



Distribution of anaemia and leukemia in an urban cohort

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Abstract

Background: *It is important to screen the population for early detection of haematological diseases, so as to avoid grievous consequences. This study was undertaken in a tertiary care centre to determine the impact of such diseases, especially leukemias and anaemias in general population.*

Subjects and Methods: *This was a 6 months prospective study which was undertaken on 1764 patients who on complete blood count (CBC) analysis presented with low haemoglobin or abnormal leukocyte and platelet counts. The CBC, peripheral smear (PS) and bone marrow evaluation were done subsequently.*

Results: *In our study, 54 patients were diagnosed with leukemia, among them 9/54 had normal total leukocyte count at presentation while 6/54 patients had pancytopenia. Bone marrow aspiration was done in 23 patients. Acute lymphoblastic leukemia (ALL) was found to be the most common leukemia in 0-10 years age group; chronic myeloid leukemia (CML) was common in 31-40 years age group while chronic lymphocytic leukemia (CLL) was common in >50 years age group. Overall, unclassified leukemias (n=28) were the most commonly reported leukemia. The most common anemia was microcytic hypochromic anaemia. Male: female ratio in leukemia was found to be 1.84:1. Thrombocytopenia was present in 37% of all leukemic patients.*

Conclusion: *The proper and thorough investigational approach is needed for early diagnosis of anaemias and leukemias which in a true sense are potentially curable and often preventable entities. The value of basic investigations such as CBC and PS evaluation cannot be underestimated and at times becomes the most crucial to screen the population for the presence or absence of such deadly haematological disorders.*

Introduction

Haematological diseases affects millions, resulting in high morbidity and high mortality.^[1] Due to the high prevalence of anaemia and leukemia, it is absolutely necessary to diligently screen the entire population. According to a survey, 07 out of every 10 children aged 06–59 months are anaemic with

3% being severely anaemic, 40% moderately and 26% mildly anaemic. As per a anaemia statistics report 2019, anaemia affects 24.8% of the world population (i.e. approximately 1.62 billion people) with the highest prevalence noted in preschool-age children (47.4%, 95% CI: 45.7–49.1), and the lowest in men (12.7%, 95% CI: 8.6–16.9%).^[2-4]

ALL accounts for 60 to 85% of all childhood leukemia. Incidence of leukemia in Indian pediatric population was reported as 34%, of which 25% was ALL. Acute lymphoblastic leukemia (ALL) is the single most common pediatric malignancy accounting for 1/4th of all childhood cancer and 3/4th of all newly diagnosed leukemia constituting approximately 3- 4 cases per 100,000 children under the age of 15 years.^[5] In India, more than 25,000 children are diagnosed with this cancer every year. AML accounts for approximately 20% of acute leukemia in children and 80% in adults and is the second most common leukemia in children.^[6] The highest rates of childhood acute myeloid leukemia (AML) occurs in Asia. Annual incidence of AML in India varies from 0.9 to 1.5 per 100,000 children. Hence, it is essential to investigate all the cases properly to timely arrest the progression of such fatal entities.^[6] In the current study, complete blood count (CBC) and peripheral smear (PS) evaluation was done to detect anaemia/ leukemia and the associated thrombocytopenia/ thrombocytosis. The usual indications for bone marrow aspiration was to confirm the diagnosis, to determine the stage or progression of a disease, to monitor the response of the treatment and to investigate pancytopenias and pyrexias of unknown origin.

Subjects and Method

Study Design: This was a 6 months prospective study which was undertaken on 1764 patients. The approval of the study was obtained from the institutional ethical committee and written informed consent was obtained before attempting any bone marrow aspiration from the patients involved in the study.

Subjects: Inclusion criteria: The patients of all the age groups were included in this study who on CBC analysis presented with low haemoglobin or abnormal leukocyte and platelet counts. Exclusion criteria: seriously ill patients with various co-morbidities.

Method: The blood collection for PS and CBC evaluation was done as a routine procedure at our

department. K₂EDTA was the preferred anticoagulant.

