



## Modernization and Cancer Understanding

Rajeev Nema<sup>1,2,3</sup>, Sarita Khare<sup>1</sup>, Parul Jain<sup>4</sup>, Alka Pradhan<sup>3</sup>, Abhishek Gupta<sup>2</sup>, Dharmendra Singh<sup>2,3</sup>, Gajraj Singh<sup>1,2</sup>

<sup>1</sup>Sarojini Naidu Government Girls Post Graduate (Autonomous) College, Shivaji Nagar, Bhopal, India.

<sup>2</sup>Center for Microbiology & Bio-Technology Research and Training, institute, Bhopal, India.

<sup>3</sup>Govt. Motilal Vigyan Mahavidyalaya, Bhopal, India.

<sup>4</sup>S.V. Polytechnic College, Bhopal, India.

\*Corresponding author's E-mail: [rrsht.nema@gmail.com](mailto:rrsht.nema@gmail.com)

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### ABSTRACT

Cancer is a category of diseases characterized by out-of-control cell growth. There are various types of cancer, and each is classified by the type of cell that is primarily affected. Cancer is a circumstance which arises while a cell starts disobeying the check mechanisms, which control the rate of cell proliferation and starts dividing in an uncontrolled manner. This leads to the formation of a neoplastic tumor, which is normally benign at this stage, but becomes malignant, when it starts metastasizing, i.e. starts spreading to other tissues.

**Keywords:** Cancer, Modernization, tumour.

### INTRODUCTION

Cancer was coined by a Greek physician Hippocrates (460-370 BC), who is furthermore well thought-of as the "Father of Medicine." Hippocrates used the terms 'carcino' and 'carcinoma' to describe non-ulcer forming and ulcer-forming tumors. Galen (130-200 AD), another Roman physician, used the word oncos' (Greek for swelling) to describe tumors. A mature human comprises about  $10^{15}$  cells; scores of them divide and differentiate in order to renew organs and tissues, which require cell turnover<sup>1</sup>. However, if the cells do not stop dividing, they may show the way to cancer. Characteristically, cancer is an uncontrolled proliferation of cells which become structurally abnormal and possess the ability to detach them from a tumor and begin a new lump at a remote site within the host<sup>2</sup>. Worldwide, cancer represents a considerable burden of disease in the community and appears to be a most important cause of concern. Every year over 200,000 people are diagnosed with Cancer in the United Kingdom only and approximately 120,000 die as an aftermath of the disease<sup>3</sup>. According to the International Agency for Research on Cancer, in 2002<sup>4</sup>, cancer killed > 6.7 million people around the world and another 10.9 million new cases were diagnosed. If the results are extrapolated, at the same rate, an estimated 15 million people will have cancer, annually, by 2020. According to an estimate given by American Cancer Society (2009)<sup>5</sup>, about 1,500,000 new cases and over 500,000 deaths are expected in the US by 2009. The National Cancer Registry of South Africa has spotted the cancers of bladder, breast, cervix, lungs and melanoma commonly among the inhabitants<sup>6</sup>.

Nearly all types of cancer lead to the development of tumors, unusual clusters of cells. However, not all tumors are cancerous. Tumors that cannot invade nearest tissues or spread to other parts of the body are called benign

tumors. With unusual exceptions, benign tumors do not cause serious diseases and are not life threatening. Malignant tumors are cancerous tumors. Malignant tumors can invade and destroy nearest tissues and organs, and spread to other parts of the body. This spread of cancer cells from one part of the body to an additional distant site is called metastasis. In short, malignant tumors are capable of attack and metastasis, but benign tumors do not have these capabilities. It is significant that, the term, 'tumor' is often used in a narrow sense to refer to malignant tumor, which is identical to cancer, and both are used in the following introduction. Just as there are different variations of names designed for cancers, with the spatial reference cancer occurrence, has been found in almost every part of the body, including the head and neck, brain, eyes, salivary gland, thyroid, lung, breast, ovary, cervix, uterus, esophagus, stomach, bowel, liver, adrenal, pancreas, kidney, bladder, prostate, bone, blood, skin, lymphomas, etc.

Now accurate reason of the cancer remains mysterious, but Apoptosis, or programmed cell death, is one of the most finely coordinated regulatory functions in favor of maintaining the homeostasis in the living organism. It involves the continuous checking of the cellular integrity and a cascade-like event of self-destruction when the integrity of the organism is endangered. Morphological hallmarks of apoptosis are nuclear condensation, cell shrinkage, membrane blebbing and the formation of apoptotic bodies. These changes are accompanied by biochemical features, including DNA fragmentation and the proteolytic cleavage of a variety of intracellular substrates.

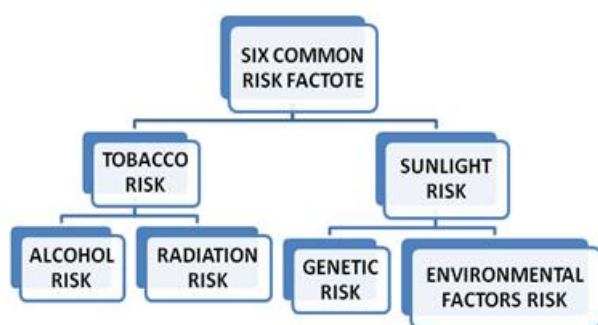
A number of additional risk factors are present from a broad range of studies in various populations and geographic locations. The evolution in research on the cause of cancer has revealed the confirmation that



nutritional patterns are closely associated with the risk of several types of cancer<sup>7</sup>. Fat has been the focus of nutritional studies on cancers of the prostate, breast and colon more than any other dietary component<sup>8</sup>. A number of studies in countries consuming high fat diets have consistently shown higher incidence and mortality rates for breast, colon and prostate cancers.<sup>9</sup>

Studies of specific environmental influences have showed an increased risk of developing various forms of cancer with exposure to particulate air pollutants and fertilizers. Substances such as asbestos, aniline dye, uranium and nickel have been mixed up as environmental carcinogens.<sup>10</sup> People are now subjected to rising pollution from industrial processes and automobile exhausts and all of these factors, along with others, combine to make cancer one of the most shocking and from an epidemiological point of view, there are many different factors involved in the development of cancer.

