

BLOOD CANCER

INTRODUCTION

Blood cancer represents a large group of different malignancies. This group includes cancers of the bone marrow, blood, and lymphatic system, which includes lymph nodes, lymphatic vessels, tonsils, thymus, spleen, and digestive tract lymphoid tissue. Leukemia and myeloma, which start in the bone marrow, and lymphoma, which starts in the lymphatic system, are the most common types of blood cancer. What causes these cancers is not known.

As leukemia and myeloma grow within the bone marrow, they can interfere with the bone marrow's ability to produce normal blood cells, including white blood cells, red blood cells, and platelets. This can cause frequent infections, anemia, and easy bruising. Lymphomas, which most typically appear as enlargement of the lymph nodes, can also interfere with the body's ability to fight infections. Additionally, myelomas generate a substance that weakens bones, and produce abnormal proteins that can cause symptoms in other parts of the body.

Treatment of blood cancers has undergone substantial improvements, resulting in increased rates of remission and survival. Remission occurs when there is no sign of cancer. Today in the United States, almost 1 million people are alive with, or in remission from, blood cancer. People who have blood cancer can have problems with bleeding and serious infections.

CAUSES OF BLOOD CANCER

Although the specific cause of blood cancer is not known, a number of factors are associated with its development. Many blood cancers are more common among older adults. Some tend to run in families. Certain infections also appear to increase the risk of some blood cancers, as does a weakened immune system.

RISK FACTORS FOR BLOOD CANCER

- Age group and blood cancer: Though it is probable amongst different age groups, the recently taken statistics point to the increased possibility amongst the older age groups.
- Certain types of infections: Those infected by HIV all come under the risky demography prone to blood cancer.

- Compromised immune system due to such conditions as HIV/AIDS, taking corticosteroids, or organ transplant
- Exposure to certain chemicals Exposure to radiation or certain types of chemotherapy
- Family history of blood cancer: Heredity/family history is one of the likely factors making one more prone to blood cancer than those without family history.
- Personal history of certain blood disorders
- Personal history of certain genetic disorders
- Smoking
- Race and blood cancer: It has also been observed that whites are more susceptible to leukemia/blood cancer.

COMMON SYMPTOMS OF BLOOD CANCER

- Abdominal pain, especially in the upper abdomen
- Bone or joint pain
- Easy bleeding or bruising
- Enlarged liver and glands, such as the spleen and lymph nodes
- Fatigue
- Fever and chills
- Frequent infections
- Frequent urination
- Nausea, which may be described as feelings of wooziness, queasiness, retching, seasickness, car-sickness or upset stomach
- Night sweats
- Unexplained weight loss

LIFE-THREATENING SYMPTOMS

- Bluish coloration of the lips or fingernails
- Change in level of consciousness or alertness, such as passing out or unresponsiveness
- Change in mental status or sudden behavior change, such as confusion, delirium, lethargy, hallucinations and delusions
- Chest pain, chest tightness, chest pressure, palpitations
- High fever (higher than 101 degrees Fahrenheit)
- Rapid heart rate (tachycardia)

- Respiratory or breathing problems, such as shortness of breath, difficulty breathing, labored breathing, wheezing, Seizure
- Severe abdominal pain

SURVIVAL RATE IN BLOOD CANCER-STATISTICAL FIGURES

Statistical orientation is given to the inputs gathered over a given period of time. The figures are gathered by different organizations According to a figure gathered by 'Leukemia and Lymphoma Society' in the year 2011 around 1,012,533 people have been found recovering from different stages of blood cancer. It includes all the three types of blood cancer. The statistical count relates to the people of U.S.A

TYPES BLOOD CANCER

Primarily, there are three basic types of blood cancer. Each of the variety may also include several variations, but in general this cancer is categorized into the following kinds

1. **Leukemia-** With spurt in the multiplicity of cancerous cells affecting either the marrow or the blood; the ability of the circulatory system to produce blood is severely impaired with.
2. **Lymphoma-** The cancerous formation affecting the lymphocytes is referred to as the lymphoma. Lymphocytes are one of the varieties of white blood corpuscles.
3. **Myeloma-** As part of Myeloma, the plasma (another variety of WBC) is affected by the cancerous formation.

LEUKEMIA

Leukemia is a type of cancer of the blood cells. White blood cells are a component of the blood. They help the body to fight against infections. When a person is infected with leukemia, the DNA in the cells mutate in such a way that a large number of immature white blood cells are produced in the body. These cells are called blasts. Leukemia can affect different cells of the blood and the disease is classified into four types according to the cells they infect. These abnormal cells gradually take over the function of the bone marrow and the disease spreads further.

