IJP (2020), Vol. 7, Issue 3 **(Review Article)**

Received on 06 February 2020; received in revised form, 22 March 2020; accepted, 25 March 2020; published 31 March 2020

DIET, BODY IMMUNE AND OTHER FACTORS ASSOCIATED WITH PREVENTION AND TREATMENT OF CANCER: A REVIEW

G. M. Prajapati *, S. S. Arole and P. R. Kithe

Department of Pharmacognosy, College of Pharmacy, Savitribai Phule Pune University, Pune - 411007, Maharashtra, India.

Keywords:

Cancer, Diet, Immune system, Fertilizers, Pesticides, Green revolution, Alcohol, Herbal medicine

Correspondence to Author:
G. M. Prajapati

Department of Pharmacognosy, College of Pharmacy, Savitribai Phule Pune University, Pune - 411007, Maharashtra, India.

E-mail: gp351667@gmail.com

ABSTRACT: Cancer is a group of diseases that involves abnormal cell growth with the potential to invade other parts of the body. Patients suffering from cancer have a significantly lower intake of a healthy diet. According to recent studies, by increasing the immune system, it helps to improve or prevent cancer. Using synthetic fertilizers and pesticides contaminate our food and environment, but the green revolution made India independent. Being obese or overweight may increase cancer risk and growth, but a healthy diet and exercise are enough to cure obesity. Nature has been provided many essential sources that are being utilized in prevention as well as treatment of cancer. Alcohol activates the cellular changes that make tumor cells spread, also tobacco is the leading cause of cancer, but by Rehabs and medication, risk of cancer can be reduced. Cancer can be medicated by various herbal medicines like turmeric, green tea, *etc*.

INTRODUCTION: Cancer is a scientific term for diseases in which cells abnormally [1]. Divide without control and can invade nearby tissue. Cancer cells can also spread to other parts of the body through blood and lymph. Cancer cannot be distinguished as one disease. It is a group of more than 100 different and distinctive diseases. There are several main types of cancer "carcinoma" is cancer that begins in the skin or in tissues that line or cover internal organs. Sarcoma" is cancer that begins in the bone, cartilage, fat, muscle, blood vessel, or other connective or supportive tissue. Central nervous system cancers are cancers that begin in the tissues of the brain [2]. Food being the basic necessity of the human body affects each and every cell of the body equally [3].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.7(3).70-75

The article can be accessed online on www.ijpjournal.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.7(3).70-75

Diet affects over 50% of the occurrence of the disease. For about 40% of cancer that occurs annually throughout the world [4]. The immune system is a critical regulator of a tumor, which inhibits the tumor development, growth, invasion and metastasis immunotherapy has explained impressive outcomes for some patients with cancer we discuss escape mechanism exploited by cancer and present strategies for applying the knowledge to improving the efficacy of cancer immunotherapy [5].

Understanding the Mechanism:

How does the Mechanism Works: Every cell having certain characteristics enzymes required to form sugar molecules for creating a surface protein in the cell. This whole process is known as glycosylation. These enzymes shift the position depending upon the health of the cell. In healthy cells, it is located in the golgi apparatus, *i.e.*, a type of the membrane system inside the cell. In carcinogenic cells, these enzymes are located in the endoplasmic reticulum.

During the formation of these proteins, they flow through both these membranes, where the enzymes act as a bridge to connect sugar chains to proteins before being positioned onto the surface of the cell.

These Positioning of the Sugar Molecules to The Protein by the Enzymes Take Place as:

- In the cancer cell and healthy cells, the enzymes are located into a different part of the cell, as quoted as" Steen fort.
- This concludes that having a long, complex sugar chain attached to a surface protein, while cancer cell gets short and simple ones attached to surface protein [7, 8].

