**Review Article**
Volume 12:11, 2021

Journal of
Nuclear Medicine & Radiation Therapy

ISSN: 2155-9619 Open Access

# Causes of Cancer: What to know about Cancer

**Aarti Jadhav*, Vijay Babar**

*Department of Community Medicine, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi (M), Wardha, India*

## Abstract

Cancer is a condition that causes body cells to divide out of control and spread to different site. Practically it can occur anywhere in the billions of cells present in human body. Carcinogen is the substance that causes cancer. Epidemiological evidence suggests that quitting smoking, increasing fruit and vegetable eating, and controlling infections will all help to lower cancer rates. Other factors include avoiding excessive sun exposure, increasing physical activity, and reducing alcohol and perhaps red meat consumption. Modification of sex hormone levels is anticipated to be required for a significant reduction in breast cancer, and the development of viable technologies for doing so is a top research goal. The potential protective roles of certain antioxidants and other components of fruits and vegetables need to be clarified.

Damage to the DNA of cancer cells causes the aberrant growth and division seen in this cell. Damage to and defects in cellular DNA can occur in a variety of ways. Environmental variables, such as cigarette smoke exposure, can set off a cascade of process that can leads DNA abnormalities, which further to cancer.it can occur through hereditary transmission. When cancer cells reproduce and proliferate, they frequently turn into tumour, which is a clump of cancer cells. Tumors pressurise, crush, and kill surrounding tissue, causing many of the symptoms of cancer. Normally human cells produce new cells by process of cell division according to body requirement. When cell get damaged and or became old they die and new cell are form and occupies their position. This multistep process can break down, causing aberrant to grow further reproduce.

**Keywords:** Cancer, Carcinogen, Tumor, Causes

## Background

Cancer is a condition that causes body cells to divide out of control and spread to different site. Practically it can occur anywhere in the billions of cells present in human body. Carcinogen is the substance that causes cancer. Epidemiological evidence suggests that quitting smoking, increasing fruit and vegetable eating, and controlling infections will all help to lower cancer rates. Other factors include avoiding excessive sun exposure, increasing physical activity, and reducing alcohol and perhaps red meat consumption. Modification of sex hormone levels is anticipated to be required for a significant reduction in breast cancer, and the development of viable technologies for doing so is a top research goal. The potential protective roles of certain antioxidants and other components of fruits and vegetables need to be clarified.

Cancer being fatal condition it leads to mortality and morbidity among population .it has been occurred due to various factor like bacteria, virus, and parasite are infectious that can be treated early if proper treatment taken, occupational and environmental factors are man-made that occur in particular cases. Diet and physical exercise are modifiable that can be prevented early. Hormonal and radiation factors can also cure if detected early. The crucial step is early detection and treatment that can increases survival of cancer patients.

Metastasis is the process through which cancer cell divide further and spread to other cells or tissue where they form new tumour cell. Cancer tumours are also called as malignant tumour numerous malignancies, including leukaemia, create solid tumours, on other hand cancers of blood do not. Cancer tumour is of mainly two types benign and malignant. Benign tumour does not spread from one place to another whereas malignant tumour spread to further sites. Cancer causes from various factor like infectious organism, environmental factors that includes radiation, metal, pollution, hormones and dyes.

***Address for Correspondence:** Aarti Jadhav. Department of Community Medicine, Jawaharlal Nehru Medical College, Datta Meghe Institute Of Medical Sciences, Sawangi (M), Wardha, India; E-mail: aartij@gmail.com*



**Received** 06 November 2021; **Accepted** 20 November 2021; **Published** 27 November 2021

### Properties of Cancer Cell

It has divided into biological properties and biochemical properties of cancer cell.

**1. Biological Properties**

- Cancer cell does not have particular phenotype because cell does not diiferentiate.
- Cancer cells undergo continuous mutation as a result of their lack of the ability to repair genetic errors.
- Cancer cells are less adherent than normal cells, resulting in the development of huge masses and the spread of cancer to other parts of the body.
- Loss of apoptotic capability in cancer cells
- Loss of sensitivity to anti-growth signals

**2. Biochemical properties**

- Cancer cell have different lipids and sterols are found in cancer cells which interferes with the synthesis of steroid hormones, reducing the activities of these hormones.
- The glycoprotein composition of cancer cells differs from that of normal cells The number of normal growth receptors generated in cancer cells decreases, while the number of malignant growth receptors produced increases.
- Gluconeogenesis is the process through which cancer cells "embrace" glucose. Because the quantity of glucose produced by a normal cell is insufficient for cancer cells, they must obtain glucose from other sources such as protein and lipids.

