

# Haematological Profile of Anaemia in Children of Age 1-12 Years in Southern Rural India

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(Received: November, 2015)

(Accepted: December, 2015)

## ABSTRACT

Anaemia in children is one of the major health problems in India as well as in many parts of the world, since anaemic children have reduced exercise tolerance, slow growth rate, impaired cognitive development and increased risk of complications associated with malnutrition and infection. The study was conducted on 561 patients in the age group of 1 to 12 years. The children with Hb% lesser than the cut-off value for their age were included in the study. Detailed clinical history was elicited and thorough clinical examination was performed. Peripheral smears of these patients were examined. Bone marrow examination was done where ever possible. The complete haemogram including reticulocyte count was done. Male children were more affected than the female children and children between 1-5 years were affected the most. Microcytic hypochromic anaemia was the most common morphological type of anaemia. Pediatric anaemias are very common since children are the most vulnerable for occurrence of these anaemias. This necessitates prompt screening and early diagnosis through utilization of basic investigations like clinical examination and peripheral smear examination, which hold a key position in the diagnostic algorithm of anaemia, in order to initiate timely treatment and appropriate management.

**KEY WORDS:** microcytic hypochromic anaemia, paediatric anaemia, iron deficiency anaemia

## INTRODUCTION:

Anaemia in children is one of the major social health problems in India, especially in rural India and in many parts of the world. Anaemic children have reduced exercise capacity, slower rate of growth, impaired cognitive development, and delayed wound healing<sup>[1]</sup>. Anaemic children are also at an increased risk of dying due to complications associated with malnutrition and infection. Prevalence rate of anaemia is an important indicator of the nutritional status within the pediatric population. As many as 20 percent of the children in the United states and 80 percent of the children in the developing countries are anemic at some point by the age of 18<sup>[2]</sup>. Because of these factors, the study of the etiopathogenesis of anaemia in infancy and childhood has attracted wide attention in

the recent years in India<sup>[3]</sup>.

Most children with anaemia are asymptomatic and have abnormal hemoglobin or hematocrit levels on routine screening. Thorough elicitation of history and findings on physical examination can reveal the underlying cause of anaemia<sup>[2]</sup>.

Anaemia is defined as decreased concentration of hemoglobin and RBC mass as compared to the values in age-matched controls<sup>[2]</sup>. India is still a developing country with very minimal degree of development achieved in the rural areas. The health care sectors in these areas are still dependent on the basic diagnostic procedures for the diagnosis of anemia due to the non-availability of biochemical investigations and other higher diagnostic tests and also due to the non-affordability of rural population. Therefore, in the present study we have concentrated on finding out the efficacy of morphological diagnosis of anemia in these areas by doing a bone marrow correlation in whichever case it was possible in children between 1-12 years of age and in both sexes.

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**MATERIALS AND METHODS:**

The present study was conducted on 561 patients in the age group of 1 to 12 years, who were admitted to pediatric ward of S Nijalingappa Medical College, Bagalkot with anaemia and also presented with other complaints and were incidentally found to have anaemia.

A detailed history was elicited along with a thorough clinical examination. The required quantity of venous blood was collected in EDTA tubes, which was analyzed using Swelab Alfa cell autoanalyser, having three part differentials. Peripheral smears were prepared on glass slides and stained with Leishman's stain. The reticulocyte count was done by the supravital staining technique using Brilliant cresyl blue. Among the anaemic cases, only few patients agreed for bone marrow examination.

Study was conducted after getting Ethical clearance.

**RESULTS:**

Total 561 anaemic pediatric patients between 1 to 12 years were enrolled in the study. These were categorized according to their age (Table 1). Children between 1-2 years were found to be most affected thus constituting 45% of total cases, followed by 26% of children falling in 3-4 years age group. The Male: Female ratio was found to be 1.2:1. Genderwise gradation of anaemia was done, which revealed presence of severe anaemia in 16% male children and 22% female children, while 46% of both male and female children had moderate anaemia whereas, mild degree of anaemia was seen in 38% male children and 32% female children (Table 2) Chisquare when applied came out to be 5.23, df = 2, p = 0.07, which is not significant.

