

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INTRODUCTION

It is a disease or a malignant growth caused by an uncontrolled division of cells in any part of the body. Most cancers begin with a genetic mutation to the DNA within the cells. The mutated cells may form as a mass called a tumour. A tumour can be Malignant or benign. A malignant tumour may show metastasis, meaning it can grow and spread to other parts of the body. A benign tumour means the tumour can grow but will not spread².

Types and symptoms of cancers⁴

Breast Cancer: A lump in the breast, bloody discharge from the nipple and changes in the shape or texture of the nipple or breast.

Prostate Cancer: Difficulty with urination, but sometimes there are no symptoms at all.

Basal Cell cancer: appears as a white, waxy lump or a brown, scaly patch on sun-exposed areas, such as the face and neck.

Melanoma: A new, unusual growth or a change in an existing mole. Melanomas can occur anywhere on the body.

Colon cancer: changes in bowel habits, changes in stool consistency, blood in the stool and abdominal discomfort.

Lung Cancer: cough (often with blood), chest pain, wheezing and weight loss. These symptoms often don't appear until the cancer is advanced.

Leukemia: Fatigue, weight loss, frequent infections and easy bleeding or bruising.

Lymphoma: Enlarged lymph nodes, fatigue and weight loss.

Risk Factors⁵

Alcohol: One alcoholic drink a day (for women of all ages and men older than age 65) or two drinks a day (for men age 65 and younger).



Fig. 1 Dividing Cancer cell

Diet: As per many reviews and preclinical studies, intake of excess Vitamin D, Tea, Garlic, Calcium and Antioxidants can reduce the risk of many types of cancers. But most of the clinical studies are in vain. Canned foods, refined sugars, processed meats, bakery products, saturated fats, salted, pickled and smoked foods, white flour, carbonated drinks and hydrogenated oils can increase the risk of cancer.

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Age

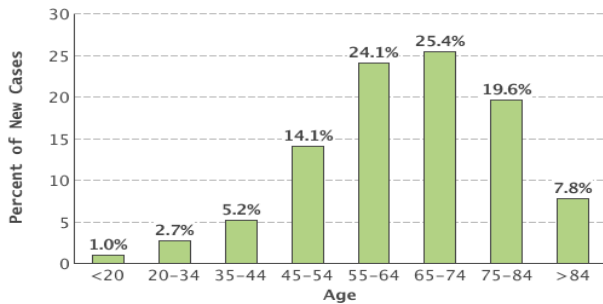


Fig 2 Relationship graph between age Vs new cancer cases reported.

Family history: Only few cancers are inherited.

Hormones: Estrogens are known human carcinogens. Excessive exposure to these lead to many cancers.

Eg: Taking combined menopausal hormone therapy can increase a woman’s risk of breast cancer. Menopausal hormone therapy with estrogen alone increases the risk of endometrial cancer and is used only in women who have had a hysterectomy.

Cancer causing substances: As per IARC, many compounds which are present around us can cause cancer.

Eg: Acrylamide from many foods, benzene, coal tar, wood dust, mining products, betel nut, tobacco, drugs like Phenacetin, etc can increase the risk of cancer².

Radiation: High-energy radiation, such as x-rays, gamma rays, alpha particles, beta particles, and neutrons, can damage DNA and cause cancer. These forms of radiation can be released in accidents at nuclear power plants and when atomic weapons are made, tested, or used¹².

Obesity: People who are obese may have an increased cancer risk of breast, colon, rectum, endometrium, oesophagus etc⁹.

Sunlight: Exposure to UV radiation causes early aging of the skin and skin damage that can lead to skin cancer¹³.

