

A COMPREHENSIVE REVIEW ON CANCER**Gurav Sharvari Vijay^{1*}, Kene Rutuja Vishwas², Giri Sandhya Subhash³**

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ABSTRACT

Cancer incidences are dramatically increasing in society. The effect of cancer is rising constantly in all age groups. Nowadays, cancer research is more focused on the study of the progressive and novel therapeutic perspectives of cancer treatment. The researchers continuously working on the medicines of good future to treat cancer. Recently, research on Cancer treatment has advanced significantly. important Cancer treatment has advanced significantly., accurate as well as less invasive treatment of cancer. Uncontrollable growth of cancer is caused due to genetic and environmental variables. The most common cancer risks involve the consumption of tobacco and smoking, obesity, infectious diseases, chemicals as well as radiation exposure. These risk factors can work together to initiate and promote the process of carcinogenesis in the body. In savior conditions, they can cause death. Various therapies are utilized for managing cancer like targeted therapy, immunotherapy, stem cell transplant, chemotherapy, surgery, hormone therapy, and radiation therapy as well as hormone therapy.

KEYWORDS: Cancer, Research, Treatment, Risks, Therapies.**INTRODUCTION**

Cancer is a major and gradually increasing problem all over the world. This is the main cause of mortality worldwide and goes on increasing day by day. Our body is made up of enormous cells, which die and get replaced by new cells. Those new cells are obtained from pre-existing cells in our body. Although, in some cases, those cells divide continuously without any restriction. This continuous division of cells causes an abnormality in our body, which we called "cancer". Cancer is a metastatic, invasive as well as proliferative disease. Uncontrollable growth of cancer is caused by genetic as well as environmental factors. Several extrinsic factors like chemicals, tobacco, radiation as well as infections organisms are also responsible to cause cancer. intrinsic factors hormones, random mutations inherited mutations, as well as immune conditions, can cause cancer. A body of a living organism is formed of the smallest unit known as cells. All kinds of cancer initially start in the cells. Generally, the body possesses the correct number of cells. For a specific reason, the cell generates specific signals. when the signal is absent then cells can begin to propagate unessentially and resulting in the formation of a lump which is known as a tumor. Although the several

types of cancer that begin with different pathways such as blood cells, it is known as leukemia, and that does not form a solid lump. The cancer cells grow continuously. Cancer cells act separately from normal cells. The cancer cells require nutrients as well as oxygen to grow as well as survive. A tumor may simply grow with nutrients as well as oxygen. It requires the blood supply to carry oxygen including nutrients for growing and multiplying. The cancer cells are distinct from the normal cells because, it divides abnormally, became evade the immune system, the avoid signals of self-destruction.

Causes of cancer

Many factors can cause cancer in distinct parts of the body. It can be analyzed as, mostly 22% deaths due to the consumption of tobacco, 10% deaths because of obesity, inadequate diet, absence of the physical activity, and enormous drinking of the alcohol. It includes some other facts like environmental pollutants, ionizing radiation exposure, and infection. About 15% of worldwide cancer is a result of certain infections like hepatitis B and hepatitis C, H. pylori, infection, HIV and the human papillomavirus as well as Epstein- Barr virus. This element slightly causes the changing of genes.

1. Physical Carcinogens

Ionizing radiation like radon, ultraviolet radiation in sunlight, alpha, beta, gamma, uranium as well as X-ray radiation.

2. Chemical Carcinogens

The compounds such as cadmium, n-nitrosamines, benzene, nickel, asbestos, and vinyl chloride including benzidine along with around 60 well known vigorous cancer-causing substances and chemicals found in cigarette smoke and consumption of tobacco. Arsenic is the main chemical contaminant in drinking water and the food contaminant is the aflatoxin.

3. Biological Carcinogens

The Infections of some bacteria, viruses, or parasites as well as pathogens such as Merkel cell polyomavirus, Epstein-Barr Hepatitis B and C, human papillomavirus

1) Cervical cancer

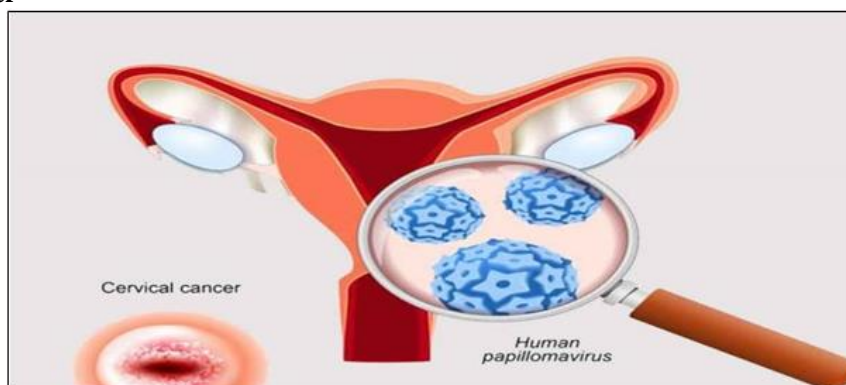


Fig. No. 1: Cervical cancer.