A sequence of mutations (permanent alterations) in the genes causes cancer cells to form. These errors are most common during the cell division process of mitosis. When cells divide, checkpoints and certain regulatory genes are activated to guarantee that the replication process is completed correctly.

If any of these regulating genes is mutated or faulty, the checkpoints fail to identify issues with cell division, and the cells divide despite their defects, resulting in proliferated cell division and cancer.

- **Oncogene:** A gene that has been altered to cause its protein product to be generated in greater amounts or to have enhanced activity, resulting

in tumour development. It can occasionally result in a growth factor receptor that is constantly "ON."

- **Tumor suppressor gene:** This gene produces proteins that prevent tumour development and genesis.
- **Carcinogenesis:**-Carcinogenesis is multistep process in which genes that regulates normal cell function, like cell growth and its control systems, are modified and mutated.
- **Carcinogens:**-it is define as substances that causes cancer.it can be any types carcinogen initiate the process of carcinogenesis

## Objectives

The main aim of this review article is to analyze cancer, and its various causes.

## Methodology and Data

The secondary data collected from different records and media are used in the literature.

## Causes

Cancer can be cause due to following cause

Infectious which include bacteria, parasite, viruses environmental that include factors like metals, Smoking, alcohol, electromagnetic radiation, physical inactivity, reproductive hormones, diet, and physical activity are all investigated and describes as follow:-

## Infectious Cause

## Bacterial:-

Infections are thought to be responsible for 20% of all human tumours (1). While epidemiological data links specific cancers to bacterial infections, tumour development is typically thought to be purely due to the inflammatory responses that follow. Nonetheless, during various stages of their infection cycle, many bacteria directly affect their host cell. Such changes can compromise the integrity of the host cell and contribute in development of cancer. Bacteria, on the other hand, have recently have been associated with cancer through two mechanisms:

- Chronic inflammation induction
- Carcinogenic bacterial metabolites.

The link between Helicobacter pylori causing stomach cancer is widely studied for any bacterial infection and cancer [1].Helicobacter pylori infection is the most particular link with the inflammatory process of carcinogenesis. Because of its proclivity for causing lifelong inflammation, H. pylori has epidemiological association with adenocarcinoma of distal part of stomach. By promoting cell growth and creation of free radicals, induces cancer [2].

Colon cancer is the best example of this paradigm. Colonic cell growth is boosted by bile salt metabolites. Exogenous chemicals like rutin may be converted by indigenous intestinal flora into mutagens. Furthermore, Bacteroides species are capable of producing fecapentaenes, which are strong in vitro mutagen, at rather high dose, Because antibiotics can be used to treat bacterial infections, identifying bacterial origins of cancer could have significant consequences for cancer prevention [3].

## Parasite

In the last few years, parasitic infections in cancer patients have emerged as a major problem. The majority of infections are asymptomatic, but they can be lethal while a patient is undergoing chemotherapy [4].

According to new data, parasites like

- Schistosoma haematobium (blood fluke)
- Opisthorchis viverrini (small liver fluke)
- Clonorchis sinensis

This is responsible for bladder cancer. The bulk of cancer cases in many endemic areas are caused by these helminths [5].

## Virus

Virus-associated cancer is a type of cancer that occurs when a virus infects the host's cells and causes them to become malignant.

Viral agent causing cancer is as follow:-

- Human papillomaviruses ,
- Mouse mammary tumour virus
- Epstein–Barr (EBV) virus

This all are potential human breast cancer agents. Although the exact involvement of viruses in carcinogenesis is unknown, it appears that they are responsibleforonlyoneofseveralprocessesnecessaryforcancerdevelopment(5), The Epstein-Barr virus (EBV) has long relation with three cancers as follows-

- Burkitt's lymphoma,
- B-cell lymphoproliferative syndromes,
- and nasopharyngeal carcinoma,
- Hodgkin's disease,
- T-cell lymphomas,
- Gastric carcinoma.