The most affected children were in the age group of 1-2 years with 253 cases (Table 3). Chisquare when applied was 30.03, df = 5, p = 0.00001 in mild and moderate anaemia whereas was 4.08, df = 5, p = 0.53 in severe anaemia. Out of 561 cases, the most common morphological type was microcytic hypochromic anaemia with 59% cases (Table 4).

In the present study, males out numbered females in cases of microcytic hypochromic, normocytic normochromic and normocytic hypochromic anaemia. Macrocytic and haemolytic anaemia showed equal gender incidence. In dimorphic anaemia, females were affected predominantly (Table 5).

The bone marrow examination for the morphological correlation was possible in 95 cases out

of total cases due to disagreement of parents and gaurdians for the same. However, in all 95 cases bone marrow picture correlated well with the morphological diagnosis given on peripheral smear examination (Table 6). Those cases in which bone marrow study was not possible also responded well to therapy which was evaluated on follow-up smears.

Table 1: Agewise distribution of anaemias (n=561)

Age years (Years)	Number	Percentage
1 – 2	253	45
3 – 4	145	26
5 – 6	85	15
7 – 8	32	6
9 – 10	25	4
11 – 12	21	4

Table 2: Genderwise gradation of anaemias (n=561)

Grade of anaemia	Male		Female		Total
	No.	%	No.	%	
Mild (Hb%>10gm/dl)	112	38	84	32	196
Moderate (Hb%>7-10gm/dl)	137	46	122	46	259
Severe (Hb%<7gm/dl)	46	16	60	22	106
Total	295	100	266	100	561

Table 3 : Age wise gradation of anaemia (n=561)

Age group	Mild		Moderate		Severe		Total
	No.	%	No.	%	No.	%	
1-2 Year	67	34	134	52	52	49	253
3-4 Year	47	24	74	28	24	23	145
5-6 Year	37	19	28	11	20	18	85
7-8 Year	18	09	10	04	04	04	32
9-10 Year	13	07	09	03	03	03	25
11-12 Year	14	07	04	02	03	03	21
Total	196	100	259	100	106	100	561

Table 4: Distribution of various morphological types of anaemia(n=561).

Etiology	Number	Percentage
Microcytic hypochromic anaemia	332	59
Normocytic hypochromic anaemia	122	22
Dimorphic anaemia	49	09
Normocytic normochromic anaemia	45	08
Macrocytic anaemia	08	01
Hemolytic anaemia	06	01
Total	561	100

Table 5: Sex distribution of various morphological types of anaemia(n=561).

Morphological type	Male	Female	Total
Microcytic hypochromic anaemia	186	146	332
Macrocytic anaemia	04	04	08
Dimorphic anaemia	23	26	49
Haemolytic anaemia	03	03	06
Normocytic normochromic anaemia	26	19	45
Normocytic hypochromic anaemia	67	54	121
Total	309	252	561

Table 6 : Bone marrow study results (n=561).

Diagnosis	Microcytic hypochromic anaemia	Macrocytic anaemia	Dimorphic anaemia
Pheripheral smear	332	08	49
Bone marrow study	78	05	12
Final diagnosis	Microcytic hypochromic anaemia	Megaloblastic anaemia	Megaloblastic and Micronormoblastic erythroid hyperplasia

**DISCUSSION**

Pediatric anaemia is an important universal problem<sup>[4]</sup>. It is a critical issue which needs to be addressed on a priority basis especially in the developing countries<sup>[5]</sup>. Nutritional anaemia is a recognized public health problem worldwide<sup>[6]</sup>. In India, anaemia is the most common nutritional problem affecting more than half of the total population particularly the children and pregnant women<sup>[7]</sup>.

Iron deficiency anaemia is the commonest form of nutritional deficiency in the world responsible for the staggering amount of ill health, cost productivity, increased mortality and morbidity. Even in the developed countries, iron deficiency with or without anaemia is still prevailing in infants, toddlers,

adolescent females and women of the child bearing age. It remains the most common hematologic disease in infants and children<sup>[8]</sup>. Given the detrimental long term effects and high prevalence of iron deficiency, its prevention in early childhood is an important public health issue<sup>[9]</sup>.

The profile, patterns, the morphological types of anaemia as analyzed in the present study of 561 anaemia cases were compared with the other similar studies.

In the present study, more number of males children were found to be anaemic as compared to females children. A similar gender distribution was noted in the study by Gomber et al<sup>[10]</sup> whereas; in a study conducted by Kapur et al<sup>[11]</sup>, there was no difference in the gender distribution.

