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1.1. Cancer- An overview

Cancer is a class of diseases or disorders characterized by uncontrolled division of cells and the ability of these cells to spread, either by direct growth into adjacent tissue through invasion, or by implantation into distant sites by metastasis (where cancer cells are transported through the bloodstream or lymphatic system).

Cancer arises from cells in the body which were once normal cells. In the growth of normal cells, a finely controlled balance exists between growth- promoting and growth-restraining signals such that proliferation takes place only when required. This order is tilted only when more cells are required such as in wound healing. In this situation differentiation takes place in an orderly manner and proliferation ceases when no longer required. However, in tumor cells this process is disrupted, cell proliferation happens continuously and loss of differentiation can occur. The normal process of programmed cell death may cease to operate. These cells which are now "transformed" to grow and divide and keep dividing in an uncontrolled manner. They differ very subtly at first compared to the cells of the normal tissue from which they originate. (Fig.1) shows the difference between normal cell division and cancer cell division.

Cancer is one of the deadliest genetic as well as induced diseases resulting due to the defects in the genetic material. It is characterized by uncontrolled and unwanted growth of cells. This is because of the loss of cell growth control mechanism due to various carcinogenic agents such as Physical, chemical and biological agents. These carcinogens bring about reversible as well as irreversible changes in the genetic material and disrupt the functionality of cell cycle control proteins. Signal damage to the genetic material will not only cause metastasis, but a collective grave damage to
the DNA which result in cancer. This is because of gradual damage in back up mechanisms of cell cycle control. Types of cancers are named according to the origin with respect to tissues, cell type and cell structure. Many drugs have been invented for cancer, which are specific for certain type of cancer. These drugs may be of immunological or chemical or phytochemical in nature.

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Loss of Normal Growth Control

Normal cell division

Cell Suicide or Apoptosis

Cell damage—no repair

Cancer cell division

First mutation

Second mutation

Third mutation

Fourth or later mutation

Uncontrolled growth

Fig.1. Normal cell division vs. Cancer cell division

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1.2. Risk factors of cancer:

Risk factors for cancer includes person's age, sex, and family medical history. Others include cancer-causing factors in the environment.

- Cancers of the lung, mouth, larynx, bladder, kidney, cervix esophagus, and pancreas are related to use of tobacco cigarettes, snuff and alcohol.
- Skin cancer is related to unprotected exposure to strong sunlight.
- Breast cancer risk factors includes age, changes in hormone levels age at first menstruation, number of pregnancies, and age at menopause, obesity.
- Dietary factors and lack of physical activity in adulthood.
- Occupational exposure to carcinogen
- Infections caused by Human papiloma Viruses
- Pollution (Air/Water/Food)

Cancer may affect people at all ages even fetuses but the risk for most varieties increases with age. Nearly all cancers are caused by abnormalities in the genetic material of the transformed cells. These abnormalities may be due to the effects of carcinogens, such as tobacco smoke, radiation, chemicals, or infectious agents. Other cancer-promoting genetic abnormalities may be randomly acquired through errors in DNA replication, or are inherited, and thus present in all cells from birth.\(^3\)

Only 5–10% of all cancer cases can be attributed to genetic defects, whereas the remaining 90–95% has their roots in the environment and lifestyle. The lifestyle factors include cigarette smoking, diet (fried foods, red meat), alcohol, exposure to radiation, environmental pollutants, infections, stress, obesity, and physical inactivity.

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The evidence indicates that of all cancer-related deaths, almost 25–30% are due to tobacco, as many as 30–35% are linked to diet, about 15–20% are due to infections, and the remaining percentage are due to other factors like radiation, stress, physical inactivity, environmental pollutants etc.¹

1.3. Carcinogens

Carcinogens are agents that cause cancer or increase the risk of getting cancer by altering cellular metabolism or damaging DNA directly in cells, which interferes with biological processes, and induces the uncontrolled, malignant division, ultimately leading to the formation of cancer tumors. Carcinogenesis can be actively caused by chemicals, radiation, and infectious biological agents. The action of specific carcinogenic agents depends upon the stages of cancer development such as initiation, promotion, and progression. The mechanism of the induction of carcinogenesis may be due to alteration in the genomic structure. The final stage of carcinogenesis, i.e., progression, may occur spontaneously enhanced by the formation and propagation of genetic errors. In addition, chemical and viral agents that lack the capacity for initiation and promotion may actively convert the cells in the stage of promotion to the stage of progression.