Procedure: Prior to any bone marrow aspiration, the vitals of the patient were checked, and the local anesthesia was injected around the pre-cleaned area (preferred site- the posterior iliac crest) where the biopsy needle was chosen to be inserted. A small incision was made, then a hollow needle was inserted through the bone and into the bone marrow. Using a syringe attached to the needle, a sample of the liquid portion of the bone marrow was withdrawn. Following which the aspirate was used to be spread over many slides for further staining and subsequent microscopic evaluation. The stain utilized for staining PS and bone marrow aspiration was Leishman stain. The special stains were also used as and when needed.

Statistical Analysis

The interpretation and analysis of the data was done by using Microsoft Excel and plotted in the spreadsheets. The quantitative data obtained were expressed as numbers and percentages in a tabular form.

Results

In our study, total 54 patients were diagnosed with leukemia among them 9/54 had normal total leukocyte count at presentation while 6/54 patients had pancytopenia. Bone marrow aspiration was done in 23 patients. ALL was found to be the most common leukemia in 0-10 years age group; CML was common in 31-40 years age group while CLL was common in >50 years age group. [Table 1, Figure 1]. Overall, unclassified leukemias (n=28) were the most commonly reported leukemia. The most common anemia was microcytic hypochromic anaemia. [Table 2, Figure 2] Male: female ratio in leukemia was found to be 1.84:1. [Table 3] Thrombocytopenia was present in 37% of all leukemic patients. [Table 4]

Table 1: Distribution of Leukemia in various age-groups

Age group	Number of patients (n=54)	ALL (n=12)	AML (n=08)	CLL (n=02)	CML (n=04)	Unclassified Leukemia (n=28)
0 – 10 years	07	1	3	0	0	3
11 – 20 years	11	3	1	0	1	6
21 – 30 years	14	3	1	0	1	9
31 – 40 years	10	2	0	0	2	6
41 – 50 years	06	2	2	0	0	2
>50 years	06	1	1	2	0	2