Epidemiology

In 2000, approximately 256,000 children and adults around the world developed a form of leukemia, and 209,000 died from it. This represents about 3% of the almost seven million deaths due to cancer that year, and about 0.35% of all deaths from any cause. Of the sixteen separate

sites the body compared, leukemia was the 12th most common class of neoplastic disease, and the 11th most common cause of cancer-related death. About 245,000 people in the United States are affected with some form of leukemia, including those that have achieved remission or cure. Approximately 44,270 new cases of leukemia were diagnosed in the year of 2008 in the US. This represents 2.9% of all cancers (excluding simple basal cell and squamous cell skin cancers) in the United States, and 30.4% of all blood cancers. Among children with some form of cancer, about a third have a type of leukemia, most commonly acute lymphoblastic leukemia. A type of leukemia is the second most common form of cancer in infants (under the age of 12 months) and the most common form of cancer in older children. Boys are somewhat more likely to develop leukemia than girls, and white American children are almost twice as likely to develop leukemia as black American children. Only about 3% cancer diagnoses among adults are for leukemias, but because cancer is much more common among adults, more than 90% of all leukemias are diagnosed in adults. Race is risk factor. Hispanics, especially those under the age of 20, are at the highest risk for leukemia, while whites, Native Americans, Asians, and Alaska Natives are at higher risk than blacks. Sex is also a risk factor. More men than women are diagnosed with leukemia and die from the disease. Around 30 percent more men than women have leukemia.

Prevalence of the disease

Rate of incidence of leukemia in USA	1 in 8831 persons
Annual rate of incidence of leukemia in USA	30800
New cases of leukemia detected in USA in 2004	Male – 19020 Female – 14420
Estimated number of deaths from leukemia in USA in 2004	Male – 12900 Female – 10310

Mortality rate from leukemia in different countries

Country	Number of deaths per 10000 population	
	Male	Female
USA	6.6	4.2
Australia	5.7	3.8
Canada	6.2	3.9
Germany	5.7	3.9
UK	4.9	3.3

Causes

There is no single known cause for any of the different types of leukemia. The few known causes, which are not generally factors within the control of the average person, account for relatively few cases. The cause for most cases of leukemia is unknown. The different leukemias likely have different causes.

- Leukemia, like other cancers, results from mutations in the DNA. Certain mutations can trigger leukemia by activating oncogenes or deactivating tumor suppressor genes, and thereby disrupting the regulation of cell death, differentiation or division. These mutations may occur spontaneously or as a result of exposure to radiation or carcinogenic substances.
- Natural and artificial ionizing radiation
- A few viruses such as human T-lymphotropic virus. Experiments on mice and other mammals have demonstrated the relevance of retroviruses in leukemia, and human retroviruses have also been identified. The first human retrovirus identified was human T-lymphotropic virus, or HTLV-1, which is known to cause adult T-cell leukemia
- Some chemicals, notably benzene and alkylating chemotherapy agents for previous malignancies. Use of tobacco is associated with a small increase in the risk of developing acute myeloid leukemia in adults. Cohort and case-control studies have linked exposure to some petrochemicals and hair dyes to the development of some forms of leukemia.
- Diet has very limited or no effect, although eating more vegetables may confer a small protective benefit.
- Some people have a genetic predisposition towards developing leukemia. The affected people may have a single gene or multiple genes in common. Affected people may develop different forms of leukemia or related blood cancers.
- In addition to these genetic issues, people with chromosomal abnormalities or certain other genetic conditions have a greater risk of leukemia.^[20] For example, people with Down syndrome have a significantly increased risk of developing forms of acute leukemia (especially acute myeloid leukemia), and Fanconi anemia is a risk factor for developing acute myeloid leukemia.
- A few cases of maternal-fetal transmission (a baby acquires leukemia because its mother had leukemia during the pregnancy) have been reported.

Types of leukemia and their causes

Type of leukemia	Description	Causes
Acute lymphocytic lymphoma (ALL)	This type of leukemia affects the lymphocytes. A large number of immature lymphocytes are produced and they hinder the functioning of the bone marrow.	Though the exact cause is not known, exposure to toxins like benzene and radiation, chemotherapy and chromosomal abnormality can increase the risk of ALL.
Acute mylogenous leukemia (AML)	This cancer develops from inside the bone marrow involving immature cells that would have turned to white blood cells.	It is caused by exposure to harmful chemicals and rays, blood disorders or weakened immune system. It is most common type and the disease progresses rapidly.
Chronic lymphocytic leukemia (CLL)	It is a slow increase in lymphocytes affecting the lymph nodes and the spleen. Ultimately it causes the bone marrow to stop functioning.	The reason is not known and it is not linked to radiation. However, exposure to Agent Orange during Vietnam war increased the risk of CLL.
Chronic mylogenous leukemia (CML)	It is a slow build up of immature white blood cells hampering the function of the bone marrow.	CML is related to the presence of an abnormal chromosome called Philadelphia chromosome. Radiation exposure may also be a cause.
Hairy cell leukemia (HCL)	This is a rare type of cancer affecting white blood cells. The cells look hairy under a microscope.	The cause is unknown.