They also causes of infectious mononucleosis. The virus's role in cancer might range from primary causing agent to cofactor both epithelial and lymphoid cell were affected by Epstein Barr virus, establishing a pathological and biological foundation for these various interactions. Presence of this virus has linked to breast and stomach cancer t, however part of this research is still controversial. EBV takes control of cellular pathways that govern a variety of homeostatic cellular activities by using viral proteins that mimic numerous growth factors, transcription factors, and antiapoptotic factors [6].

# Environmental

## Metals

Metals in trace levels are necessary nutrients, but at higher concentrations, they can be hazardous to living cells. Metals can act as both endocrine disruptors and carcinogens, causing hormonal disruption and malignant transformation. The changing effect of heavy metals is higher in growing organisms such as the foetus (exposed via the mother) and persons in early childhood, similar to other carcinogens. Metal contamination in the environment has risen dramatically in industrialised countries in recent decades. Most prevalent environmental factors are contaminants include arsenic, nickel, hexavalent chromium and cadmium. Long term exposure to this substance causes variety humans cancer. Making them major public health concern [7]. In volcanic locations, the possibility of thyroid malignancy is significantly higher. Because of this, the volcanic environment is an excellent model for studying the conditions that favour thyroid cancer [8].

## Smoking

Cigarette smoking has been associated to a wide range of neoplastic illnesses, according to a large body of epidemiologic evidence. It has been discovered that smokers have a higher relative chance of dying from cancers of lung, pancreas, head and neck, urinary system and bladder. Recently research had linked smoking as increased possibility of leukaemia as well as myeloma. Enormity of this dangers had encouraged to search into the metals involved in enormous smoking-related cases [9].

Mutation has been discovered in both type of cell lung cancer well as mutations in dominant oncogenes in the latter. The molecular genetics of smoking-related malignancies is becoming more understood, which could lead to better detection and therapy. The detection of oncogene or tumour

suppressor gene alterations in premalignant tissues should help identify people who have an inherited propensity to smoking-related carcinomas [10].

## Alcohol

There has been a causative relationship between alcohol intake and oral cavity malignancies, throat, oesophagus, liver, rectum, larynx, colon and, breast cancer among women, association with pancreatic and lung cancers is hypothesised. It is evident that polymorphisms modify the effect of alcohol in genes that codes for metabolism in ethanol enzymes (e.g. dehydrogenases of alcohol), DNA repair.

Whereas possible events include: genes toxic effect on acetaldehyde, major metabolite for ethanol, increased level of oestrogen, that is important in breast cancer act as solvent for tobacco carcinogenesis; producing reactionary oxygen and nitrogen molecules and changing of the mechanism of the carcinogenic effects after alcohol consumption. Many nations, alcohol intake had become a major worldwide cause of cancer [12].

Ethanol metabolism leads to the production of free radicals and acetaldehydes (AA). Evidence has shown that acetaldehyde is mainly responsible for carcinogenesis associated with alcohol. Acetaldehyde mutagenic as well as carcinogenic that attaches to the DNA, protein and destroys folate. Acetaldehydes are produced in the upper and lower gastrointestinal tract by tissue alcohol hydiasis, cytochrome P 4502E1 and bacterial oxidative metabolism. Due to functional polymorphisms of enzyme genes, its genes or degradation has been modulated. Oral and faecal bacteria may also produce acetaldehyde [13].

## Radiation

The intensive epidemiological examination was conducted on ionising radiation. Studies had found that exposure from moderately to high concentration may cause the majority of cancer, leukaemia, pulmonary, breast, thyroid malignancies, in particular at the age of youthful exposure to radiation [14]. Excess cancer deaths were discovered in studies of radiation workers, underground miners, and painters which increases the development of radiation safety regulations and theories of cancer.

Although ionising radiation appears to cause practically all types of neoplasms, the relationship between tumour incidence and dose varies depending on the type of neoplasm, host constitution, irradiation settings, and other factors .