Figure 1: Age-wise distribution of leukemia

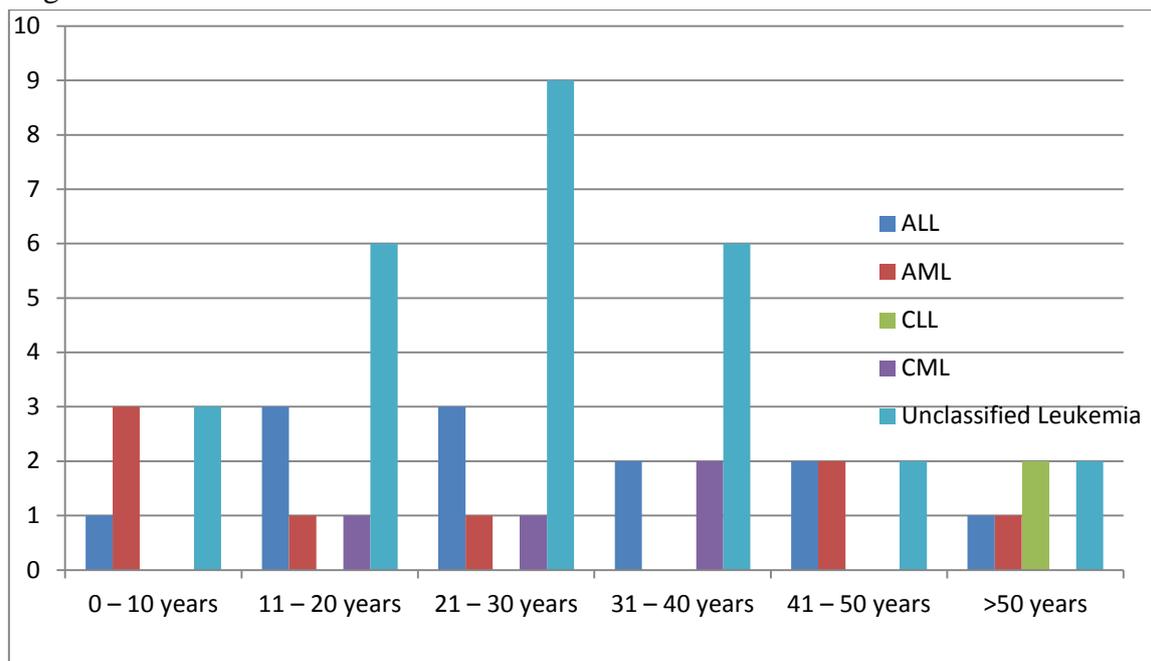


Table 2: Distribution of anaemias and leukemias among 1764 patients

Disease	Classification	No. of cases
Anaemias (n=1710)	Microcytic Hypochromic	806
	Normocytic Normochromic	620
	Macrocytic	220
	Dimorphic	64
Leukemias (n=54)	Acute Leukemia (Unclassified Leukemias)	28
	ALL	12
	CML	08
	AML	04
	CLL	02

Figure 2: Distribution of anaemia and leukemia in the study population

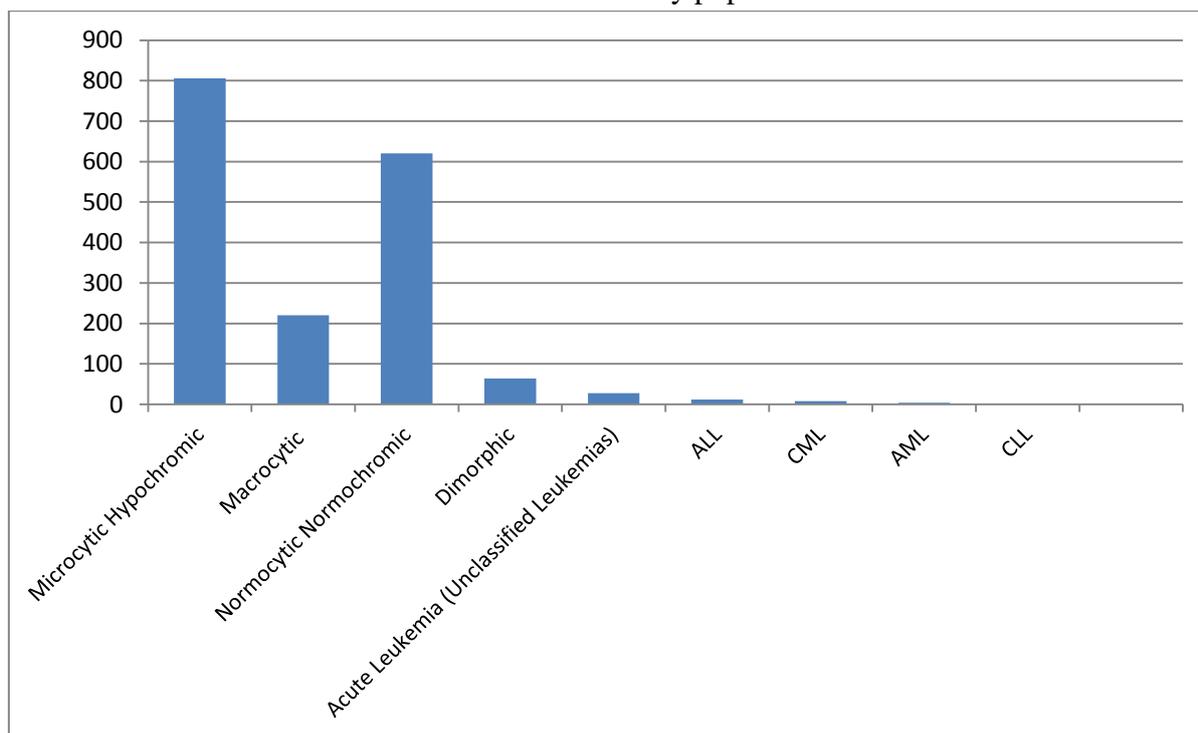


Table 3: Distribution of leukemia in males and females

Leukemia	Male (n=35)	Female (n=19)
ALL	6	6
AML	3	1
CLL	0	2
CML	6	2
Unclassified	20	8