TABLE 1: COMPARISON OF CANCER RATES IN INDIA AND THE UNITED STATES [6, 14]

Cancer rates	India		United States	
All sites	**Male**	**Female**	**Male**	**Female**
Except skin	99.0	104.4	361.4	283.2
Oral	12.8	7.5	6.3	3.7
Esophagus	7.6	5.1	4.9	1.4
Stomach	5.7	2.8	7.3	3.6
Lung	9.0	2.0	58.6	34.0
Colon/rectum	4.7	3.2	40.6	30.7
Breast	-	19.1	-	91.4
Ovary	-	4.9	-	10.6
Cervix	-	30.7	-	7.8
Endometrial	-	1.7	-	15.5
Prostate	4.6	-	104.3	-
Liver	2.3	2.0	4.2	1.7
Bladder	3.2	0.7	23.4	5.4
Kidney	1.2	0.5	11.2	6.0
Melanoma	0.3	0.2	4.2	1.7

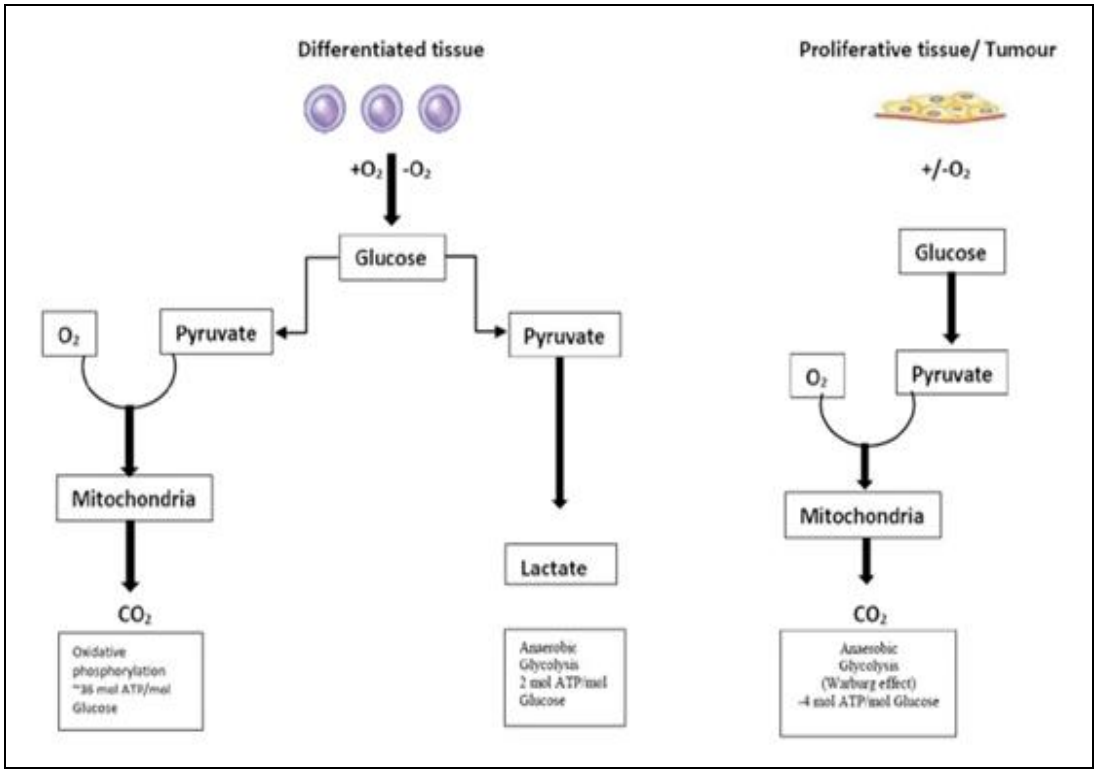

FIG. 1: SCHEMATIC DIAGRAM OF AEROBIC GLYCOLYSIS IN CANCER COMPARED WITH NORMAL CELL[9]

Food That Promotes the Growth of Cancer Cells:

1. Sugar and Refined Crabs: Higher levels of blood sugar, glucose, insulin are cancer risk factors. Insulin has been shown to stimulate cell division, supporting the growth and spread of cancer cells, making them more difficult to eliminate. They also cause an inflammatory sensation in the body *e.g.*, sugary drinks-soft drinks, sweetened ice tea, juice flavored drinks [13].