### Six Common Cancer Risk Factors



### Classification of Cancer

There are five broad groups that are used to classify cancer.

- Carcinomas are characterized by cells that cover internal and external parts of the body such as lung, breast, and colon cancer.
- Sarcomas are characterized by cells that are located in bone, cartilage, fat, connective tissue, muscle, and other supportive tissues.
- Lymphomas are cancers that begin in the lymph nodes and immune system tissues.
- Leukemia's are cancers that begin in the bone marrow and often accumulate in the bloodstream.
- Adenomas are cancers that arise in the thyroid, the pituitary gland, the adrenal gland, and other glandular tissues.

### Genetic Basis of Cancer

#### Cancer Biology

Only a small number of around 35,000 genes present within the human genome have been related with cancer. Alterations in the same gene often are associated with different forms of cancer. These malfunctioning genes can

be generally classified into three categories. The first category, called proto-oncogenes, produces protein products that normally enhance cell division or inhibit normal cell death. The mutated forms of these genes are called oncogenes. The second category, called tumor suppressors gene (TSG), makes proteins that normally prevent cell division or cause cell death. The third category contains DNA repair genes, which help prevent mutations that lead to cancer. Proto-oncogenes and tumor suppressor genes work much like the accelerator and brakes of a car, respectively.

#### Proto-Oncogenes

Proto-oncogenes are genes which function to control normal cell proliferation and differentiation<sup>21</sup>. Alterations of these genes, gain-of-function mutations, can lead to overly active growth-promoting genes, which appear in cancerous cells as activated oncogenes<sup>22</sup>. Proto-oncogenes are usually dominantly acting genes at the cellular level<sup>23</sup>. The somatic mutations that cause activation of oncogenes are characterized by mutations that cause structural changes to the encoded protein, such as point mutations and chromosomal translocations<sup>24</sup>. Proto-oncogenes can also be transformed to oncogenes by elevated expression through gene amplification or chromosomal translocations<sup>25</sup>.

#### Tumor Suppressor Genes (TSG)

Tumor suppressor genes are normal genes that slow down cell division, repair DNA mistakes, or inform to cells when to die (a process known as apoptosis or programmed cell death). When tumor suppressor genes don't work accurately, cells can grow out of control, which can lead to cancer. Many different tumor suppressor genes have been found, including TP53 (p53), BRCA1, BRCA2, APC, and RB1. Tumor suppressor genes (TSG) operate to suppress cell proliferation through many biochemical mechanisms, and are often inactivated in various ways in cancer cells<sup>26</sup>. An inherited mutant copy of a TSG increases susceptibility to specific types of cancer<sup>27</sup>. The Knudson hypothesis of TSG inactivation postulates that mutant alleles of TSG are recessive at the cellular level. Therefore both alleles of a TSG must be inactivated, loss-of-function mutations, in the transformation of normal cells to cancerous cells<sup>28</sup>. The loss of TSG function can occur either by genetic mutation or epigenetic silencing of genes via promoter methylation<sup>29</sup>.

### Epidemiology of Cancer

#### World Epidemiology of Cancer

According to the World Health Organization, cancer is the second leading cause of death in developed countries and is among the three leading causes of death for adults in developing countries (WHO). A steadily increasing proportion of elderly people in the world will result in approximately 16 million new cases of cancer by the year 2020 (IARC). International Agency for Research on Cancer (IARC) has predicted that by 2030, 27 million new cancer

cases and 17 million cancer deaths will occur each year worldwide. From 2005-2009, the median age at diagnosis for cancer of all sites was 66 years of age<sup>30</sup>. Approximately 1.1% was diagnosed under age 20; 2.6% between 20 and 34; 5.5% between 35 and 44; 14.2% between 45 and 54; 23.4% between 55 and 64; 24.9% between 65 and 74; 20.6% between 75 and 84; and 7.7% 85+ years of age. The age-adjusted incidence rate was 465.2 per 100,000 men and women per year. These rates are based on cases diagnosed in 2005-2009 from SEER and 12.7 million new cancers and 7.6 million cancer death reported by GLOBOCAN 2008. The American Cancer Society predicts that approximately 1,690,000 new cancer cases will be diagnosed and 577,000 Americans will ultimately die of cancer in 2012<sup>30</sup>. At present it is estimated that 1,638,910 men and women (848,170 men and 790,740 women) will be diagnosed with and 577,190 men and women will die of cancer of all sites. The above information is based on NCI's SEER Cancer Statistics Review<sup>31</sup>.

## CONCLUSION

In the present time researcher creating pioneering approaches that would avoid cancer and their associate genetics diseases. With the intention of so many researcher paved the way for cancer research and discovery for their genetically analysis, this advances technology for understanding of the genetics of diverse cancers. Now a day's emerging molecular technologies, suggest that genetic defects of cancer cells could revolutionize management of this disease. There are number of bioinformatics tools as well as online server for proper analysis predicts function and structural annotation. These program users friendly and give much aware results.

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