Pathophysiology of Leukemia

Leukemia is malignant neoplasms of the cells derived from either the myeloid or lymphoid line of the hematopoietic stem cells in the bone marrow. Proliferating abnormal and immature cells (blast) spill out into the blood and infiltrate the spleen, lymph nodes, and other tissue. Acute leukemias are characterized by rapid progression of symptoms. High numbers (greater than 50,000/mm³) of circulating blast weaken blood vessel walls, with high risk for rupture and bleeding, including intracranial hemorrhage. Lymphocytic leukemias involve immature lymphocytes and their progenitors. They arise in the bone marrows but infiltrate the spleen, lymph nodes, central nervous system (CNS), and other tissues. Myelogenous leukemias involve the pluripotent myeloid stem cells and, thus, interfere with the maturation of granulocytes, erythrocytes, and thrombocytes. Acute myelogenous leukemias (AML) and acute lymphatic leukemia (ALL) have similar presentations and courses. Approximately half of new leukemias are acute. Approximately 85 % of acute leukemias in adults are AML, and incidence of AML increases with age. ALL is the most common cancer in children, with peak incidence between ages 2 and 9. Although the cause of leukemias is unknown, predisposing factors include genetic susceptibility, exposure to ionizing radiation or certain chemicals and toxins, some genetic disorder (Down syndromes, Fanconi's anemia), and human T-cell leukemia-lymphoma virus. Complications include infection, leukostasis leading to hemorrhage, renal failure, tumor lysis syndrome, and disseminating intravascular coagulation.

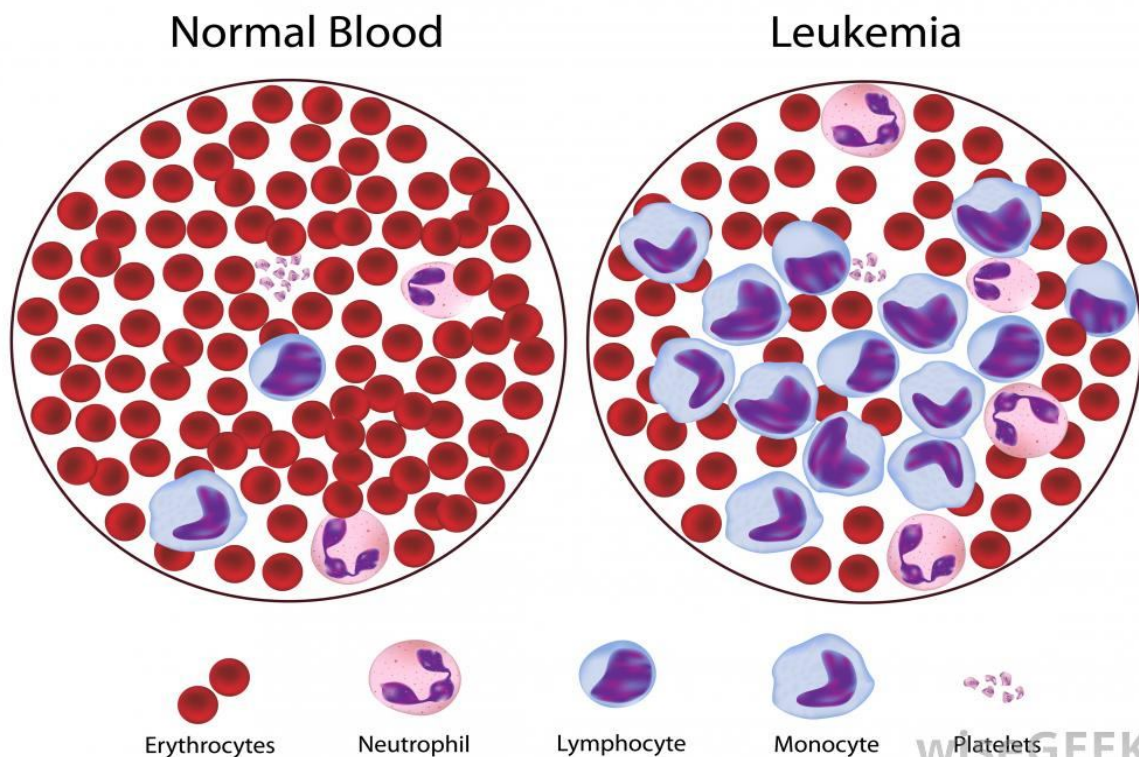


Fig. Normal blood cell and Leukemia

Signs and Symptoms of Leukemia

The common signs and symptoms of the different types of leukemia are as follows:

- Leukemia is a cancer that affects the bone marrow. It gradually hampers the proper functioning of the bone marrow. As a result, people with leukemia tend to bruise and bleed easily.
- White blood cells are the responsible for fighting infection in the body. Leukemia attacks these cells. So, the immune system of the body is weakened. So one become more vulnerable to infections like sore throat, sores in the mouth, diarrhea or pneumonia.
- Anemia is common in leukemia.
- Fever, chill, fatigue, flu like symptoms and weight loss are other common symptoms.
- Some type of leukemia also causes pain in the bones and joints.
- Other symptoms are loss of appetite, paleness, red spots on skin, swollen glands etc.