TABLE 2: POSSIBLE DIETARY OTHER FACTORS ASSOCIATED WITH CANCER IN INDIA

	Decreases risk	Increases risk
Oral cancer	Diet high in vegetables and fruits [26] fish, egg	Betel quid chewing [25] reverse smoking [27]
Esophageal cancer	Diet high in vegetables [28]	Betel quid chewing [28] chilies [29] salted tea [29]
Endometrial cancer	Diet high in vegetables and fruits, a diet high in carotenoids [30]	High body mass index [30]
Cervical cancer	Vitamin C and E [30]	Tobacco use [30]
Ovarian cancer	Diet high in fish [30]	Saturated fat intake [30]
Breast cancer	Diet high in vegetables and fruits [25]	Saturated fat [30]
Stomach cancer	Green tea, turmeric [31] cumin, basil [32] tapioca [33]	Dried fish [31] spicy food [33]

Processed Meat: It is considered as carcinogenic by the international agency for the research of cancer (IARC) it basically refers to meat that has been treated to preserve flavor by undergoing salting or smoking. Several reviews that combine results from multiple studies found that the evidence linking unprocessed red meat to cancer is weak and inconsistent, *e.g.,* processed meat-hotdogs, salami, pepperoni [10].

3. Dairy Products: High dairy consumption may, in certain patients, increase the risk of the" prostate cancer" theories suggest that due to increased intake of calcium, increase the chance of cancer level in the cell, *e.g.,* ice cream and milkshakes [11].

Effects of Chemical Fertilizers and Pesticides on Human Health: Agrochemicals, too, do have an ill effect on the health of farmers and labours. It may be considered as a powerful weapon or magic bullet in developing countries, but it has its downside too. They hazardous to the human endocrine and immune system and promote developing cancer. These fertilizers and pesticides get access to the human body and thereby get into the bloodstream proving highly carcinogenic effects. When these are sprayed on the farmland, they get transmitted directly or indirectly into vegetables and directly enter in human and livestock bodies. Organophosphates pesticides used in vegetables gradually get deposited into the human body and has a strong link with cancer. Organophosphates pesticides such as diazinon, are those type of pesticides that works by damaging enzyme in the body is called as acetylcholinesterase.

This enzyme is critical for controlling the immune system. Lac k of this enzyme leads to delay detection of cancer symptoms and increases the overall culture growth. Diazinon is mostly associated with ovarian cancer (RR = 1.87, 95%) (1-1.07 to 3.43). It is also linked to childhood cancer, such as soft tissue sarcomas leukemia and cancer of the brain. Prolonged exposure to pesticides like chlorpyrifos raises the risk of lung cancer. Regard with food grains. The green revolution made India Independent, but indiscriminate use of synthetic fertilizer and pesticides contaminated our food and environment [12].

TABLE 3: LIST OF NATURAL PESTICIDES [36]

S. no.	List of natural pesticides
1	Neem oil
2	pyrethrum
3	Rotenone
4	Eucalyptus oil
5	Hubner

Risk Associated with Obesity: Obesity increases the risk of about seven types of cancer: colorectal, kidney, pancreatic, postmenopausal breast, endometrial, gallbladder, and oesophageal cancer are called adenocarcinoma [16]. Diseases such as hypothyroidism, insulin resistance, polycystic ovary syndrome, and Cushing syndrome are also contributors to obesity.

According to BMI, seven most common of obesity is physical inactivity, overeating, genetics, a high diet of simple carbohydrates, frequency of eating, medications, and psychological factors [15].

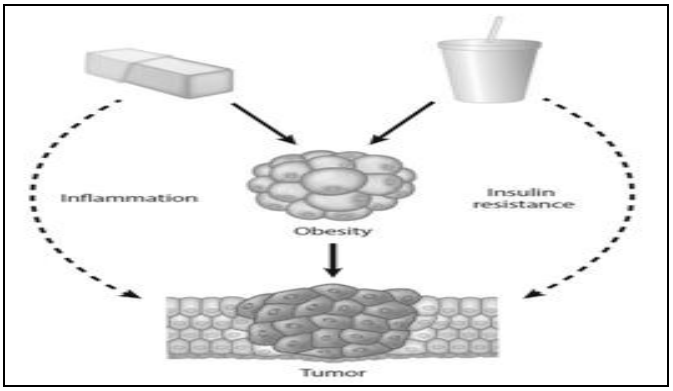

FIG. 2: VICIOUS CYCLE: AN ILLUSTRATION OF HOW FATTY AND SURGERY FOODS, SUCH AS BUTLER AND SODA, CAN FUEL OBESITY, INFLAMMATION AND INSULIN RESISTANCE- POTENTIALLY FEEDING CANCERS CREDIT: WEILL CORNELL MEDICAL COLLEGE [17]