Statistics¹⁵

Estimated New Cases		Males		Females		
Prostate	161,360	19%		Breast	282,710	30%
Lung & bronchus	116,860	14%		Lung & bronchus	165,510	17%
Colon & rectum	71,420	8%		Colon & rectum	64,010	8%
Urinary bladder	60,490	7%		Uterine corpus	61,380	7%
Melanoma of the skin	52,170	6%		Thyroid	42,470	5%
Kidney & renal pelvis	40,610	5%		Melanoma of the skin	34,940	4%
Non-Hodgkin lymphoma	40,080	5%		Non-Hodgkin lymphoma	32,160	4%
Leukemia	38,293	4%		Leukemia	35,840	3%
Cholelithiasis & pancreas	35,720	4%		Pancreas	26,184	3%
Liver & intraperitoneal bile duct	29,200	3%		Kidney & renal pelvis	23,580	3%
All Sites	836,150	100%		All Sites	852,630	100%

Estimated Deaths		Males		Females		
Lung & bronchus	84,590	27%		Lung & bronchus	71,280	25%
Colon & rectum	27,150	8%		Breast	40,610	14%
Prostate	26,730	8%		Colon & rectum	23,110	8%
Pancreas	22,300	7%		Pancreas	20,790	7%
Liver & intraperitoneal bile duct	19,610	6%		Ovary	14,080	5%
Leukemia	14,300	4%		Uterine corpus	10,920	4%
Esophagus	12,720	4%		Leukemia	10,200	4%
Urinary bladder	12,240	4%		Liver & intraperitoneal bile duct	9,210	3%
Non-Hodgkin lymphoma	11,450	4%		Non-Hodgkin lymphoma	8,850	3%
Brain & other nervous system	8,620	3%		Brain & other nervous system	7,680	3%
All Sites	318,420	100%		All Sites	282,080	100%

Fig. 3 Ten Leading Cancer Types for the Estimated New Cancer Cases and Deaths by Sex, United States, 2017

Cancer Treatment⁸

There are many types of cancer treatment. The treatment depends on the type of the cancer and the stage at which it is present. The treatment may be a single treatment or the combination of treatments listed below.

- Surgery
- Radiotherapy - uses high doses of radiation to kill cancer cells and shrink tumours.

- Immunotherapy - helps to boost the immune system to fight against cancer cells.
- Targeted therapy
- Stem cell transplant therapy
- Hormonal therapy - slows or stops the growth of breast and prostate cancers
- Hyperthermia
- Photodynamic treatment
- Laser treatment
- Blood transfusions.
- Chemotherapy - uses drugs to kill cancer cells.

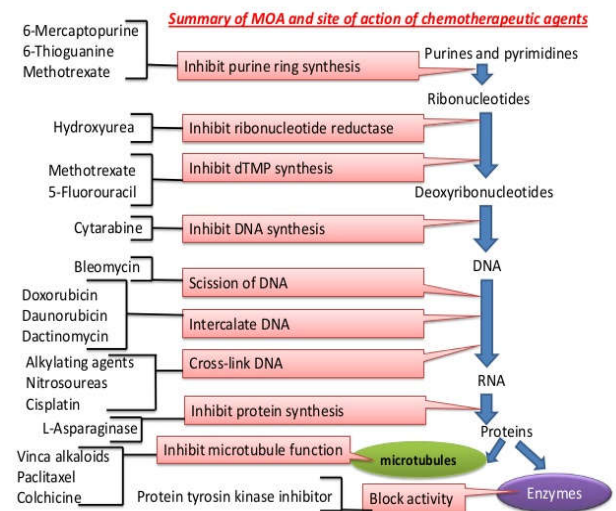


Fig 4 Summary of MOA of Chemotherapeutic agents

Side Effects of cancer Treatments

1. Anaemia
2. Appetite Loss
3. Bleeding and Bruising (Thrombocytopenia)
4. Constipation, Fatigue and Diarrhoea
5. Edema
6. Fertility problems in both males and females
7. Hair Loss (Alopecia)
8. Infection and Neutropenia
9. Lymphedema
10. Delirium and Peripheral Neuropathy
11. Nausea and Vomiting
12. Skin and Nail Changes
13. Insomnia etc.

Nutritional Supplements in Cancer Therapy

Apart from the cancer treatment, the dietary supplements of nutritious food also help the cancer patients in order to reduce some side effects of treatment. Some medical practitioners in complementary to integrative medicine support the use of certain dietary supplements – such as vitamin D, mushroom extracts, green tea and curcumin – in certain cases, they may have cancer-fighting properties and reduce treatment side effects. Research is still evolving, but several points are clear.

Dr. Victor Sierpina, a professor of family and integrative medicine at the University of Texas Medical Branch in Galveston, Texas says that "without the knowledge of the oncologist, no one should take any food supplements, because these supplements may interact with the cancer chemotherapy. These either decrease the effectiveness of the drugs, or cause side effects or affect the metabolism of the drugs".