Globally, Cervical cancer continues to rank third in prevalent malignancy among women. However, rates of death and incidence have significantly decreased in nations that offer screening as well as these decreases are made even more pronounced when considering the subsequent rise in contact to hazards components of cervical cancer. The Papanicolaou (Pap) test, which uses cytological evaluation of cells shed from the cervix, is still the most frequently utilized test and was developed

(HPV), this *Schistosoma* spp., in addition to *Helicobacter pylori*.

4. Genetics

Genetics is a general reason for cancer or tumor such as skin cancer, ovarian, prostate, breast, and colorectal cancer. The harmful compounds formed by the elevation of temperature in cooked meat also raise the risk of cancer¹¹⁻¹³.^[1]

Types of Cancer

The first type is Carcinoma in which, Cancer originates in the skin. or tissues, it covers internal organs as well as glands that produce the solid tumor.

2) Breast cancer

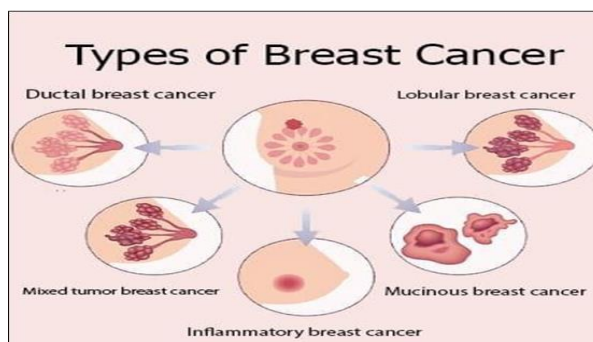


Fig. No. 2 Breast cancer.

The most common is breast cancer that is most frequently

determined in women globally (Globocan, 2008), and its

prevalence is on the rise in several prosperous developed countries, likely due to evaluation for earlier identification of breast cancer as well as changes in reproductive practices and life style. Mammography, the only commonly advised monitoring test, utilizes breast

x-rays to find cancers before they develop into noticeable bumps. Eleven mammography randomized controlled trials From 1963 to 1991, researchers done investigations in the United Kingdom, Scandinavia, and North America.

3) Colorectal cancer

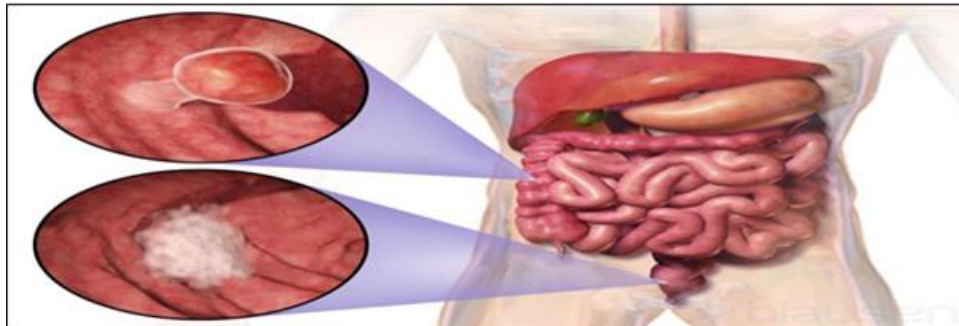


Fig. No. 3 Colorectal cancer.

Nonetheless, there is a known precancerous stage in his cervical cancer, CRC. The most effective test for identifying Beth canors and pre-canons is endoscopic imaging of the whole colon. Through an endoscopy, poteps can be removed to stop CRC from developing. Although there are currently Randomized controlled trials for monitoring for colonoscopies, the public health case has been established based on case-control and

naturalistic studies (Levin et al., 2008). Physicians or other qualified medical professionals may carry out flexthle rigmoidoscopy (FS), an altecuaitse test, without the need for sedation. Although it only looks at the distal colon, this is where mout polyps are detected, and colonoscopies can be used to follow up with those who have numerous or more dangerous polyps.