1.4. Malignant cell features:

- Evading apoptosis.
- Unlimited growth potentials (immortalization) due to overabundance of telomerase.
- Self-sufficiency of growth factors.
- Insensitivity to anti-growth factors.
- Increased cell division rate.

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- Altered ability to differentiate.
- Absence of contact inhibition.
- Ability to invade neighboring tissues.
- Ability to build metastases at distant sites.
- Ability to promote blood vessel growth (angiogenesis)

1.5. Molecular mechanism of cancer

Several lines of evidence indicate that tumorogenesis in humans is multistep process and these steps reflect genetic alterations that drive the progressive transformation of normal cell into highly malignant derivatives. Tumor cells are invariably altered at multiple sites having suffered disruption through lesion as subtle as point mutations and as obvious as changes in chromosome complement.\(^5\)


![Fig.2. Physiological alterations of cancer cells](image)

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1.5.1 Self Sufficiency in Growth Signals:

Normal cell require mitogenic growth signals (GS) before they can move from a quiescent state into an active proliferative state. These signals are transmitted into the cell by transmembrane receptors that bind distinctive classes of signaling molecules such as diffusible growth factors, extracellular matrix components, and cell-to-cell adhesion/interaction molecules. Normal cell can not proliferate in the absence of such stimulatory signals. Many of the oncogenes in the cancer catalog act by mimicking normal growth signal in one way or other. Acquired Growth signal (GS) autonomy due to the prevalence of dominant oncogenes was the first of the six alterations of the cancer cells. Three common molecular strategies to achieve autonomy are alterations in extracellular growth signals, transcellular transducers of these signals and intra cellular circuits that translate these signals into action. The most complex mechanisms of acquired GS autonomy derived from alterations are components of downstream cytoplasmic circuitry that receives and processes the signals emitted by ligand activated GF receptos and integrins. The SOS-Ras-Raf-MAPK cascade plays a central role. In about 25% human tumors, Ras protein are present in structurally altered forms that enable them to release a flux of mitogenic signals into cells without ongoing stimulation by their normal upstream regulators.
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1.5.2. Insensitivity to Antigrowth Signals:

With in a normal tissue multiple antiproliferative signals operate to maintain cellular quiescence and tissue homeostasis, these signals include both soluble growth inhibitors and immobilized inhibitors embedded in the extracellular matrix and on the surface of nearby cells. Antigrowth signals can block proliferation by two different mechanisms. Cells may be forced out of the active proliferative cycle into quiescent state or cells may be induced to permanently relinquish proliferative potential by being induced to enter into postmitotic states. Incipient cancer cells must evade these antiproliferative signals if they are to prosper.

Normal cells response to antigrowth signals is associated with cell cycle clock, specifically the components governing the transit of the cell through G1 phase of its growth cycle. Cells monitor their external environment during this period and on the basis of sensed signals, decide whether to proliferate, to be quiescent, or to enter into promitotic state. Antiproliferative signals are funneled through the retinoblastoma protein (pRb) and its tow relatives p107, and p130. When in a hypophosphrylated state pRb blocks proliferation by sequestering and altering the function of E2F transcription factor that controls the expression of genes essential for progression from G1 to S phase. Distribution of the pRb pathway liberates E2Fs and thus allows cell proliferation, rendering cells insensitive to antigrowth factors that results in the uncontrolled proliferation of the cells.
1.5.3. Evading apoptosis:

The ability of tumor cell population to expand is determined not only by the rate of cell proliferation but also by the rate of cell attrition. Programmed cell death – apoptosis represent a major source of this attrition. Acquired resistance toward apoptosis is a hallmark of most and perhaps all types of cancer. Apoptotic programme latently present in all cell types throughout the body. Once triggered by a variety of physiological signals this program unfolds in a precisely choreographed series of steps. Cellular membranes are disrupted, the cytosolic and nuclear skeletons are broken down, the cytosol is extruded, the chromosomes are degraded and the nucleus is fragmented all in a span of 30-120 min. At the end the shrunken cell corpse is engulfed by nearby cell typically within 24hrs. The apoptotic machinery can be broadly divided in two classes of components – sensors and effectors. The sensors are responsible for monitoring the extra cellular and intracellular environment conditions of normality or abnormality that influence whether a cell should live or die. These signals regulate the second class of components which function as effectors of apoptotic death. The sensors include cell surface receptors that bind survival or death factors. Example of these receptor is IGF-1R which receives survival signals conveyed by IGF-1/IGF-2. Death signals are conveyed by the FAS.
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receptor and TNF-R1. Intracellular substances sense the activation of death receptors and activates the intracellular proteases Caspases. Two gatekeeper caspases 8 and 9 are activated by death receptors such as FAS or by cytochrome C released by mitochondria respectively. These proximal caspases trigger the activation of dozen more caspases that execute the death program, through selective destruction of sub cellular structures and organelles and of the genome.