Common Supplements along with Contraindications

Curcumin: Present in turmeric and has been shown to have cancer-inhibiting action. But caution is advised for patients with gallbladder disease, because it may worsen symptoms by stimulating gallbladder contractions.

Glutamine: Glutamine may help relieve chemotherapy side effects such as mouth sores and diarrhea. It also might reduce nerve pain from certain drugs. However, glutamine may interact with Anti epileptics.¹¹

Mushrooms: Used to treat high blood pressure and diabetes, evidence suggests mushroom extracts may have tumour-fighting properties. But extracts are discouraged for patients on medications to lower blood sugar or those who take the blood-thinning drug Warfarin, because of increased risk of bleeding.

Fish oil: By reducing inflammation, fish oil may potentially slow cancer progression. But patients currently on chemotherapy might do better going off fish oil. A study in the June issue of JAMA Oncology suggests fish oil may reduce chemo's effectiveness, possibly by increasing resistance within cancer cells.

Probiotics: During cancer care, probiotics can help treat diarrhea and other GI side effects.

Milk thistle: The active part of milk thistle seed, Silymarin, may protect the liver from toxic effects of chemotherapy.

Some Contraversial Foods in Cancer Therapy

Intake of Antioxidants like Vitamin A, C and beta carotene during cancer therapy is in high confusion at present. A research done on a small randomized controlled studies by NIH found people who used antioxidants during cancer treatment fared worse, particularly more if they were smokers. The results are in vain as per the study. So, scientists of NIH advise patients to consult the dietician before taking any food supplement during cancer therapy. Some nutrients can help to heal better after surgery - zinc, vitamin C, arginine and glutamine.

Vitamin D deficiency is one of the severe problems for cancer survival and symptoms. Vitamin D supplements can be taken safely during cancer therapy, with dosing guided by blood levels. Vitamin D levels above 50 nanograms per millilitre have been shown to reduce the risk of recurrence of breast cancer in survivors.

In hormonal based cancers like breast and Prostate cancers, Edamame or Soy beans or Tofu are suggested. But limit the use because of the presence of isoflavones in these foods, which hinder the cancer therapy.

Doses of Vitamins and Other Nutritional Supplements

Vitamin C - may either stimulate or inhibit tumor growth depending on the form, dose, and timing of supplementation, cancer site, and type of chemotherapy 500 mg/day.¹¹

Itamin E - important nutrient for enhancing antineoplastic activity, because it prevent peroxidation of lipids. Some evidence shows that in cancer cells vitamin E has a synergistic effect with chemotherapy and radiation. 15 - 30 mg/day.

Vitamin D-3 - central role in bone and calcium metabolism but also has been shown to suppress the growth of tumors of different origins, including breast cancer cells 5 µg/d for ages

19–50 y, 10 µg/d for 51–70 y, and 15 µg/d for ≥70 y. The UL is 50 µg/d

β-carotene: β-carotene supplements are not advised routinely for cancer patients. It has shown protective effect against cancer and two studies showed an increased risk of lung cancer and overall mortality. 150 - 180 mg/day.

Selenium: supplementation may directly cause tumor cell apoptosis. 200 microgm per day.

Polyunsaturated fatty acids: α-Linolenic acid, Fish oil supplementation enhanced the efficacy of the cancer chemotherapeutic agent CPT-11 (irinotecan) against MCF7 breast carcinoma xenografts and ameliorated intestinal side effects in MCF-7-bearing mice. 0.8gm DHA per day.

Non Contraversial Super foods for Chemotherapy Symptoms

Carrots: Carrots are the super foods in chemotherapy. According to a recent study by the New Zealand Institute for Plant and Food Research, Carrots could be the one of the best supplement for cancer patients. In case of dry mouth, this makes swallowing difficult, try carrot juice mixing with very low fat milk. Carotenoids are strong antioxidants that serve to neutralize free radicals in the body, thus reducing DNA damage and therefore the risk of certain cancers manifesting. Other antioxidants present in carrots are flavonoids and phenolic derivatives, have also been shown to exert anti-carcinogenic, immune boosting, and inflammation reducing capabilities.

