

Original Research Article

# Prevalence and spectrum of anemia among 3920 pediatric in-patients – A cross sectional study

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## Abstract

**Background:** Anemia is one the common hematological laboratory abnormality in pediatric practice. To this reason we have studied the prevalence and spectrum of anemia among pediatric in-patients whom were admitted in a tertiary care hospital in Andhra Pradesh.

**Materials and methods:** The present cross sectional study was done in the Department of Pathology at tertiary care hospital for two years. All pediatric patients with anemia due to clinically suspected or proven cases of leukemia were included. Patients with other causes of anemia such as chronic infection and systemic disorders were excluded. The study was based on peripheral smear examination and bone marrow aspiration cytology reports. Clinical details of these patients were recorded. Anemia and leukemias were grouped and classified based on the morphological type of the FAB classification. Data was extracted from patient case records and laboratory reports. Data management was done using Microsoft excel spreadsheet and statistical analysis using SPSS-16. Actual numbers and percentages were used as descriptive statistics.

**Results:** A total of 3920 patients were admitted in pediatric ward. Among them, 212/3920 (5.4%) were being the hematological diseases, 170/212 (80.2%) being anemic due to causes other than leukemia's and 42/212 (19.8%) were anemia due to leukemia's. Among the 170 cases, the anemia due to Iron, Folate and B12 deficiency was 163 cases (76.88%) of total cases and seven cases (3.31%) were hemolytic anemia's. Among these 42 leukemia cases, acute lymphoblastic leukemia's were 32 (76.2%) AML were 19.04% (8) and CML was 4.76% (2).

**Conclusion:** The commonest type of anemia noticed was the microcytic hypochromic anemia due to nutritional deficiency, followed by macrocytic anemia. 20% anemias were due to leukemias. The

commonest acute leukemia noted was ALL (L1 type). There is seasonal raise of anemia incidences was also noticed between June and September, of which cause is not known. Nutritional anemias can be preventable and treatable effectively through better mother and child health care policies.

## Key words

Pediatrics, Anemia, Leukemia, Peripheral smear examination, Acute Lymphoblastic Leukemias (ALL).

## Introduction

Anemia is one the common hematological laboratory abnormality in pediatric practice [1, 2]. The cause of anemia is multi-factorial, such as nutritional deficiencies, genetic RBC disorders and infections [3]. Iron deficiency causes impairing the cognitive development of children particularly in India [4]. Anemia can be due to malignant or non-malignant in nature, which affects the health of the children [5]. Leukemias are group of malignant diseases of the hematopoietic system characterized by the uncontrolled overproduction of either immature or terminally differentiated leukocytes [6]. Approximately 30% of all childhood malignancies belong to Acute leukemia. Even though there were advances in the diagnostics and limited therapeutic agents available for chemotherapy, the sub typing of leukemia is very important. To establish the diagnosis and classifying leukemia morphology still remains one of the key techniques. Leukemias were classified into myeloid and lymphoid leukemias on the basis of types of cells involved [7]. The purpose of assessing anemia is to make a decision on the type of measures to be taken to prevent and control anemia [8]. To this reason we studied the prevalence and spectrum of anemia among pediatric in-patients whom were admitted in pediatric department in a tertiary care hospital in Andhra Pradesh.

## Material and methods

The present cross sectional study was done in the Department of Pathology, Kurnool Medical College, Kurnool during the period of two years from November 2002 to October 2004. All Pediatric patients with anemia due to clinically suspected or proven cases of leukemia were

included. Patients with other causes of anemia such as chronic infection and systemic disorders were excluded. Institute Ethical Committee has approved the study. The study was based on peripheral smear examination and bone marrow aspiration cytology reports. Clinical details of these patients were recorded. Anemia was classified based on WHO (Hemoglobin levels) [9] and leukemias classified based on the morphological type of the FAB classification [10].

## Statistical analysis

Data was extracted from patient case records and laboratory reports. Data management was done using Microsoft excel spreadsheet and statistical analysis using SPSS-16. Actual numbers and percentages were used as descriptive statistics.