Diagnosis

Diagnosis is usually based on

- Repeated complete blood counts and a bone marrow examination following observations of the symptoms, however, in rare cases blood tests may not show if a patient has leukemia, usually this is because the leukemia is in the early stages or has entered remission.
- A lymph node biopsy can be performed as well in order to diagnose certain types of leukemia in certain situations.
- Following diagnosis, blood chemistry tests can be used to determine the degree of liver and kidney damage or the effects of chemotherapy on the patient. When concerns arise about visible damage due to leukemia, doctors may use an X-ray, MRI, or ultrasound. These can potentially view leukemia's effects on such body parts as bones (X-ray), the brain (MRI), or the kidneys, spleen, and liver (ultrasound).
- Finally, CT scans are rarely used to check lymph nodes in the chest.
- Mutation in SPRED1 gene has been associated with a predisposition to childhood leukemia. SPRED1 gene mutations can be diagnosed with genetic sequencing.

Treatment

Leukemia is treated so that abnormal blood cells are destroyed and normal blood cells are produced in the body. The type of treatment depends on the type of leukemia, general physical health, age and the stage of leukemia.

- Chemotherapy is the most widely used treatment of leukemia. It occurs in following three stages:
 1. Induction is the stage where all abnormal cells are killed off in the blood.
 2. The next stage is consolidation. It destroys those abnormal cells which may be rare enough that they do not show up on regular blood tests.
 3. The third stage is maintenance and is specially used in case of ALL. It prevents the regrowth of any leukemia cells which can lead to the reversal of the recovery process.
 4. If leukemia spreads to the brain or the spinal cord, intrathecal chemotherapy is used where the drug is directly injected in these areas.
- Radiation therapy is also used to treat leukemia. High dose of direct radiation is aimed at the cancer cells to induce remission.
- In severe cases, stem cell transplantation is tried. A matched donor is found and the infected bone marrow is completely destroyed. It is then replaced by the healthy stem cells.

LYMPHOMA

Lymphoma is a type of cancer of the blood where lymphocyte – a component of the blood grows at an abnormal rate. They are often present as a solid tumor in certain parts of the body like lymph nodes, bone marrow, spleen etc. In most cases, the causes are not known. The common symptoms include fever, chills, fatigue, pain in lymph nodes and other specific areas of the body. Chemotherapy, radiation therapy and bone marrow transplantation are the most common treatment options for lymphoma.

B or T lymphocytes are a component of the blood. They help the body to fight against infections and form a part of the immune system. They are found in the lymph tissue which forms the lymphatic glands. Lymphoma is a type of cancer of the blood that affects the lymph nodes. The result is that the lymphocytes begin to behave in an abnormal manner. They also multiply rapidly and prevent normal cells from being formed till they overwhelm the system. However, with timely intervention, certain types of lymphomas can be cured completely.

Risk factors for lymphoma

Age and gender

Hodgkin lymphoma can occur at any age, although it is rare. It becomes more common in the teens. There is a peak between 15 and 29 years of age. Hodgkin lymphoma is slightly more common in men than in women.

Previous non Hodgkin lymphoma

People treated for a previous non Hodgkin lymphoma (NHL) have an increased risk of Hodgkin lymphoma, which may be due to the treatment they had for the NHL.

Lowered immunity

Anyone whose immune system is not working properly is more likely to develop Hodgkin lymphoma. People with HIV or AIDS have a risk of Hodgkin lymphoma that is 11 times higher than the general population. People who have had an organ transplant are 4 times more likely to develop Hodgkin's lymphoma than other people in the population.

Contact with common infections

A few studies show that Hodgkin lymphoma risk is lower in groups of people who are exposed to infections early. Researchers think that getting infections early may help us to develop a healthy immune system and this could be what lowers the risk of Hodgkin lymphoma.

Epstein Barr virus

Epstein Barr virus is the virus that causes glandular fever (mononucleosis). People who have had glandular fever have an increased risk of Hodgkin lymphoma afterwards.

Hepatitis C virus

Results from a few studies show that people who have the Hepatitis C virus may have an increased risk of Hodgkin's lymphoma.

Family history

First degree relatives of people with Hodgkin lymphoma have an increased risk of getting Hodgkin themselves. A first degree relative is a parent, child, sister or brother. A study published in 2005 also showed that first degree relatives of people with non Hodgkin lymphoma or chronic lymphocytic leukaemia have an increased risk of Hodgkin lymphoma.

An identical twin of a diagnosed Hodgkin lymphoma patient is nearly 100 times more likely to develop it than other people in the population.