A study documented in the *Journal of Medicinal Food* shows some extremely promising results. The authors of the paper state: "Carrots contain beneficial agents such as β-carotene and polyacetylenes, which could be effective in the treatment of leukemia." A dose-response analysis showed that an increase in carrot consumption of one serving per week or 10 g per day was associated with a 5.0 or 4.0 % decrease in the risk of prostate cancer in the overall population.

Orange juice prevents dry mouth: According to the National Cancer Institute (NCI), drinking liquids like lemonade and orange juice will help to produce more saliva by stimulating salivary glands.

Note: Avoid these foods during sore mouth or throat in chemotherapy.

Rice and bananas for diarrhea: Bland foods like rice, bananas, cooked apples, and dry toast will help bind your stool if you have diarrhea from chemotherapy. Avoid fatty foods, raw fruits, and whole grain products, which can make diarrhea worse. You can also try these home remedies for diarrhea.

Whole grains for constipation: On the other hand, if you are constipated, drinking plenty of fluids and eating foods high in insoluble fibre, such as whole grain breads or cereals, dried fruits, and dried beans or peas, will aid your digestive system. The National Cancer Institute (NCI) recommends drinking eight to 12 cups of liquid a day for those undergoing cancer treatments. Here are other sneaky ways you might be making yourself dehydrated.

Small meals increase appetite: Loss of appetite is a common side effect of chemotherapy. Instead of having heavy meals at once, split the meals into 5 – 6 smaller meals throughout the day. Adding protein supplements and higher-calorie foods will help to maintain a healthy weight.

Ginger candy eases nausea: Chemotherapy often causes nausea and vomiting. Sucking Ginger candy and lemon drops before eating will help ease dizziness and settle the stomach.

Onion and garlic boost your immune system: Grilled, cooked, or raw onions and garlic are the best cancer fighters, as their high levels of antioxidants. Cornell researchers found that strong-flavoured onions could even inhibit the growth of some cancer cells.

Lean protein maintains energy and muscle: The NCI recommends eating more protein like eggs, fish and lean chicken while chemotherapy, give more energy make muscles stronger. Opt for lean proteins.

Selenium-rich foods fight cancer: Brazil nuts, seafood, oat and brown rice are rich in selenium, a cancer-fighting mineral. A study from the *Journal of Biological Chemistry* found that selenium compounds boost the immune system, allowing it to fight certain cancers like leukemia and melanoma.

Note: Avoid eating shellfish and raw fish because they increase the risk of food-borne diseases during treatment, according to the NCI. Eat fully cooked freshwater fish like salmon and catfish.

Physical Activities During Chemotherapy

As outlined by the Centers for Disease Control and Prevention, examples of moderate and vigorous activities include:

Moderate Activities ("I can talk while I do them, but I can't sing"):	
Canoing	Biking on level ground or with a few hills
Water aerobics	Ballroom or line dancing
Walking briskly	General gardening (raking or trimming shrubs)
Tennis (doubles)	Sports where you can catch and throw (softball, volleyball)
Using a manual wheelchair	

Vigorous Activities ("I can only say a few words without stopping to catch my breath"):	
Aerobic dance	Biking faster than 10 miles per hour
Fast dancing	Heavy gardening (digging, hoeing)
Hiking uphill	Race walking, jogging, or running
Tennis (singles)	Sports with a lot of running (basketball, hockey, soccer)
Martial arts	Swimming fast or swimming laps
Jumping rope	

Suggestions for Becoming F.I.T.T.

- F** **Frequency:** refers to how often you are physically active and is usually measured in days per week.
- I** **Intensity:** describes how hard your body is working during physical activity, and it is often described as light, moderate or vigorous.
- T** **Time:** measures how long you spend being physically active during your daily routine.
- T** **Type:** describes what kind of activity you choose such as walking, gardening, hiking, biking, weight training, household chores or playing golf.

CONCLUSION

As per all the researches, we can conclude that cancer is not deadly disease, if we follow the healthy food habits and life style. Above all the conventional methods of cancer treatment a cancer or a chemotherapy patient need a proper nutrition, exercise and homely care. Cancer can be treated completely if we eat right, do proper exercise and shoe some concern towards them.

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