

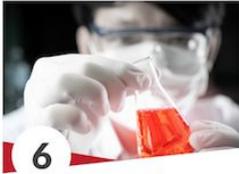
## What is Acute Myeloid Leukaemia (AML)?

Acute Myeloid Leukaemia (AML) is a type of blood cancer that occurs due to the excessive production of a specific type of immature white blood cells (also known as myeloblasts) in the bone marrow. These excess myeloblasts cause overcrowding in the bone marrow, leaving little room for the production of other healthy blood cells such as red blood cells and platelets.

## What causes AML?

### Causes of Acute Myeloid Leukaemia (AML)



- **1**  
Age
- **2**  
Gender
- **3**  
Exposure to Cancer Treatment
- **4**  
Exposure to Radiation
- **5**  
Pre-Existing Blood Disorders
- **6**  
Exposure to Certain Chemicals
- **7**  
Smoking
- **8**  
Genetic Disorders



Acute Myeloid Leukaemia may occur due to the damage to the DNA of cells in the bone marrow. This can affect the production of blood cells in the bone marrow resulting in the production of immature white cells called myeloblasts.

While the exact causes for the DNA mutations to the bone marrow cells are not known, factors that affect the incidence of AML include:

- **Age:** The risk of AML increases with advancing age. It has been found that acute myeloid leukaemia is more common in adults above the age of 65 years old.
- **Gender:** The incidence of acute myeloid leukaemia is higher in men than in women.
- **Exposure to cancer treatment:** Patients who have received chemotherapy or radiation for the management of cancer are more prone to developing AML.
- **Exposure to radiation:** It has been found that exposure to high levels of radiation may lead to abnormal changes in the bone marrow and trigger the development of AML. Survivors of nuclear reactor accidents may be at risk of developing AML.
- **Pre-existing blood disorders:** Patients who suffer from other blood disorders such as myelofibrosis, myelodysplasia, thrombocythaemia, or polycythemia vera could be at risk of developing AML.
- **Exposure to certain chemicals.** Some chemicals such as Benzene can increase the chances of developing AML. However strict regulations in most countries limit the exposure of such chemicals which means they play a very small part in causing AML.
- **Smoking:** Smoking is associated with more than 15 types of cancers including leukaemia, as cigarettes contain many substances which are harmful to the body. There are also reports on an increased risk of leukaemia in children of parents who smoke.
- **Genetic disorders:** The risk of AML is more in patients with genetic diseases such as Down syndrome.

## What are the signs and symptoms of AML?

### Signs & Symptoms of Acute Myeloid Leukaemia (AML)

- **1**  
Fever
- **2**  
Repeated Infections
- **3**  
Fatigue
- **4**  
Pale Skin
- **5**  
Difficulty in Breathing
- **6**  
Pain in the Bones
- **7**  
Tendency for Bruising and Unusual Bleeding
- **8**  
Bleeding from the Nose or Gums

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The symptoms of Acute Myeloid Leukaemia may vary depending on the type of blood cells affected. However, in the initial phase, the symptoms may be similar to that of the flu.

As the disease progresses, patients may develop symptoms such as:

- Fever
- Repeated infections
- Fatigue
- Pale skin
- Difficulty in breathing
- Pain in the bones
- Tendency for bruising and unusual bleeding
- Bleeding from the nose or gums

## How is AML diagnosed?

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- **Blood tests**

The presence of too many white cells with a reduced count of red cells and platelets in the blood could be a sign of AML. The presence of immature blast cells, which are normally present in the bone marrow but not in the peripheral blood, can also be considered an indicator of AML.

- **Bone marrow biopsy**

A **bone marrow biopsy** and aspiration involve the insertion of a thin needle into a long bone of the body to withdraw a small amount of marrow. The sample can be tested in a laboratory to detect any abnormalities linked to AML.

Specific tests are performed on the bone marrow aspirate including:

- **Immunophenotyping**

Immunophenotyping is a specialist test that is performed on either a blood sample or bone marrow aspirate sample. The patient sample is analysed through a machine known as a flow cytometer, which allows identification of abnormal markers which are present on the surface of white cells.

Immunophenotyping allows for the detection of blood cancers, and aids in the classification of the sub-type of the blood cancers. In addition, as the test can detect even small amounts of residual disease in the blood or bone marrow, it is used following treatment to assess disease response.

- **Cytogenetic tests**

Genetic tests of the bone marrow can help to confirm the diagnosis of AML. The results of these studies can also be useful for determining how the disease will progress in the future.

This test involves the examination of the chromosomes in the cells of the marrow sample taken during a biopsy. It can help to detect mutations in the chromosomes that can affect the functions of the bone marrow and trigger the development of AML.

- **Molecular testing**

Increasingly, there are several recognised molecular genetic abnormalities (mutations) in AML cells that are linked to prognosis. Molecular testing provides information on the risk group of AML patients. In addition, monitoring of the level of known mutations in patients often also allows us to measure the response of patients to therapy, even when there may be only very small levels of AML disease in the bone marrow.

## How is AML treated?

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The treatment of AML can be categorised into 2 phases:

1. **Induction therapy:** This is the first phase of AML treatment. It is aimed at destroying leukaemia cells in the bone marrow and blood. However, remission induction may not kill all the leukaemia cells. Hence, further treatment is needed to prevent relapse.
2. **Consolidation therapy:** This phase of AML treatment involves the destruction of the remaining leukaemia cells. It is also called maintenance therapy or post-remission therapy. It is considered vital for reducing the risk of relapse.

Depending on the patient's age, health condition and subtype of cancer, AML treatment may include one or a combination of the therapies discussed below:

- **Chemotherapy**  
**Chemotherapy** is a form of induction therapy although it is sometimes included in the consolidation therapy as well. Chemotherapy involves the use of medications to kill cancer cells. The number of sessions of chemotherapy depends on the extent of AML.
- **Targeted therapy**  
**Targeted therapy** involves the use of drugs such as Midostaurin that directly attack specific vulnerabilities of cancer cells. Midostaurin works by inhibiting the action of an enzyme in the cancer cells (known as the FLT3-ITD mutation) thereby preventing their survival.
- **Other drug therapy**  
Anti-cancer drugs such as all-trans retinoic acid (ATRA) and Arsenic trioxide (Trisenox) can be included in the treatment of a subtype of Acute Myeloid Leukaemia, known as acute promyelocytic leukaemia (APML).

- **Stem Cell transplantation**

Not all patients with AML require a **stem cell transplantation**. However patients with poor risk AML, or those who have not responded well to induction or consolidation chemotherapy will often need to proceed to transplantation if a suitable donor can be identified.

A bone marrow transplant is often included in the consolidation phase. A bone marrow transplant is aimed at re-establishing healthy stem cells in the marrow. It involves replacing unhealthy marrow with healthy stem cells to stimulate the regeneration of mature blood cells.

High doses of chemotherapy or radiation is given before a bone marrow transplant to destroy abnormal marrow. This is followed by the infusion of healthy stem cells from a compatible donor.

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