TABLE 4: COMPARISON OF RISK FACTORS CANCER INDIA AND UNITED STATES [6, 18, 20]

	India	United States
Physical activity	Not available	23.5%
Obesity	M: 3%	M: 20%
	F: 14%	F: 23%
Energy intake	M:1812	M: 2517
	F: 1395	F: 1764
Dietary fat intake	24-27%	30%
Carbohydrate intake	60%	50%
Protein intake	13%	15%

Risk Associated with Alcohol Consumption: Research shows that being alcohol consumption can lead to over the seven different types of cancer in the body. It generally risk of the mouth cancer,

oesophageal cancer, laryngeal cancer, breast cancer, bowel cancer, liver cancer. Alcohol actually gets all over the body by flowing through the blood and thus damaging all the body.

Risks Associated with Tobacco Consumption: Tobacco is a leading cause of cancer and death from cancer. Tobacco causes a type of cancer, including cancer of the lungs, mouth, esophagus, throat, bladder, stomach, liver, pancreas, kidney, colon, rectum, and cervix, as well as acute myeloid leukemia.

Risks Associated with Cohesive Smoking and Drinking: Firstly, this calculation is based on the cohesive effect of smoking and drinking on the healthy and affected body. Cohesively doing both increases the risk of cancer by four times.

Improving understanding of other risk factors should not come at the price of reducing the perceived danger of smoking, because there is no other risk factor that is as bad as smoking and drinking both [21].

Risk Associated with the Immune System: The immune system blocks foreign particles from destroying the bodily systems. It protects against bacteria, parasites, and viruses.

Two different functional divisions work together under this process. However, transformed cancer cells are able to avoid destruction done by the immune system by reducing their expression of tumor antigens.

The research shows that there is a presence of increased incidents of cancer of characteristic cancers in immune-suppressed patients with AIDS. This includes the lymphoma, kopasi sarcoma anal carcinoma, cervical carcinoma.

It is seen for certain individuals that receive immune-suppressive drugs have an increases incidence of the immune system affecting cancers, which are common in the breast, lungs, and colon.

Tumor antigens are located in the tumor cell are mainly tumor-specific transplantation antigens.

These Tumour Agents are four Types;

- Those are encoded by genes.
- Those are encoded by deviate forms of normal genes.
- Those typically expressed at an earlier stage.
- Those expressed at a later stage.

However, the innate for cancer helps to curb the diseases but also has a certain adverse effect on the immune system. Although the results are not completely consistent, these therapies prove to the immunosuppressive. An example is given breast carcinoma survivors receiving chemotherapies significantly T and B cells.

The platinum included in the chemotherapy reduces the number of alveolar macrophages. A drug like fludarabine used in hematologic used in cancers produces profound depilation in this T cell.

Radiotherapy on Immune System: Radiotherapy indeed is a life-saving option for cancer survivors, but it also has an adverse effect on the immune system.

It has shown to have significantly reduced normal killer cell (NK) activity in breast carcinoma survivors and colorectal carcinoma survivors. Radiotherapy also indicates a significant decrease in the total number of lymphocyte cells, and it is a proliferation in response to mitogenic stimulation.

Surgery on Immune System: Surgery also has proved to another cancer treatment modality to suppress the function of the immune system.

This impaired function includes monocytes phago-cytises, antigen presentation, and superoxide release. There is a case of reduction in NK cells within two-three weeks of surgery.

The ability of the body to produce such a new cell is also hampered several. Due to limited research in the change in the immune system function during or after anticancer therapy such as complication or risk of recurrence, there are several important cancer outcomes.

Primary studies suggest the idea of the immune-suppressive effect on the human body. Certain studies show magnitude if a decrease in the number of neutrophils and lymphocytes occurring during chemotherapy [22].