Breastfeeding

A study combining all the results of earlier research found a lower risk of Hodgkin lymphoma in children who had been breastfed.

Workplace chemicals

A recent study reported that people exposed to pesticides in their work may have an increased risk of Hodgkin lymphoma.

Alcohol and smoking

A few studies show a lower risk of Hodgkin lymphoma in alcohol drinkers. A study published in 2007 showed a lower risk in drinkers, but not in drinkers who smoked.

Being very overweight

One research study has shown an increased risk of Hodgkin's lymphoma for men who are very overweight (obese) but women did not have an increased risk.

Non-Hodgkin lymphoma risk factors**HIV/AIDS**

Associations between NHL and HIV/AIDS are well documented.

Other infections

In addition to HIV, a number of other infectious agents have been associated with specific NHL B and T cell subtypes. The most common is probably bacterial infection with *Helicobacter pylori*, which is associated with gastric NHL. Hepatitis C virus (HCV) infection is associated with an increased risk of NHL. Hepatitis B virus also appears to be related to an increased NHL risk. Epstein-Barr virus (EBV) has also been associated with an increased risk of NHL.

Autoimmune conditions

Autoimmune disease, like lymphomagenesis, is underpinned by immune dysregulation. Accordingly, several autoimmune conditions have been associated with an increased risk of subsequent NHL development. Among these, chronic inflammatory diseases have shown the strongest and most consistent associations: the risk of NHL is increased around 19-fold with primary Sjogren's syndrome; seven-fold with systemic lupus erythematosus (SLE); and two- to four-fold with rheumatoid arthritis.

Iatrogenic immunosuppression

It has been consistently shown that patients receiving immunosuppressant medication after an organ transplant are at around eight times greater risk of NHL, usually DLBCL. Antitumor necrosis factor alpha therapy (anti-TNF α) treatment for inflammatory rheumatic diseases may increase the risk of developing B-cell NHL subtypes.

Genetics

Like many cancers, there appears to be a genetic component to NHL risk, though the extent and variability by NHL subtype remains unclear.

Types of Lymphoma

There are two common types of lymphoma and a third, lesser known type. They have been described as follows:

Name	Description	Causes
Hodgkin lymphoma	It is the cancer of the lymph tissue found in spleen, lymph nodes, bone marrow etc.	The cause is unknown. Prior infection with HIV or Epstein Barr virus is seen to increase the risk of this disease.
Non Hodgkin lymphoma	It is the cancer of the B lymphocytes found in lymph tissues	The cause is unknown. The disease mostly develops in people with weakened immune system. Prior HIV infection or organ transplantation increases the risk.
Burkitt lymphoma	It is a rare type of disease mostly observed in African children. It is common in males.	In Africa, it is linked to the Epstein Barr virus, but no such link has been found in the USA. Weakened immune system increases the risk

Lymphoma is a common cancer of the blood experienced in the USA. The following table helps to understand some common facts regarding lymphoma:

Incidence of lymphoma per 100000 population in 2012	12.5
Number of people living with lymphoma in USA in 2012	694577
Number of expected deaths from lymphoma in USA in 2012	20130
New cases of lymphoma reported in 2012	79190
Five year relative survival rate for those diagnosed before 45 years of age	93.1%
Increase in relative survival rate for Hodgkin lymphoma between 1975 to 2012	72% to 87%
Increase in relative survival rate for lymphoma between 1975 to 2012	47% to 71%

Pathophysiology

Lymphatic tissue is composed mainly of lymphocytes. There are two main types of lymphocytes:

- B cells make antibodies that kill bacteria and viruses.
- T cells fight infections using other chemicals and processes.

Lymphoma starts when a lymphocyte changes into an abnormal cell that begins dividing out of control. These abnormal cells often form masses (tumors) in lymph nodes and elsewhere. Because lymph tissue is located throughout the body, lymphoma can begin almost anywhere. It can spread to almost any tissue or organ.

The two main types of lymphoma are Hodgkin disease (Hodgkin lymphoma) and non-Hodgkin lymphoma. There are about 30 different types of non-Hodgkin lymphoma.

Hodgkin disease can affect lymph tissue anywhere in the body. It can also spread from lymph tissue to other organs. Hodgkin disease usually affects people in their late 20s or older than 50. Males get the disease more often than females. Whites are affected more often than people of other races.

Non-Hodgkin lymphoma has become more common in the past few decades. This may be related to the rise in the number of people who have a suppressed immune system, such as people infected with human immunodeficiency virus (HIV) and those who have had an organ transplant and need to take drugs that alter the immune system.