Resistance to apoptosis can be acquired by cancer cells through a variety of strategies. The most commonly occurring strategies is loss of proapoptotic regulator p53 tumor suppressor gene. Mutation in the p53 gene resulting in the functional inactivation of its product p53 protein which ultimately results in the inactivation of apoptotic pathway. More than 50% of human cancers are out come of this mutation of p53 gene.
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Fig 5. Apoptosis

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1.5.4. Limitless Replicative potentials

Three acquired capabilities such as growth signal autonomy, insensitive to antigrowth signals and resistance to apoptosis all lead to deregulated proliferation programme resulting in a vast cell population that constitute macroscopic tumors. All type of mammalian cells carry an intrinsic cell autonomous program that limits their multiplication. But in some cell population might have progressed through a certain number of doublings a process termed “senescence”. All type of tumor lose senescence state and has critical state characterized by massive cell proliferation, karyotypic disarray associated chromosomal alterations and have the ability to multiply without limit\textsuperscript{12}

1.5.5. Sustained angiogenesis:

The oxygen and nutrients supplied by the vasculature are crucial for cell function and survival, obligating virtually all cells in a tissue to reside within a 100 micrometer of capillary blood vessel. Once tissue is formed, the growth of new blood vessel the process of angiogenesis is carefully regulated. The positive and negative signals encourage and block angiogenesis. The angiogenesis initiating signals are exemplified by vascular endothelial growth factor (VEGF) and fibroblast growth factors (FGF). The angiogenesis inhibitor is thrombospondin-1 and Beta-interferon.

Tumors appear to activate the angiogenic switch by changing the balance of angiogenesis inducers and inhibitors\textsuperscript{13}. One common stratergy for shifting the balance involves altered gene transcription. Many tumors evidence increased expression of VEGF and FGF compared to their normal tissue. Expression of endogenous inhibitors such as thrombospondin-1 is down regulated) in few tumors\textsuperscript{14}

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1.5.6. Tissue Invasion and Metastasis

In the earlier or later stages of development of most types of human cancer, primary tumor masses spawn pioneer cells that move out, invade adjacent tissues and then travel to distant sites where they may succeed in forming new colonies. These distant settlements of tumor cells—metastases are the cause for 90% of cancer deaths$^{15}$. The capability for invasion and metastasis enables cancer cells to escape the primary tumor mass and colonize new terrain in the body where at least initially nutrients and space are not limiting. The newly formed metastases arise as amalgams of cancer cell and normal supporting cells conscripted from the host tissue.

Invasion and metastasis are exceedingly complex process and their genetic and biochemical determinants remain incompletely understood. At the mechanistic level, they are closely allied process which justifies their association with one another as one general capability of cancer cell. Both utilize similar operation strategies involving changes in the physical coupling of cells to their microenvironment and activation of extra cellular proteases.

The activation of extracellular proteases and the altered binding specificities of cadherins, and integrins (CAMs) are clearly central to the acquisition of invasiveness and metastatic ability. But the regulatory circuits and molecular mechanism that govern these shifts remains unclear.

1.6. Signs and symptoms of cancer

Signs and symptoms of cancer vary depending on the type and stage. Possible indicators of cancer or its recurrence include fatigue, unexplained weight changes (loss or gain), anemia, dysphagia (difficulty in swallowing), breathing problems, lymphedema (swelling), and digestive problems such as nausea, vomiting, diarrhea or constipation.

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1.7. Diagnosis of cancer

The diagnosis of cancer need an attempt to accurately identify the anatomical site of origin of the malignancy and the type of cells involved. The body part in which cancer first develops is known as the primary site. Secondary site refers to the body part where metastasized cancer cells grow and form secondary tumors. Recently there are several sophisticated techniques available to diagnose the cancer that includes biopsy, imaging techniques and lab tests.