TABLE 5: MICRONUTRIENTS AND ANTIOXIDANTS [23]

Micronutrients and antioxidant	Diet
Omega 3s	Coldwater fish (salmon, sardines, fresh tuna, halibut) walnuts, flaxseed, soya bean & canola oils, brussels sprouts, kale, spinach
Antioxidants	Oranges, cantaloupe, papaya, apples, berries, sweet potato, broccoli, carrots, spinach, kale, bell peppers, asparagus, onions, garlic, beets, red/yellow spices
Zinc	Legumes(beans), 100 percent whole wheat, beef, pork, chicken, spinach, oysters, yogurt, pumpkin seeds, cashews, dark chocolate, mushrooms, fortified cereals
Iron	Red meat, dark-green vegetables (spinach, collard greens), fortified cereals, slow-cooked beans, artichokes, blackstrap molasses, tofu, quinoa, prunes
Vitamin D	Fortified dairy & soy foods, sunlight, tuna, salmon, fortifies foods (orange juice, cereals). Smaller amounts in beef and egg yolks

Prevention:

- The research found that 30 to 40% of all cancers worldwide are because of dietary factors lack of physical activity, including obesity. This can be prevented by a healthy diet, exercise, healthy weight maintained.
- Appropriate safety precaution in term of pesticides and fertilizers, that use of pesticides showing less toxic effect,
- Use fewer chemicals, including pesticides and fertilizers. Instead of this, we should use organic fertilizers. bhb all cancers caused by tobacco use, smoking cigarette, and heavy use of alcohol can be prevented by Rehab therapy or using medication like disulfiram for alcohol and nicotex for tobacco and cigarette .
- By increasing the immune system, it will be helpful to fight against the cancer cells [24].

Herbal Medication:

- Turmeric contains curcumin, a spice that harvested from the root of the rhizomes belonging to the ginger family (curcuma longa), which used for the prevent cancer [34].
- The leaves of camellia contain antioxidants, which help to reduce cancer in different ways.
- According to a recent study found that tea can shrink tumors and reduces tumor growth. Both green and black tea contains antioxidants, which have prevented cancer [35].

CONCLUSION: The systemic review suggest that appropriate inclusions of a healthy diet and immune enhancement to our routine can prevent disease like cancer, leading cause of death worldwide, it is very appealing to the thing that increases of a healthy diet and immune by supplement could be a simple remedy, by using the natural pesticides, avoiding cohesive consumption of alcohol and smoking can help to prevent cancer. Increasing your intake in a healthy diet could be very simple, inexpensive, effective health insurance.

ACKNOWLEDGEMENT: Nil

CONFLICTS OF INTEREST: Nil

REFERENCES:

1. The Cancer diseases Available from, http://www.britannica.com/science/cancer-disease.
2. Defination of cancer. Available from, http:// www. Cancer. gov/ publication/ dictionaries /cancer-terms/ def/ cancer.
3. Details about nutrients. Available, http;//www.nutrient. com.
4. Tayyem RF, Bawadi HA and Dennis D: Heath DOI 10.22034/APJCP.2018.19.1.261,3 Jan 2018.
5. Beatty LG and Whitney L: Gladney immune escape mechanism as a guide for cancer immunotherapy. DOI: 10.1158/1078- 0432.CCr.14-1860, 12 Dec.2012, 687-692.
6. Sinha R, Anderson DE, McDonald SS and Greenwald P: Cancer risk and diet in India. National Cancer Institute and National institute of Health 20892-7273, 200: 222-28.
7. Detail about mechanism. http://scienceordic.com/a/ 1390465 06: 2013; 25: 17.
8. Zhang J, Irwin H, Gelman, Katsuta E, LiangY, Wang X, Li J, Qu J, Yan L, Takabe K and Steven N: Hochwald. Cellular and Molecu Gastro and Hepat 2019; 8(25): 37-59.
9. Fadaka A, Ajiboye B, Ojo O, Adewale O, Olayide I and Emuowhochere R: Biology of glucose metabolization in sugar cancer cells. Journal of Ontological Sciences 2017; 345-51.
10. Diet related factors: Mary Jane Brown, PhD, RD (UK) Healthline.com/nutrition.
11. IARC Monographs evaluate consumption of red meat and processed meat. International Agency for Research on Cancer, Press Release N 240 2015; 1-2.
12. Sharma N and Singhvi R: Effect of chemical fertilizers and pesticides on human health and environment: a review. International Journal of Agriculture Environment and Biotechnology DOI: 10.5958 / 2230-732X. 2017. 00083.3, 2017; 676-79.