The mechanisms that drive normal B cell differentiation and activation are frequently subverted by B cell lymphomas for their unlimited growth and survival. B cells are particularly prone to malignant transformation because the machinery used for antibody diversification can cause chromosomal translocations and oncogenic mutations. The advent of functional and structural genomics has greatly accelerated our understanding of oncogenic mechanisms in lymphomagenesis. The signaling pathways that normal B cells utilize to sense antigens are frequently derailed in B cell malignancies, leading to constitutive activation of prosurvival pathways. These malignancies co-opt transcriptional regulatory systems that characterize their normal B cell counterparts and frequently alter epigenetic regulators of chromatin structure and gene expression. These mechanistic insights are ushering in an era of targeted therapies for these cancers based on the principles of pathogenesis.

Signs and Symptoms of Lymphoma

The most common signs and symptoms of Hodgkin lymphoma are as follows:

- Intermittent fever, night sweat and chills.
- Swelling of lymph glands in neck, groin or armpit.
- Unexplained weight loss.
- Flushed skin
- Coughing and itching
- Excessive sweating
- Loss of appetite.

The first most common symptom to appear is swollen lymph glands whose cause cannot be explained. The disease then spreads to the spleen and the bone marrow. The most common signs and symptoms of non Hodgkin lymphoma are as follows:

- Most of them are the same as that of the Hodgkin lymphoma.
- Pain in the abdomen.
- Sweating, vomiting and nausea.
- Headache leading to seizures.
- Changes in personality.

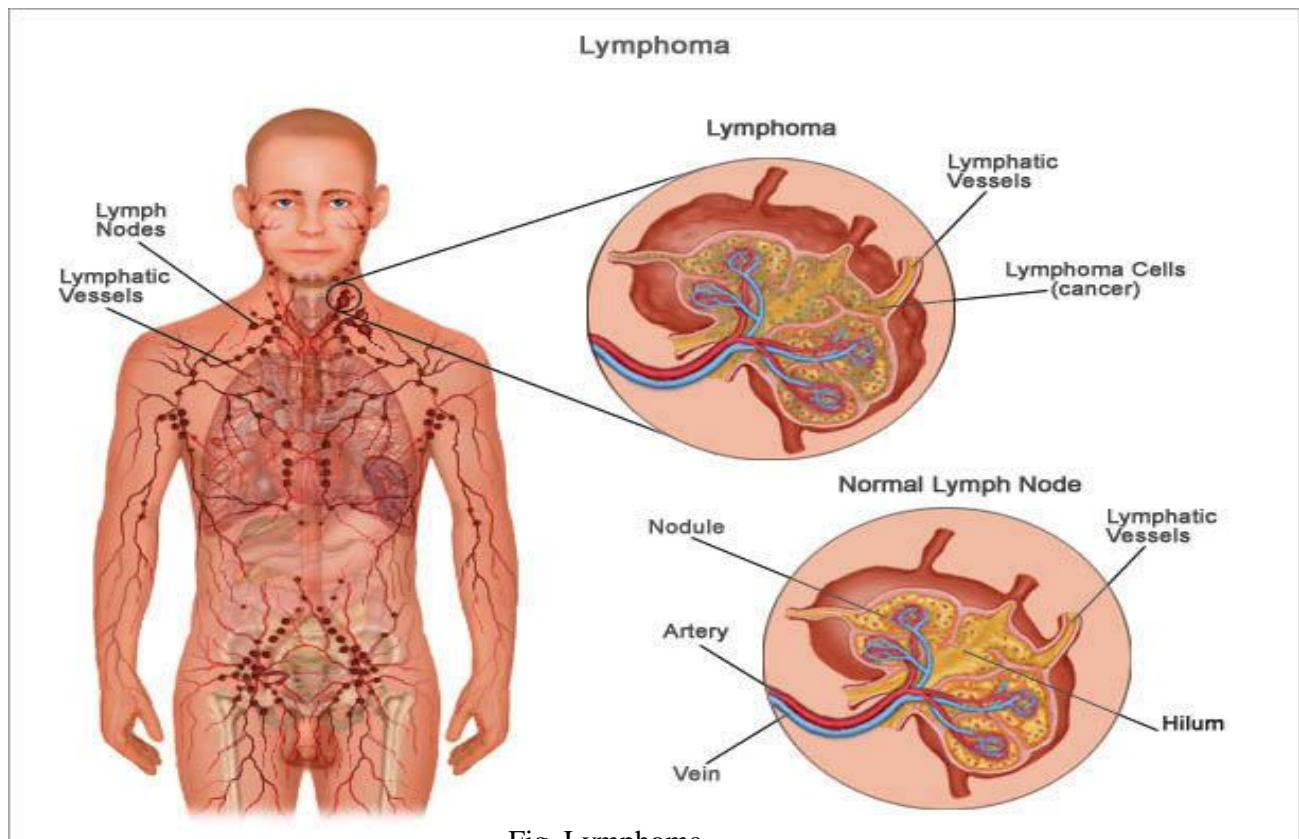


Fig. Lymphoma

Diagnosis of Lymphoma

When you experience any of the above symptoms, the doctor will order a number of diagnostic tests to check for lymphoma. These are as follows:

- The first step is a physical exam where the doctor checks your lymph nodes to make sure whether there are pain and swelling.
- If he suspects lymphoma, he will order a biopsy of the lymph tissue.
- Certain blood tests are done. These include complete blood count and testing for protein, urea, kidney function etc.
- CT scan of chest, abdomen and pelvis may be done.
- PET scan and Gallium scan (in case of non Hodgkin lymphoma) are done.
- In certain cases, bone marrow biopsy has to be done.