Table 4: Platelet count in leukemic patients

	Number of cases (n=54)	%
Thrombocytopenia	20	37.03
Thrombocytosis	02	03.7
Normal	32	59.2

In our study, a 9 year old girl presented to us with a 3 months history of fever on and off with generalized weakness. On CBC analysis, she had severe pancytopenia; her peripheral smear examination revealed few atypical cells with blast like morphology following which she was advised bone marrow aspiration. Finally the bone marrow findings revealed hypercellular marrow with the presence of more than 90% lymphoblasts favoring the diagnosis of acute leukemia, morphologically suggestive of ALL.

Discussion

As per various studies^[1], a vast majority of Indians of all ages are usually anaemic; the prevalence of anaemia ranged between 57.1% and 89.3% similar to that observed in our study, in which 96% were found to be anaemic. The high risk population who are prone for the development of anaemia includes females of reproductive age group, babies, especially if premature, children going through puberty, people following a strict vegetarian or vegan diet, people with cancer, stomach ulcers and some chronic diseases, people on fad diets and athletes.^[3-4,9] Microcytic hypochromic anemia was found to be the most common anemia similar to the studies done by various other researchers, especially iron deficiency anaemia^[10-12] It is important to detect such anaemias at the earliest to avoid grievous consequences, especially in very young children and pregnant women.

Among the patients suffering from leukemia, 9/54 had normal total leukocyte count at presentation while 6/54 patients had pancytopenia. ALL was found to be the most common leukemia in 0-10 years age group,^[5] CML was common in 31-40 years age group while CLL was common in >50

years age group similar to the previously established studies^[5] which supports that ALL is more common in children and young adult, AML and CML occurs predominantly in middle age while CLL primarily affects elderly. According to various studies^[5-7], the commonest leukemia was CML followed by ALL, AML and CLL. The findings of our study varies from the above study due to different environmental, genetic, nutritional and economical factors. In a hierarchal approach, genetic changes have a precedence in the acute myeloid leukemia and immunology and genetic changes have a precedence in the acute lymphoblastic leukemia. In our study, many cases were unclassified leukemias where the blasts cell lineage could not be decided simply on the basis of morphological analysis. As per the current WHO classification of leukemia, genetic aberrations and immunology are now the major defining features in addition to morphology. However, in a limited resource settings, the cytogenetic analysis and other high end investigations are generally not feasible. In a study, of 156 cases, 90 were male and 66 were females with male: female ratio is 1.36:1 whereas in our study male: female ratio was found to be 1.84:1. Thrombocytopenia was present in 37% of all leukemic patients which was similar to the findings seen in other studies^[5-7] Radiation exposure, Benzene, aromatic hydrocarbons, drugs like alkylating agents and other chemotherapeutic agents and Human T cells leukemia lymphovirus I and II, are particularly notorious to cause leukemias.^[11]

The morphological features of various anaemias have already been discussed in the established literatures. Morphologically, as per FAB classification of acute lymphoblastic leukemia (ALL), L1 morphology is characterized by the presence of uniform-sized blasts, L2 ALL with more blast cell variation and L3 blasts is characterized by the presence of more clumped nuclear chromatin, nucleoli, basophilic cytoplasm, and cytoplasmic vacuoles. As per WHO classification, AML are currently subclassified

into many subtypes and cytogenetic analysis is must; however simply on the basis of morphology, the auer rods is still the best hint towards the diagnosis. Only on the basis of morphology, acute leukemia subclassification classification should not be particularly attempted. Immunophenotyping analysis and cytogenetic study is must for definite categorization,

Conclusions

This study highlights the value of proper and thorough investigational approach needed for early diagnosis of anaemias and leukemias which in a true sense are potentially curable and often preventable. The basic investigations should always be recommended and needs to be carried out for the screening purposes.

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