## Results

During this period, a total of 3920 patients were admitted in Pediatric ward. Among them, 212/3920 (5.4%) were being the hematological diseases, 170/212 (80.2%) being anemic due to causes other than leukemia's and 42/212 (19.8%) were anemia due to leukemia's. Among the 170 cases (**Table – 1**), the anemia due to Iron, Folate and B12 deficiency was 163 cases (76.88%) of total cases, and seven cases (3.31 %) were hemolytic anemia's. Among these 42 leukemia cases, acute lymphoblastic leukemias (ALL) were 32 (76.2%), AML were 19.04% (8) and CML was 4.76% (2). The youngest patient was an eight-month female child, and the eldest was the 13-year male child. 7/170 (4.12%) were hemolytic anemia's among them 3 were hereditary spherocytosis 3 were  $\beta$ - thalassemia and one sickle-cell anemia.

**Table – 1:** Types of anemia, age and gender distribution

Age in Years	0-2		2-4		4-6		6-8		8-10		10-12		12-14		Total		Total	%	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
Microcytic hypochromic	5	2	6	13	6	5	9	15	2	9	5	10	3	18	36	72	108	63.53	
Macrocytic	0	4	0	0	0	0	3	0	3	0	4	2	2	2	12	8	20	11.76	
Normocytic Normochromic	2	3	0	0	6	0	2	0	2	0	4	6	0	4	16	13	29	17.06	
Dimorphic	0	0	0	0	0	0	2	1	0	0	0	2	0	1	2	4	6	3.53	
Hemolytic	0	0	1	1	1	1	0	0	0	0	2	1	0	0	4	3	7	4.12	
Total	7	9	7	14	13	6	16	16	7	9	15	21	5	25	70	100	170	100	
Anemia due to leukemia's																			
ALL	L1	0	1	4	4	3	0	4	2	1	0	4	3	4	2	20	12	32	76.19
AML	M2	1	0	1	0	0	1	0	0	1	0	0	0	1	1	4	2	6	14.29
AML	M3	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2	2	2	4.76
CML		0	0	1	0	0	0	0	0	1	0	0	0	0	2	0	2	2	4.76
Total		1	1	5	5	3	1	4	2	3	0	4	3	5	3	26	16	42	100

Among the three cases of hereditary spherocytosis, one case was in the age group of 2-4 years and in 10-12 years one was male and other one was a female child. Spherocytes were seen on peripheral blood smear with abnormal osmotic fragility test. One case had a strong family history. The reticulocyte count increased (>15%). Serum bilirubin was unconjugated. Three cases were of B-Thalassemia major were observed. One was female in 2-4 years age group and two cases in both male & female children of 4-6-year age group. RBC on peripheral smear with many target cells and nucleated RBC, increased reticulocyte count, increased serum bilirubin levels, characteristic x-ray features and increased HbF levels on Hb electrophoresis. Only one case of sickle cell anemia was found in a male child of 10-12 years. RBC was with sickle cells, target cells and ovalocytes on peripheral smear. Reticulocyte count (10-15%) sickling test proved positive. Isolation of HbS was on Hb electrophoresis.

### Discussion

Hematological diseases are frequently encountered in pediatric patient population. The most prevalent and preventable form of microcytic anemia is due to iron deficiency anemia [11]. Macrocytic anemias in children are

relatively uncommon, but are usually caused by a deficiency of vitamin B12 and folate. Additional possible causes include chronic liver disease, hypothyroidism and myelodysplastic disorders. Folic acid deficiency is usually a secondary cause to inadequate dietary intake [12]. Acute lymphoblastic leukemia is the most common malignancy in pediatric patients; malignant white blood cells continuously multiply leading to an excess of lymphoblasts in the peripheral blood and the bone marrow [13, 14].

### Conclusion

In the preset study, Anemia secondary to acquired causes is a disorder with grave consequences. The commonest type of anemia noticed was the microcytic hypochromic anemia due to nutritional deficiency, commonly encountered in female children, followed by macrocytic anemia. 20% were anemias were due to leukemias. The commonest acute leukemia noted was ALL (L1 type) between 2 to 4 years; more incidences in male children were noticed. There is seasonal raise of anemia incidences was also noticed between June and September, of which cause is not known. Nutritional anemias can be preventable and treatable effectively through better mother and child health care policies.

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