It is necessary to identify whether the lymphoma is indolent or aggressive. People can live for a long time without developing any symptoms if they have indolent lymphoma. That is why diagnosis is important. Specific genetic trends are noticed in the incidence of the disease. Lymphoma is also more common among males than females.

Treatment of Lymphoma

Lymphoma can be cured with timely intervention and proper treatment. The type of lymphoma, the spread of the disease, the age of the patient and prior medical history are all important in determining the best treatment for lymphoma.

- If the lymphoma is localized on the skin or occurs as extra-nodal tumors in spleen and abdomen, they are treated with surgery.
- The most widely used line of treatment option for lymphoma is chemotherapy.
 1. Drugs are given to kill of the abnormal cells circulating throughout the body.
 2. The drugs also aim to suppress the creation of new batches of abnormal lymphocytes.
 3. They are given in cycles. This allows the patient to recover from the side effects like anemia and allow the creation of new healthy white blood cells.
 4. The common drugs used to treat Hodgkin lymphoma are ABVD and MOPP. Apart from these, BEACOPP with its seven different components have been shown to have beneficial impact.
 5. For non Hodgkin lymphoma, CHOP (cyclophosphamide, doxorubicin, vincristine and prednisone) is commonly used. Other variations depend on the stage and type of the disease.

- Immunotherapy is also used. Antibiotics are given to produce antibodies in the blood which often work with chemotherapy.
- Radiation therapy uses rays to kill off the tumors. Today, radiation coupled with real time imaging helps doctors to concentrate blasts of radiation at the affected areas and bring about better prognosis.
- In some cases, stem cell transplantation is tried.
- Traditional medicine like acupuncture may be used to drain the lymph nodes. Recent researches suggest Fucoidan found in seaweeds can hold a natural cure for lymphoma.

MYELOMA

The plasma cells in bone marrow produce antibodies and help immune system to fight against outside aggression. Myeloma is a type of cancer that affects these plasma cells. They begin to behave abnormally and form tumors outside the solid bone. This gradually weakens the bones. It also does not allow the bone marrow to produce healthy blood cells. The cause of the disease is not clearly known.

The blood cells in the human body are formed in the soft spongy tissue of the bone marrow. One of the cells which are produced here is the B lymphocytes or the plasma cells. These cells help to produce antibodies in the blood. The antibodies are the chief soldiers of the immune system of the body. When myeloma occurs, these plasma cells begin to behave abnormally. They multiply rapidly and eventually they form tumors on the surface of the solid bones. This attacks the bones so that it can no longer function properly. Moreover, the abnormal plasma cells interfere with the ability of the bone marrow to produce healthy blood cells. The abnormal plasma cells often produce an antibody called paraprotein which affects the kidney function negatively. The bone function is also hampered resulting in abnormally high calcium levels or hypercalcemia. Myeloma is also known as plasma cell myeloma or Kahler's disease.

Causes of Myeloma

The exact cause of myeloma is unknown. There are some research suggesting and longtime exposures to certain harmful chemicals or radiation can cause myeloma. However, many cases are reported where no such exposure is recorded. In such cases, it has not been possible to determine the causative factors.

Incidence of myeloma (2005 – 2009):

Male	7.4 per 100000
Female	4.7 per 100000
Blacks	11.7 per 10000
Whites	5.3 per 100000
Highest incidence found among Black males aged 85 years and above	93.1 per 100000
Number of people living with myeloma	81089
Number of new cases expected to be diagnosed with myeloma in 2012	Male – 12190 Female – 9510

Death and survival rates for myeloma

Five year relative survival rate in 2008	42.6%
Three year survival rate in 2009	57.1%
Number of anticipated deaths from myeloma in 2012	10710
Mortality rates for myeloma	White males – 4.1 per 10000 Black male - 8.0 per 10000 White female – 2.5 per 10000 Black female – 5.4 per 10000

Signs and Symptoms

Since myeloma is manifested in the form of tumors on the bones, the most prevalent symptoms of myeloma is the pain in joints and bones. The symptoms of the disease are as follows:

- The disease interferes with the ability of the bone marrow to produce healthy blood cells. So, anemia is a common symptom. This is a condition where red blood cells fall dangerously below the required quantity. Paleness, fatigue and shortness of breath are common signs of anemia.
- Low platelet count is common because platelets are no longer being produced normally. This may lead to abnormal and easy bleeding and bruising.
- Lesions may develop on the bones.
- More than 70% cases report high level of bone pain. Prolonged localized pain can even lead to bone fracture.

