

Acute lymphoblastic leukemia

ABSTRACT

Acute lymphoblastic leukemia is a cancer of the lymphoid line of blood cells characterized by the development of large numbers of immature lymphocytes. Symptoms may include feeling tired, pale skin colour, fever, easy bleeding or bruising, enlarged lymph nodes, or bone pain. As an acute leukemia, acute lymphoblastic leukemia progresses rapidly and is typically fatal within weeks or months if left untreated.

INTRODUCTION

Acute lymphoblastic leukemia is typically treated initially with chemotherapy aimed at bringing about remission. This is then followed by further chemotherapy typically over a number of years. Additional treatments may include intrathecal chemotherapy or radiation therapy if spread to the brain has occurred. Stem cell transplantation may be used if the disease recurs following standard treatment. Additional treatments such as immunotherapy are being studied.

Acute lymphoblastic leukemia affected about 876,000 people globally in 2015 and resulted in about 111,000 deaths. It occurs most commonly in children, particularly those between the ages of two and five. In the United States it is the most common cause of cancer and death from cancer among children. Acute lymphoblastic leukemia is notable for being the first disseminated cancer to be cured. Survival for children increased from under 10% in the 1960s to 90% in 2015. Survival rates remain lower for babies (50%) and adults (35%).

Initial symptoms can be nonspecific, particularly in children. Over 50% of children with leukemia had one or more of five features: a liver one can feel (64%), a spleen one can feel (61%), pale complexion (54%), fever (53%), and bruising (52%). Additionally, recurrent infections, feeling tired, arm or leg pain, and enlarged lymph nodes can be prominent features. The B symptoms, such as fever, night sweats, and weight loss, are often present as well.[citation needed]

Central nervous system (CNS) symptoms such as cranial neuropathies due to meningeal infiltration are identified in less than 10% of adults and less than 5% of children, particularly mature B-cell Acute lymphoblastic leukemia (Burkitt leukemia) at presentation.

The signs and symptoms of acute lymphoblastic leukemia are variable and include:

- Generalized weakness and feeling tired
- Anemia
- Dizziness
- Headache, vomiting, lethargy, neck stiffness, or cranial nerve palsies (CNS involvement)
- Frequent or unexplained fever and infection
- Weight loss and/or loss of appetite
- Excessive and unexplained bruising
- Bone pain, joint pain (caused by the spread of "blast" cells to the surface of the bone or into the joint from the marrow cavity)
- Breathlessness
- Enlarged lymph nodes, liver and/or spleen
- Pitting edema (swelling) in the lower limbs and/or abdomen

- Petechiae, which are tiny red spots or lines in the skin due to low platelet levels
- Testicular enlargement
- Mediastinal mass

The cancerous cell in acute lymphoblastic leukemia is the lymphoblast. Normal lymphoblasts develop into mature, infection-fighting B-cells or T-cells, also called lymphocytes. Signals in the body control the number of lymphocytes so neither too few nor too many are made. In Acute lymphoblastic leukemia, both the normal development of some lymphocytes and the control over the number of lymphoid cells become defective.

ALL emerges when a single lymphoblast gains many mutations to genes that affect blood cell development and proliferation. In childhood acute lymphoblastic leukemia, this process begins at conception with the inheritance of some of these genes. These genes, in turn, increase the risk that more mutations will occur in developing lymphoid cells. Certain genetic syndromes, like Down syndrome, have the same effect. Environmental risk factors are also needed to help create enough genetic mutations to cause disease. Evidence for the role of the environment is seen in childhood acute lymphoblastic leukemia among twins, where only 10–15% of both genetically identical twins get Acute lymphoblastic leukemia. Since they have the same genes, different environmental exposures explain why one twin gets ALL and the other does not.

Infant Acute lymphoblastic leukemia is a rare variant that occurs in babies less than one year old. KMT2A (formerly MLL) gene rearrangements are most common and occur in the embryo or fetus before birth. These rearrangements result in increased expression of blood cell development genes by promoting gene transcription and through epigenetic changes. In contrast to childhood acute lymphoblastic leukemia, environmental factors are not thought to play a significant role. Aside from the KMT2A rearrangement, only one extra mutation is typically found. Environmental exposures are not needed to help create more mutations.

REFERENCES

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