4) Prostate cancer

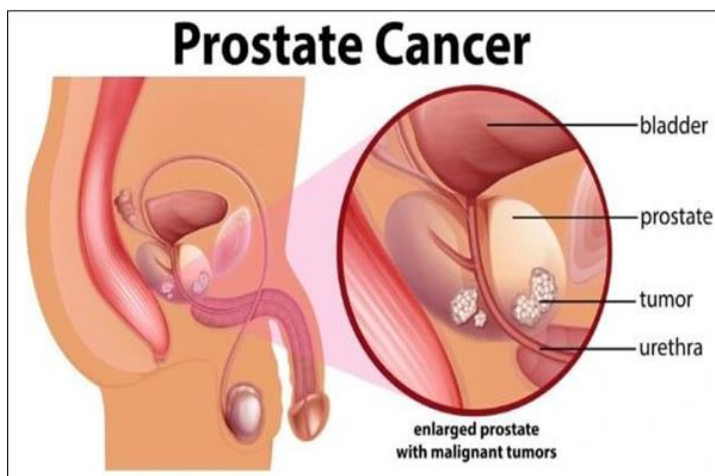


Fig. No. 4: Prostate cancer.

In the screening spectrum, prostate cancer holds a special place. It is the second most common cancer in males globally (Globocan, 2008), and in many countries with cancer screening, it is the second most common cause of cancer-related deaths in men (ACS, 2012a; CR-UK, 2012). A blood test that gauges serum levels A common digital rectal examination (DRE) tool for assessing the prostate and a predictor of the severity of prostate cancer is prostate-specific antigen (PSA). A biopsy is performed if P and DRE indicate an increased threat.

5) Lung and ovarian cancer

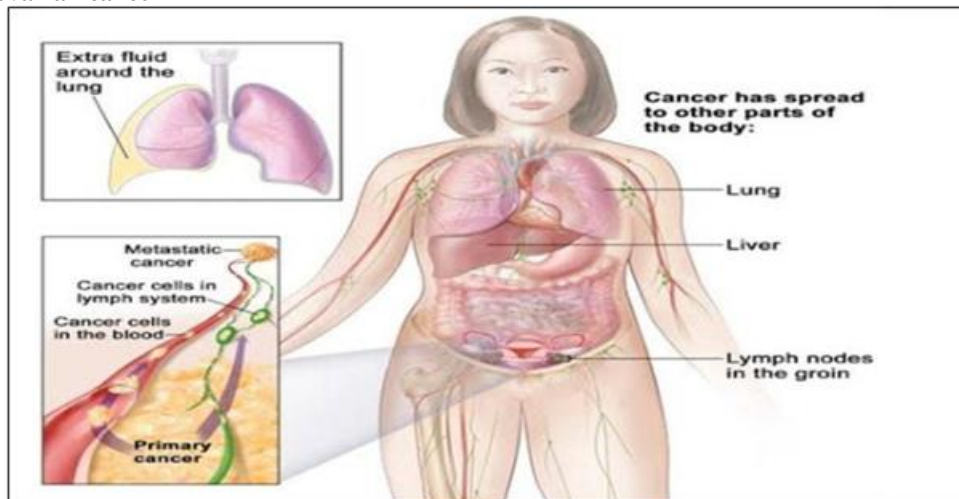


Fig. No. 5: Lung and ovarian cancer.

Cancer of the ovaries is the seventh most cause of cancer-related deaths among women worldwide (Globocan, 2008); in the UK, it ranks between fourth and fifth in terms of most prevalent cancer diagnoses. In the US, respectively (ACS, 2012b, CR-UK, 2012). Although it is one of the rarer cancers in women, it usually manifests at a severe stage with a very poor survival rate. There has always been excitement about utilizing serum levels of the tumor marker CA125 or transvaginal ultrasonography to provide an indicator of cancer before symptoms appear because early detection of the condition improves mortality. The most extensive randomly assigned study until now, meanwhile, reported no decrease in death rates, despite a possibility of a survival benefit in screen-detected patients (Buys *et al.*, 2011).