- Increase in the bone resorption lead to abnormally high levels of calcium. This coupled with the abnormal functioning of the blood cause renal failure which is another symptom of myeloma.
- If the cancerous tumor presses on the nerves, it can affect the nervous system of the body. Hence, weakness, confusion and fatigue are caused. Later, pain and numbness may spread to the arms and legs. Neuropathies may also result.
- In the later stages, lessening control of bowel and bladder and paraplegia may result due to spinal cord compression.

Diagnosis of Myeloma

A number of tests are run to confirm the diagnosis of myeloma. These are as follows:

- A number of blood tests are performed to determine complete blood count, level of albumin, calcium and total protein.
- Blood and urine are tested to check for antibodies and proteins.
- Tests are made for hypercalcemia, anemia, renal failure and bone lesions to confirm the diagnosis.
- Bone marrow biopsy and bone x rays are performed to detect the disease.
- Bone density testing is done to monitor the bone loss.

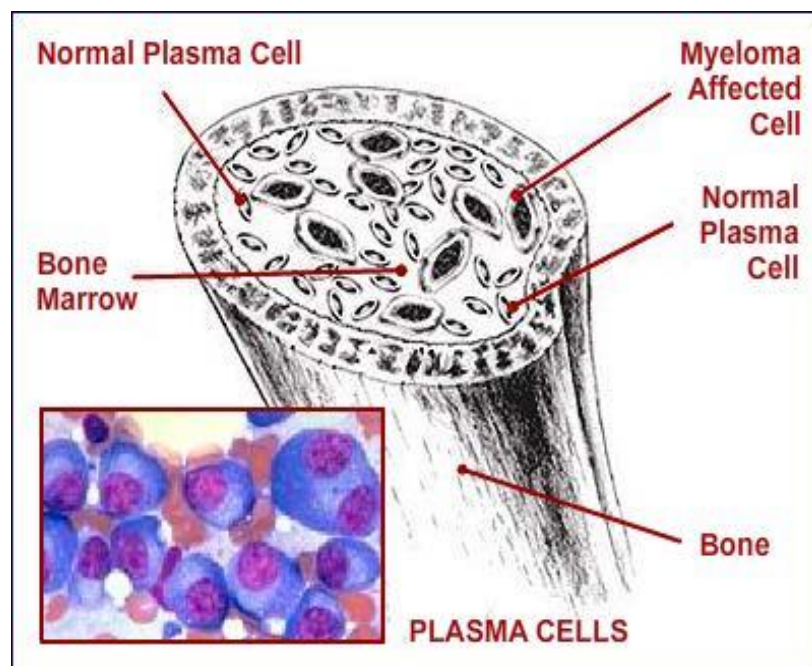


Fig. Myeloma in Bone

Treatment of Myeloma

The treatment of myeloma depends on whether it is smoldering or aggressive. No treatment is prescribed for smoldering myeloma but it is closely monitored. The conventional treatment options for aggressive myeloma include chemotherapy and radiation.

- Chemotherapy includes the administration of several drugs, especially biophosphonates to help to maintain the health of the bones.
- Steroids are sometimes administered.
- Radiotherapy is used to treat localized bone pain caused by concentrated tumors.
- Surgery is not a common option. But it is sometimes used to repair bone damage.
- Bone marrow transplantation is used in certain cases. it may be of two types:
 1. Autologous bone marrow or stem cell transplantation is the process that uses the patient's own stem cells.
 2. Allogenic bone marrow transplant is that where stem cells from a donor is used. This treatment option has serious risks, but it offers long term possibilities of cure.

PREVENTION OF BLOOD CANCER

- Healthy lifestyle with specialized focus on balanced diet
- In fact, health of nutrition and that of living can go a long way in combating blood cancer. Instead of freaking out on dollops of sugar and that of dressed meat items, one ideally needs to fall back on the organic greens.
- Avoiding junk food and going back on a nutritious platter with abundance of green can add to the prevention of blood cancer.
- Dressed meat/fish items have been identified as one of the incentives to blood cancer. So, they need to be avoided as well.
- Trans or saturated fat is congenial to the development of this dreaded disease. So together with dressed items and that of starch, one needs to go low in this category as well.
- Eat, drink and breathe in fresh air.
- Regularized schedule of exercising over a bare minimum period of half an hour can be pretty effective.

- Besides depending on a judicious blend of diet and rest, regularized regimen of exercise with abundant exposure to the unpolluted deals of natural fresh is another incentive to blood cancer prevention.
- Due safety measures to be adopted
- People working in nuclear, chemical or dye making plants belong to the risk category of blood cancer. Thus, they need to take safety measures so that the exposure to the deals of radiation and that of chemicals are minimized.
- Adding to the strength of the immunological system
- It also pays because people immunologically strong are better capacitate in resisting diseases including blood cancer.

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