1.8. TYPES OF CANCER:

**Carcinoma:** Malignant tumors derived from epithelial cells. This group represents the most common cancers, including the common forms of breast, prostate, lung and colon cancer.

**Lymphoma and Leukemia:** Malignant tumors derived from blood and bone marrow cells.

**Sarcoma:** Malignant tumors derived from connective tissue, or mesenchymal cells.

**Mesothelioma:** Tumors derived from the mesothelial cells lining the peritoneum and the pleura.

**Glioma:** Tumors derived from the glia, the most common type of brain cell.

**Germinoma:** Tumors derived from germ cells, normally found in the testicle and ovary.

**Choriocarcinoma:** Malignant tumors derived from the placenta.
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1.9. Mortality Rate

Cancer is a malicious health threat in our society today. Cancer continues to represent the largest cause of mortality in the world and claims 6 million lives every year\(^{16}\). Cancers in all forms are causing about 12 per cent of deaths throughout the world. In the developed countries cancer is the second leading cause of death accounting for 21\% (2.5 million) of all mortality. In the developing countries cancer ranks second as a cause of death and accounts for 9.5\% (3.8 million) of all deaths. It is estimated that there will be 16 million new cases every year by 2020. In India cancer is one of the ten leading causes of death today and advancing in rank year by year. It is estimated that there are nearly 1.5-2 million cancer cases at any given point of time. Over 7 lakh new cases of cancer and 3 lakh deaths occur annually due to cancer.

It is the second leading cause of death for both men and women preceded only by heart disease. The global burden of cancer has increased more than double in the past 30 years\(^ {17}\). At least one in three people will develop cancer and one in four men and one in five women will die due to cancer. Hence of late, cancer prevention and control have become a major concern\(^ {18}\). In the year 2008 alone, approximately 12 million new cases of cancer were diagnosed (6.7 million men and 5.8 million women), 7 million deaths occurred (4.3 million men and 3.3 million women) due to cancer and about 25 million are living with cancer.
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Table 1 - Estimated numbers of new cases and deaths of common cancer types in India:

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Estimated New Cases</th>
<th>Estimated deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladder</td>
<td>67,160</td>
<td>13,750</td>
</tr>
<tr>
<td>Breast</td>
<td>178,480</td>
<td>40,460</td>
</tr>
<tr>
<td>Colon and rectal(combined)</td>
<td>153,760</td>
<td>52,180</td>
</tr>
<tr>
<td>Endometrial</td>
<td>39080</td>
<td>7,400</td>
</tr>
<tr>
<td>Kidney(renal cell)cancer</td>
<td>43,512</td>
<td>10,957</td>
</tr>
<tr>
<td>Leukemia(all)</td>
<td>44,240</td>
<td>21,790</td>
</tr>
<tr>
<td>Lung(including bronchus)</td>
<td>213,380</td>
<td>160,390</td>
</tr>
<tr>
<td>Melanoma</td>
<td>59,940</td>
<td>8,110</td>
</tr>
<tr>
<td>Non-Hodgkin's lymphoma</td>
<td>63,190</td>
<td>18,660</td>
</tr>
<tr>
<td>Pancreatic</td>
<td>37,170</td>
<td>33,370</td>
</tr>
<tr>
<td>Prostate</td>
<td>218,890</td>
<td>27,050</td>
</tr>
<tr>
<td>Skin(Non-melanoma)</td>
<td>&gt;1,000,000</td>
<td>&lt;2,000</td>
</tr>
<tr>
<td>Thyroid</td>
<td>33,550</td>
<td>1,530</td>
</tr>
</tbody>
</table>

Lines of treatment of cancer vary from surgery to monoclonal antibody therapy. The choice of therapy depends upon the location and grade of the tumor and the stage of the disease, as well as the general state of the patient. Today Modern medicine provide number of conventional methods such as Radiation therapy, Chemotherapy, Immunotherapy, Hormonal suppression, and Monoclonal antibody therapy. But these lines of treatments are known for their serious side effects hence at present researchers are focusing their research towards phyto medicines in order to develop a safe, efficacious and cost effective therapy for this second killer disease.

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In these attempts it is necessary for a researcher to know the nature of this disease, various types of the cancer that are prevalent and various mechanism of action involved in the spread of this disease. Hence a brief review on type of cancer, its diagnosis mechanism of action and lines of treatment are presented and discussed in sequel.