DIAGNOSIS

1 Imaging

1) X-rays

X-rays for diagnosis represent the most significant man-made source of ionizing radiation exposure for the general public. The extent to which these exposures pose substantial cancer risks remains uncertain. The risks of cancer from diagnostic irradiation are thought to be relatively low, with the exception of few cases in the past, such as repeated chest fluoroscopies in TB patients.^[2] Nevertheless, research has revealed. Diagnostic increased risks of thyroid cancer, meningioma, glioma, parotid gland tumors, and chronic myeloid and monocytic leukemia have been associated with medical and dental x-rays, especially for high-dose exposures that occurred decades ago. Given the enormous frequency and ubiquity of x-ray exposure during diagnostic procedures, any discernible rise in cancer risk would be quite significant from a public health standpoint.^[3]

2) CT

In the case of cancer patients, computed tomography is currently considered a vital tool by many radiologists and physicians. Both early and advanced disease, as well as

people who are simply suspected of having cancer, can benefit from the method, which is commonly utilized for a variety of tumor types. When a lesion has a different density from its surrounds, like in the case of a liver metastasis, or when a mass is present that changes the shape of a normal structure, like in pancreatic carcinoma, the lesion is detected using CT. The primary benefit of CT imaging is the direct imaging of tumors, which allows for the accurate delineation of the mass's boundaries. This is pertinent to both the care of individual patients and the investigation of human tumor behavior.^[4]

3) MRI

Combining diffusion-weighted, dynamic contrast-enhanced, and T2-weighted imaging has shown outstanding efficacy in multiparametric magnetic resonance imaging (mp-MRI) in diagnosing high-grade prostate cancer (PCa). A diverse group of 219 MRI images from three separate scanners prior to prostatectomy were utilized to train and validate the model utilizing a five-fold cross-validation process.

4) PET scans

Positron emission tomography (PET) has emerged as a significant advancement in the imaging of lung cancer. Traditional imaging methods rely on variations in tissue structure. However, false-negative results may arise in lesions that are less than 1 cm, as an adequate quantity of malignant cells that are metabolically active cells is necessary for a PET diagnosis. In this regard, PET provides limited additional advantages due to its constrained capacity for precise anatomical localization. While the positive predictive value is acceptable, false-positive results may occur in cases of anthracosilicosis, infections, or granulomatous diseases. PET serves as a valuable staging tool due to its capability to identify the primary tumor along with local and distant metastases in a single noninvasive procedure, and it generally offers greater accuracy compared to standard imaging techniques. Consequently, PET has the potential to

significantly influence stage classification and treatment strategies.^[5]

2 Biopsy

1) Microscopic examination of tissue

Polarized light imaging offers detailed microstructural insights into samples and has been utilized for identifying various abnormal tissues. The polarized light microscope enhances the visibility of structures that are anisotropic within examples of living cells and other tissues. This imaging technique has proven effective in detecting different types of abnormal tissues. The Mueller matrix microscope has been used to employed to analyze malignant tissues in the human cervix and liver, particularly those exhibiting fibrosis. With its straightforward design, rapid measurement capabilities, and high precision, the Mueller matrix-based polarized light microscope demonstrates significant potential for diagnostic applications respect.^[6]

3 Lab Tests

1) Blood tests

The significant human and financial implications have led to extensive research aimed at assessing Tests for the early identification of cancer. when it is still treatable. Various methods have existed proposed for the purpose of population screening, including different forms of the faecal o The colonoscopy, flexible sigmoidoscopy, and fecal occult blood test.colonoscopy, flexible sigmoidoscopy, and ccult blood test. Consistent screening of stool samples for blood can identify colorectal cancer at an earlier stage, potentially lowering mortality rates among at-risk groups, particularly older individuals. Implementing population-based screening programs could contribute to a decrease in mortality associated with colorectal cancer (CRC).

4 Identifies hereditary risks

In recent decades, several types of cancers, such as breast, ovarian, colorectal, and kidney cancers, have been linked to hereditary syndromes. When there is a suspicion of an inherited cancer or syndrome within an individual or their family, it is essential to refer them for genetic counseling as part of the risk assessment process. Unfortunately, there is currently no standardized set of referral guidelines, nor is there consensus on the criteria that define a potential hereditary cancer case. During a counseling session, a genetic counselor gathers comprehensive personal and family medical histories related to cancer and other relevant conditions, reviews the family pedigree, informs the patient about their potential hereditary cancer risk, clarifies the implications of specific cancers, and discusses the benefits and limitations of genetic testing. In these assessments, analyzing the family pedigree is valuable, as it allows genetic counselors to evaluate the inheritance patterns of cancers and determine the appropriateness of genetic testing for the patient or their relatives.^[7]

TREATMENT

Cancer treatment modalities

Cancer treatment approaches can be classified into two primary groups conventional (traditional) and advanced (novel or modern). Currently, more than fifty percent of all active medical trials globally are dedicated to cancer therapies. The choice of treatment options and their progression is influenced by various factors, including the type of cancer, its location, and its severity. Radiotherapy, chemotherapy, and surgery are the most often used conventional therapeutic modalities. On the other hand, contemporary therapeutic approaches include immunotherapy, dendritic cell-based immunotherapy, hormone therapy, anti-angiogenic treatments, and stem cell therapies.