## Occupation

Occupational can lead to a malignant tumour produced caused by occupational expose to carcinogens. In developed countries, it is expected that one from the three person acquire cancer at any stage of their life. Transfers of hazardous businesses are also putting developing countries at risk. Occupational cancers are not pathologically or clinically different from their non-occupational counterparts, and they are treated in the same way as non-occupational malignancies. Nonetheless, in terms of public health, the identification of occupational malignancies is critical, because all occupational cancers, like other occupational diseases, are preventable.

In men, the risk of lung cancer was much higher in sales, transportation and communications, metal, ceramics, and construction employees, and in women, the risk was significantly higher in service workers. Men in the transportation and communications and service industries had a considerably higher chance of acquiring liver cancer. Colon cancer risk was much higher in professional people of both sexes, as well as clerical employees in men. Professional women, administrative and clerical professionals, and hairdressers all had a significantly higher chance of acquiring female breast cancer.Gastric cancer is a most common source of fatal condition in the United States. There are various risk factors, with one of them being one's work. There's a lot of evidence that suggest people working in coal mines, steel production, rubber production, all raise the risk of stomach cancer. Other “dusty” jobs, such as wood processing or working in high-temperature conditions, have been linked, although the evidence isn't conclusive.

## Pollution

The burden of disease is largely influenced by outdoor air pollution worldwide. The majority of world's population residing in places where air pollution has exceed the air-quality rules of the World Health Organisation, as a result of export from industrial factories, electricity, transportation, according to WHO guidelines. Air pollution is important health concern the most common primary air pollutants, which are released directly environment due to combustion biomass are as follow:-

- Sulphur dioxide
- Carbon monoxide
- Nitrogen dioxide
- Volatile organic substances

## Physical inactivity

Sedentary behaviour is linked with increased possibility of cancer, on the other hand regular physical activity and good fitness have decreases the chance. Lifestyle therapies targeted at raising Physical activity levels and CRF, especially individual who recovered from caner, are needed.

Promoting PA regularly together with adipose and CRF monitoring indicators can give strong cancer preventive strategies in communities, help to deal with their illness more efficiently, and increase secondary prevention programmes among cancer patients [15].

## Ink

The risk of cancer to those who are coloured with azo dyes with tattoos, paper folders, toys, bed clothing, watch straps and ink. Benzidine, 2.4-tololenediamine; 4,4'-diaminodiphenylmethane; 3,3'-dichlorobenzidine; o-toluidine have been identified in these items. In essence, the risk evaluation comprises both the (estimated) level of aromatic amines that enter the body during the duration of product usage and tolerable limits as determined for long term exposure to these amines.

In the risk assessment, the following objectives are considered.

1) The possibility of azo dyes and amines being present,

2) The frequency of use of the products,

3) The amount of level that contact with skin,

4) Level of amine

5) Movements of dye and amines within product

6) Dyes and amines absorption through skin [16].

## Hormones

Hormones have a key part in the development of some of the world's most frequent cancers, including endometrial, breast, and ovarian cancers in women, and prostate cancer in men. Hormones are thought to influence cancer risk through influencing the pace division and differentiation of cell, and amount of vulnerable cell. Hormones has a strong influence during division of cell in the endometrium, oestrogens that promotes mitosis, on the other hand progestins inhibit it. During post menopause period, oestrogen replacement can increase, the risk of endometrial thus be proportionate to the length of oestrogen exposure that is not subject to progestin, possibly as unopposed oestrogens promote endometrial division. Endometrial cancer risk will increase. The effects of hormones in non-pregnant females on breast epithelial cell divisions are much less obvious than their endometrial effects, but both oestrogens and progesterone seem to accelerate mitosis. The risk of early menarche breast cancer increases late menopause and replacement treatment for oestrogen possibly due to increased breast exposure to hormone [17].

Hormones have little direct influence on epithelial cells that cover ovaries, but they do induce ovulation, after division of cell at the time of epithelial repairing. The incidence of cancer decrease after decreasing use of contraceptives. Changes in sex hormone exposure modify the risk of all three

malignancies within a few years, and some of them change faster than others.

### Diet

Diet has important important role in causing cancer like breast, colon cancer, and perhaps despite the lack of conclusive data, it has proven that intake dietary fibre can protects against colon cancer, while there is strong evidence that vegetable consumption does.

