24. The Spectrum of Paediatric Leukemia in A Tertiary Care Hospital in North India

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BACKGROUND: Childhood leukemias represent the most common paediatric malignancy with an incidence of 35–50% in India, higher than the global figure of nearly 30–35%. The most common subtypes are B Lineage Acute Lymphoblastic Leukemia (B-ALL) (60–70%), Acute Myeloid Leukemia (AML) (~25%), and T Lineage ALL (T-ALL) (20–30%). Genetic predispositions, including prenatal chromosomal translocations, Down syndrome (DS), Klinefelter's syndrome, and Fanconi anaemia, along with socioeconomic and environmental influences, contribute to disease aetiology. Approximately 4–10% of neonates with DS develop Transient Abnormal Myelopoiesis (TAM), a clonal, self-limiting proliferation of megakaryoblasts caused by GATA1 mutations, of which 20–30% progress to Myeloid Leukemia of Down Syndrome (ML-DS), particularly AML-Megakaryoblastic Leukemia (AML-M7). Recognition of these entities is essential for early risk stratification and tailored follow-up. **METHODS:** A prospective observational study was conducted over 2 years (2024–2025) at a tertiary care centre in North India. Paediatric patients aged 0–15 years with clinical suspicion of leukemia were included (n=36). Data collected included demographics, clinical presentation, hematological parameters, and bone marrow findings. Subtyping was performed using morphology, cytochemistry, and flow cytometry on a 3-laser 10-color Beckman Coulter Navios analyzer. Correlation of subtype with presentation, frequency of TAM, AML, and ALL, and short-term follow-up outcomes were recorded. **RESULTS:** Of the 36 cases, 66.7% were ALL, 22.2% were AML, and 11.1% were TAM. The mean age was approximately 5 years, with a male preponderance (1.8:1). Among ALL cases, CALLA+ B-ALL predominated (58.3%), followed by B-ALL (16.66%) and T-ALL (16.7%). Hepatosplenomegaly was observed in ~33% of ALL and ~50% of TAM cases. Among DS children (n=9), 44.4% were diagnosed with TAM, 22.2% with CALLA+ B-ALL, and 11.1% each with B-ALL, AML Megakaryoblastic, and AML Monocytic. Flow cytometry in a representative AML-M7 case identified two blast populations: myeloblasts (CD34+, CD117+, CD56+, CD36+, HLA-DR+) and megakaryoblasts (CD34−, CD41+, CD56+, CD117 dim+). Follow-up data showed 75% of ALL and 37.5% of AML cases were MRD negative. On short-term outcomes, 98.5% of ALL and 87.5% of AML children were alive. Approximately 40% of data was lost to follow-up. Among DS-related leukemias, 50% of TAM cases progressed to leukemia, and 25% required long-term hematologic surveillance. **CONCLUSION:** This study delineates the spectrum and outcome of paediatric leukaemia in North India, reaffirming ALL (B-ALL) as the most common type, followed by AML and TAM. TAM, seen exclusively in DS, warrants close follow-up for progression into leukemia to enable early diagnosis and treatment. The study emphasizes the diagnostic value of combining morphology, cytochemistry, and flow cytometry for accurate subtyping in resource-limited settings, and highlights the need for improved long-term surveillance, particularly in DS-related leukemia.

Key Words: Precursor Cell Lymphoblastic Leukemia-Lymphoma; Leukemia, Myeloid, Acute; Down Syndrome; Myelopoiesis; Immunophenotyping