13. http://www.aicr.org, Heal well: A cancer nutrition guide. American Institute of Cancer Research.
14. Fenley J, Bary F and Pisani DMe: GLBOCAN 2000 Cancer incidence, morality and prevalence worldwide. World Health Organization Lyon France: IARC Press; 2001.
15. Jerry R: Balentine and Melissa Conrad Stoppler "Medicine Net", 8/12/ 2019.
16. Detail about obesity. http://www.medicinenet.com/ obesity_weight_loss/article. htm.
17. Cantley L: Sickeningly sweet, wiell cornell medicine 2019.
18. Misra A, Sharma R, Pandey RM and Khanna N: Adverse profile of dietary nutrients, anthropometry and lipid in urban dwellers in Northern India. Eur J Clin Nutr 2001; 55: 727-34.
19. Bialostoslky K: Dietary intake of micronutrients and other dietary constituents: Untied States 1988-94. National center of health statistics. Vital Health Stat 20002; 11.
20. IARC Working Group on the Evaluation of Cancer-Preventive Strategic. In: Vanio H, Bainchi F, editors. IARC Handbooks of Cancer prevention, Weight control and physical activity. Lyon France IARC Press 2002; 6.
21. Pelucchi C, Sc D, Gallus SD, Garavello W, Bosetti CMD, Sc D and Veehia CLMD: Cancer risk associated with alcohol and tobacco use: focus on the upper aero digestive tract liver. Health Risk 2006; 29(3): 193-98.
22. Adrian S, Kerry FS, Courenya, Catherine J, John FR and Mackey: Physical exercise and immune system in cancer survivors. A Comprehensive Review and Future Directions 2002; 94:
23. Detail Information of food increases the body immune, www.NCAA.org/SSI Sports, Cardiovascular and Wellness Nutrition 2013.
24. Barnard JR: Prevention of cancer through lifestyle. Evidence Based Complementary and Alternative Medicine 1(3): 233-239.
25. Krishanasawamy K and Polasa K: Diet, nutrition & cancer, the Indian scenario. Indian J Med Res 1995; 102: 200-09.
26. Rajkumar T, Sridhar H, Balaram P, Vaccarella S, Gajalakshmi V and Nandkumar A: Oral cancer in Southern India: the influence of body size, diet, infection and sexual practies. Eur J Cancer Prev 2003; 12: 135-43.
27. Gupts PC, Bhonsle RB, Mehta H, Zheng W and Sanderson M: Dietary exposures and oral precancerous lesion in Srikakulam District, Andhra Pradesh, India. Public Health Nutr 2002; 5: 303-12.
28. Nayar D, Kapil U, Joshi YK, Sundaram KR, Srivastava SP and Shukla NK: Nutritional risk factors in esophageal cancer. J Assco Physicians India 2000; 48: 781-7.
29. Malkan G and Mohandas KM: Epidemiology of digestive cancer in India. General principles and oesophageal cancer. India Gastroenterol 1997; 16: 98-02.
30. World Cancer Research Fund, American institute for Cancer Research. Food nutrition and the Prevention of cancer: a global perspective/World Cancer research Fund associated with American Institute for cancer research. Washington, DC: American Institute of Cancer Research, 1997.
31. Rao DN, Ganesh B, Dinshaw KA and Mohandas KM: A case-control study of stomach cancer in Mumbai, India. Int J Cancer 2002; 99: 727.
32. Mahay GB, Pendland Sl, Yun G and Lu ZZ: Turmeric (*Curcuma longa*) and curcumin inhibit the growth of *Helicobacter pylori*, a group 1 carcinogen. Anticancer Res 2002; 22: 4179-81.
33. Mathew A, Gangadharan P, Varghese C and Nair MK: Diet and stomach cancer: a case-control study in South India. Eur J Cancer Prev 2002; 9: 89-97.
34. Various medications for cancer.http://www.cancertherapy advisor.com/home/tools/ act-sheets/ curcumin-and-cancer/.
35. Medication for cancer. http://www.cancertherapy advisor.com/home/tools/fact-sheets/green-tea-andcancer/.
36. Laxmishree C and Nandita S: Botanical pesticide-a major alternative to chemical pesticide: a review, ISSN: 2320: 7817 eISSN: 2320-964X. Int J of Life Science 2017; Vol. 5(4): 722-29.

How to cite this article:
Prajapati GM, Arole SS and Kithe PR: Diet, body immune and other factors associated with prevention and treatment of cancer: a review. Int J Pharmacognosy 2019; 7(3): 70-75. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.7(3).70-75.