Cancer tumor spread, through Invasion which refers to the direct migration and penetration of cancer cells into neighboring tissues. Metastasis refers to the ability of cancer cells to penetrate into lymphatic and blood vessels, circulate through the bloodstream, and then invade normal tissues elsewhere in the body. For example, a melanoma (a cancer of pigmented cells) arising in the skin that enter the bloodstream and spread to distant organs such as the liver or brain. Cancer cells in the liver would be called metastatic melanoma, not liver cancer. Metastases share the name of the original ("primary") tumor. Melanoma cells growing in the brain or liver can disrupt the functions of these vital organs and so are potentially life threatening.

1.10 Existing lines of Treatment /Side effects

Choice of cancer treatment is based on several factors such as specific characteristics of the cancer and severity of the cancer, overall conditions such as to block the spread of cancer or provide systematic relief to the symptoms of cancer.

1.10.1. Radiation Therapy:

Radiation therapy uses certain types of energy to shrink tumors or eliminate cancer cells. It works by damaging cancer cell's DNA, by preventing its multiplication. Cancer cells are highly sensitive to radiation and typically die when treated.

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1.10.2. Hormonal Therapy

Useful for breast or prostate tissue cancer which growth and spread may be caused by abnormal secretion of body’s own hormones, Hence these are drugs that block hormone production or change the way of hormonal activity.

1.10.3. Targeted Therapy

A targeted therapy is one that is designed to treat only the cancer cells and minimize damage to normal, healthy cells. Cancer treatments that “target” cancer cells may offer the advantage of reduced the treatment-related side effects.

1.10.4. Biological therapy

Biological therapy is synonymous to many terms like, immunologic therapy, immunotherapy, or biotherapy. Biological therapy is a type of treatment that uses the body’s immune system to facilitate the killing of cancer cells. Biological therapy includes usage of interferon, interleukin, monoclonal antibodies, colony stimulating factors (cytokines), and vaccines.

1.10.5. Chemotherapy

Chemotherapy is the treatment where chemical drugs are used to destroy cancer cells. Cancer chemotherapy may consist of single drugs or combinations of drugs, and can be administered through a vein, injected into a body cavity, or delivered orally in the form of a pill. It differs from surgery or radiation in that it is almost always used as a systemic treatment. This means the medicines travel throughout the body to reach cancer cells wherever they have spread. The basic aim in the usage of these drugs are to inhibit the proliferation of cancer cells or to destroy them without damaging normal cells.

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Chemoetherapeutic agent belongs to different categories based on their mode of action.

- Compounds inhibiting the synthesis of nucleic acid precursors
- Compound interacting with the DNA and inhibiting the replication and transcription process
- Compound inhibiting the synthesis of proteins or lipid cell membrane components
- Compound preventing the stimulation of cell division by exogenic factors

Alkylating agents

Alkylating agents directly damage DNA and prevent the cancer cell from reproducing. As a class of drugs, these agents are not phase-specific they work in all phases of the cell cycle.

Antimetabolites

Antimetabolites are a class of drugs that interfere with DNA and RNA growth by substituting the normal building blocks of RNA and DNA. These agents damage cells during the S phase.

Anti-tumor antibiotics

These are Anti-tumor antibiotics that interfere with enzymes involved in DNA replication. These agents work in all phases of the cell cycles.
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Table 2- Common Synthetic drugs with their mode of action

<table>
<thead>
<tr>
<th>Group</th>
<th>Examples</th>
<th>Mode of action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum complexes</td>
<td>Cisplatin</td>
<td>Bind to protein actine causes death of cell by cross linking, depolymerisation and shortening of microfilaments.</td>
</tr>
<tr>
<td>Uracil derivatives</td>
<td>5-Fluorouracil</td>
<td>Inhibit the DNA synthesis by blocking the enzyme thymidylate synthase a enzyme responsible for the synthesis of thymine nucleotides.</td>
</tr>
<tr>
<td>Folic acid derivatives</td>
<td>Aminopetrin, Aametopetrin</td>
<td>Inhibits the enzyme dihydrofolate reductase which is mainly involved in the synthesis of deoxyribo nucleotides</td>
</tr>
<tr>
<td>Heterocyclic compounds</td>
<td>Actinomycin D</td>
<td>Inhibit the DNA dependent RNA polymerase, and DNA synthesis</td>
</tr>
<tr>
<td>Heterocyclic compounds</td>
<td>Holichondrin B,</td>
<td>G2-M cell cycle arrest, Disruption of mitotic spindles,</td>
</tr>
</tbody>
</table>