It has predicted that intake of healthy food with good dietary fibre can prevent chances of all types of cancer. Low fibres in diet imbalance between concentration of Omega-3 and Omega-6 fats cause cancer risk.it can be prevented by intake of veggies and fruits which contain vitamin B12,selenium and antioxidant such as carotenoids. When taken orally, ascorbic acid can beneficial but it can be only helpful when administered intravenously. Few of the related studies on carcinomas were reviewed.

### Diagnosis

Key cancer diagnostic techniques are as follow:-

1. Diagnosis of radiology
2. Diagnosis of cytology
3. Histological diagnosis
4. Section Frozen
5. Diagnostic haematology
6. Infectious Histochemistry
7. Molecular disease.
8. Markers of tumour

## Conclusion

Nowadays, cancer has become drastic condition. Understanding the cause of cancer, its mechanism and how it can increase with other factor has become important for its prevention and further management are required. Cancer being most fatal condition emerged into morbidity and mortality. Its main causes are required to identify and the sources from where it originate. Cause can occur from various factor ranging from infectious to modifiable risk factor environmental.

## References


1. Parsonnet, Julie. "Bacterial infection as a cause of cancer." *Env Hea Pers* 103 (1995): 263-268.
2. Vogelmann, Roger, and Manuel R. Amieva. "The role of bacterial pathogens in cancer." *Curr Op in Microbio* 10 (2007): 76-81.
3. McGarr, Sean E, Jason M. Ridlon, and Phillip B. Hylemon. "Diet, anaerobic bacterial metabolism, and colon cancer: a review of the literature." *J Clin Gastro* 39 (2005): 98-109.
4. Plata, Juan David, and Ximena Castañeda. "Parasites in cancer patients." *Onco Cri Care* (2020): 1441-1450.
5. Amarante, Marla Karine, and Maria Angelica Ehara Watanabe. "The possible involvement of virus in breast cancer." *J Cancer Res and Clin Oncol* 135 (2009): 329-337.
6. Wang, Zhishan, and Chengfeng Yang. "Metal carcinogen exposure induces cancer stem cell-like property through epigenetic reprograming: A novel mechanism of metal carcinogenesis." *Semin Cancer Biol* 57 (2019): 95-104.
7. Carbone D. ‘‘Smoking and cancer.’’ *Am J Med* 95 1992:13–7.
8. Alberg, Anthony J, Malcolm V. Brock, Jean G. Ford and Jonathan M. Samet, et al. "Epidemiology of lung cancer." *Chest* 143 (2013): 1-29.
9. Boffetta, Paolo, and Mia Hashibe. "Alcohol and cancer." *Lancet Oncol* 7(2006): 149-156.
10. Pöschl, G, and Helmut K. Seitz. "Alcohol and cancer." *Alcohol Alcohol* 39 (2004): 155-165.
11. Seitz, Helmut K., Gudrun Pöschl, and Ulrich A. Simanowski. "Alcohol and cancer." *Recent Dev Alcohol* (1998): 67-95.
12. Wakeford, Richard. "The cancer epidemiology of radiation." *Onco* 23 (2004): 6404-6428.
13. Rushton, L, S. Bagga, R. Bevan and T. P. Brown, et al. "Occupation and cancer in Britain." *Br J Cancer* 102 (2010): 1428-1437.
14. Raj, A, JF Mayberry, and T. Podas. "Occupation and gastric cancer." *Post Med J* 79 (2003): 252-258.
15. Vineis, Paolo, and Kirsti Husgafvel-Pursiainen. "Air pollution and cancer: biomarker studies in human populations." *Carcinog* 26(2005): 1846-1855.
16. Zeilmaker, MJ, ED Kroese, P. Van Haperen and M. P. Van Veen, et al. "Cancer risk assessment of azo dyes and aromatic amines from garment and footwear." (1999).
17. Vineis, Paolo, and Kirsti Husgafvel-Pursiainen. "Air pollution and cancer: biomarker studies in human populations." *Carcinogenesis* 26, no. 11 (2005): 1846-1855.


**How to cite this article:** Jadhav, Aarti, Babar V. “Causes of Cancer: What to know about Cancer” *J Nucl Med Radiat Ther* 12 (2021): 465.