Stem cells therapy

Undifferentiated cells known as stem cells, which can differentiate into numerous kinds of body cells, are found in bone marrow (BM). The therapeutic approach utilizing stem cells is recognized as a potential treatment for cancer, regarded for its safety and efficacy. The application of stem cells remains in the experimental phase, with ongoing clinical trials investigating their role in regenerating damaged tissues. Currently, Mesenchymal stem cells (MSCs) obtained from bone marrow, adipose tissue, and connective tissues are being employed in these studies.

1 Pluripotent stem cells

Embryonic stem cells (ESCs) derived from the uniform inner cell mass of an embryo have the unique ability to differentiate into virtually any cell type, with the exception of those that form the placenta. The discovery of Yamanaka factors in 2006, which enable the somatic cell reprogramming into in vitro induced pluripotent stem cells (iPSCs), represented a significant advancement in the field of cell biology. This innovation circumvents the ethical concerns associated with the destruction of embryos, as iPSCs share similar properties with ESCs. Currently, hematopoietic human embryonic stem cells (hESCs) and iPSCs are being utilized for the generation of effector T cells and natural killer (NK) cells, as well as for the development of anti-tumor vaccines.

2 Adult stem cells

Adult stem cells (ASCs) that are commonly used in cancer treatment include neural stem cells (NSCs), mesenchymal stem cells (MSCs), and hematopoietic stem cells (HSCs). HSCs can develop into any type of mature blood cell in the body; they are found in the bone marrow. As of right now, the only FDA-approved treatment for leukemia and multiple myeloma is the infusion of HSCs derived from cord blood samples. Because they may develop into other cell types, such as osteocytes, adipocytes, and chondrocytes, MSCs—which are present in a variety of tissues and organs—are essential for tissue repair and regeneration. Their unique biological properties frequently result in their application in conjunction with various therapeutic modalities for the

treatment of cancer. NSCs can renew themselves and produce new neurons and glial cells, which makes them relevant for treating both primary and metastatic breast tumors, as well as other tumor types.

3 Cancer stem cells

Normal stem cells or precursor/progenitor cells give birth to cancer stem cells (CSCs) via epigenetic alterations. They are important in tumor treatment influencing. The progression of cancer, its spread to other areas, and the likelihood of returning, which offers potential for the management Stem cells associated with solid tumors. employ various systems to combat tumors.

4 Gene therapy

In order to treat a particular condition, gene therapy involves introducing a healthy copy of a defective gene into the genome. This technique was initially used in 1990 to introduce the adenosine deaminase (ADA) gene into the T cells of individuals with severe combined immunodeficiency (SCID) using a retroviral vector. Presently, there are around 2,900 ongoing clinical trials related to gene therapy, with approximately two-thirds concentrating on cancer treatment. Researchers are exploring various approaches for cancer gene therapy, such as the expression of pro-apoptotic and chemosensitizing genes, the introduction of functional tumor suppressor genes, the activation of genes that can elicit targeted immunological responses against tumors and the targeted inhibition of oncogenes.

5 Natural antioxidants

Quercetin is a natural compound derived from plants that demonstrates efficacy both on its own and in conjunction with chemotherapeutic drugs for the treatment of various cancers, including cancers of the breast, colon, liver, prostate, and lung. It works by attaching itself to cellular receptors and interfering with several signaling pathways. Six clinical trials are now underway, and seven investigations have been completed.

6 Chemotherapy

Chemotherapy used medicines or drugs for the management of cancer. In this Treatment through therapeutic methods py, chemicals are used for the treatment of cancer to stop and slow down the cancer cells' growth or kill the cancer cells along with shrinking the tumors, it causes pain as well as another problem although has serious difficulties.

7 Surgery

That prevents or decreases the spread of diseases including removing cancer from the body, a surgeon can remove the lymph nodes. The surgeon generally used small and thin knives known as scalpels. Surgery usually needed cuts in skin, muscles, as well as frequently bone. Surgeries are mainly useful for solid tumors; this is a local treatment reason that is enclosed in one area.^[8]

CONCLUSION

In conclusion, cancer remains a pervasive and devastating disease, but Continuous research and progress in treatment therapies provide optimism for better results. and potential cures. Ultimately, addressing cancer necessitates a comprehensive strategy, incorporating prevention, early detection, and cutting-edge therapies to alleviate the suffering of those affected and strive towards a cancer-free future. As cancer research advances, we move closer to conquering this complex disease. By understanding its causes, developing innovative treatments, and promoting awareness, we can create a brighter future for those impacted by cancer.

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