1.10.6. Side effects of Existing lines of treatment

Chemotherapy is widely used along with surgery and radiotherapy for the treatment of malignant diseases. Selectivity of most drugs for malignant cells remain elusive. Unfortunately, an insufficient therapeutic index, lack of specificity, and the emergence of drug-resistant cell subpopulations often hamper the efficacy of drug therapies. Despite the significant progress achieved by chemotherapy in the treatment of disseminated malignancies, the prognosis for solid tumors remain poor. A number of specific difficulties are associated in the treatment of solid tumors, where the

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access of drugs to cancer cells is often limited by poor, unequal vascularization and presence of areas of necrosis. The histological heterogeneity of the cell population within the tumor is another major drawback.20

The most common side effects of chemotherapy include neutropenia (a low white blood cell count), anemia (a low red blood cell count), thrombocytopenia (a low blood platelet count), nausea, and hair loss. The risk for infection increases due to the presence of few white blood cells.

Cancer cells may grow and divide more rapidly than normal cells, many anticancer drugs are to kill these growing cells, but certain normal, healthy cells that multiply quickly, are also affected by this chemotherapy. This damage to normal cells causes side effects. The fast-growing, normal cells most likely to be affected are blood cells in the bone marrow and cells in the digestive tract (mouth, stomach, intestines, esophagus), reproductive system (sexual organs), and hair follicles. Some anticancer drugs may affect cells of vital organs, such as the heart, kidney, bladder, lungs, and nervous system.

Fatigue: The body uses lots of energy during treatment due to stress, by taking regular trips to hospital and due to the repair work in normal cells exposed to radiation. The best way to handle fatigue is to limit activities and increase sleep. Good nutrition is also very important.

Skin Problems: The skin in the treatment area frequently becomes dry, itchy, darkened, red or tanned. Do not rub, scratch or scrub this skin. Apply for a lotion which will not interfere with treatment. Protect the skin from the sun.
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Hair Loss: Hair loss generally occurs in the area of treatment.

Loss of Appetite: This may be caused by nausea, stomach pain, change in taste and difficulties in swallowing. Maintain a balanced diet and eat whenever possible. A soft diet is best and plenty of nourishing liquids like milk, soup and coconut water. Smoking, drinking alcohol and eating hot, spicy food should be avoided.

Digestive Tract Problems: Upset stomach, nausea, diarrhea and constipation have been observed when radiation is being delivered to the lower abdominal area. Most of these problems can be controlled with medication.

Effect on Sexual and Reproductive Function: Radiation therapy, when applied to reproductive organs can cause a decrease in the number of sperm or viable ova, reducing the ability to fertilise. There may be a possible decrease in sexual desire and impotence in men.

Lymphodema: The swelling of the arm due to damaged axillary lymphatic vessels either by surgery or radiation causes the lymph to collect in the lower arm. Lack of vessels and the force of gravity make it difficult to pump the fluid back into circulation causing swelling and discomfort. Take special care to avoid infection and injury to the affected arm.

Other side effects may include fluid retention, rashes, irritated bladder, swelling and soreness of the mucous membranes, and numbness and aching of the joints, hands, and feet.

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Recently, a greater emphasis has been given towards the researches on complementary and alternative medicine that deals with cancer management. Several studies have been conducted on herbs under a multitude of ethno botanical grounds. From the collected data there are nearly 3000 plants which possess anticancer properties and subsequently been used as potent anticancer drugs. Ayurveda, a traditional system of Indian medicine of plant drugs has been successful since early times in preventing or suppressing various tumors.

During the last decade attempts were made in search of new anticancer drug based on different mode of mechanism as discussed above. Various data available regarding the action and kinetics of cancer cells, could be useful for scientists to discover novel drugs from natural herbal sources.

Due to the increased incidences of the adverse drug reactions and economic burden of the modern system of medicine users of Phytomedicines or herbal medicines are growing exponentially. Hence in the present dissertation attempts were made to develop an eco-friendly cost effective anticancer herbal medicine. Studies will also be focused towards understanding the mechanism of anticancer action of the herbal drugs selected for the study.

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