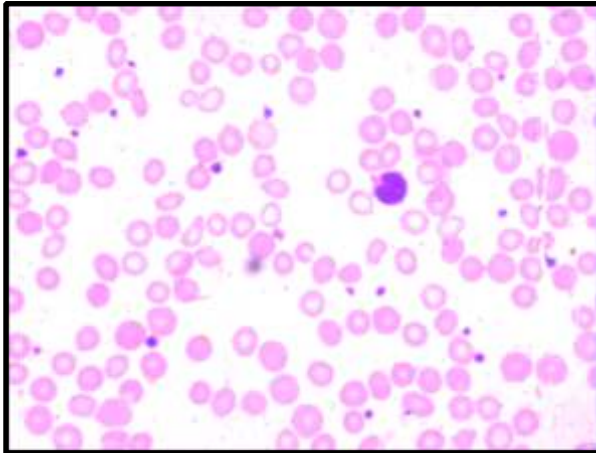


Figure 1: Peripheral smear showing microcytic hypochromic cells, Leishman's stain (X400).

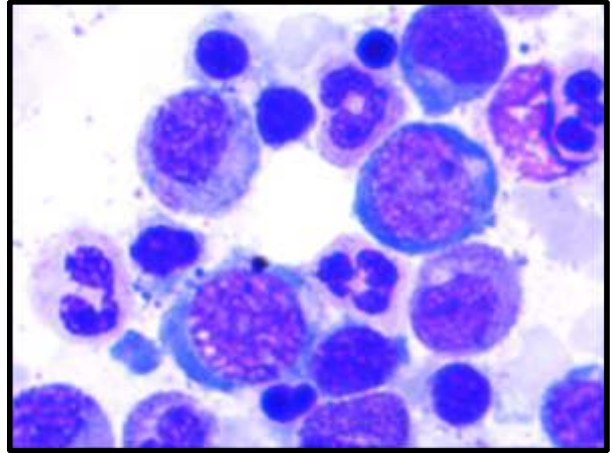


Figure 4: Bone marrow aspiration smear showing megaloblasts, Giemsa stain (X1000)

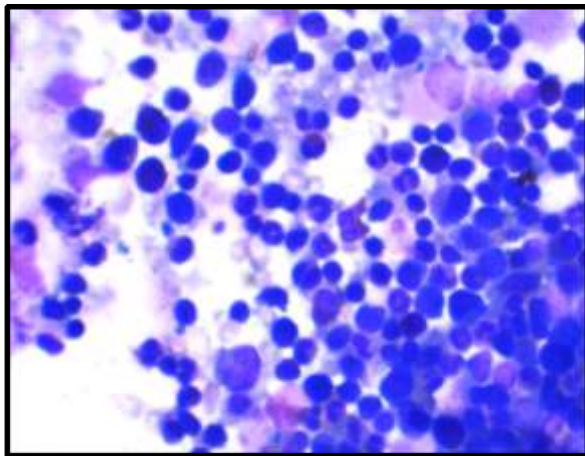


Figure 2: Bone marrow aspiration smear showing micronormoblasts, Giemsa stain (X400).

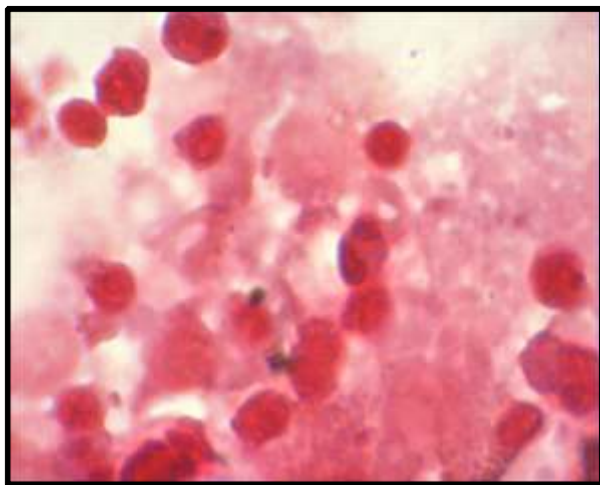


Figure 3: Bone marrow aspiration smear showing reduced iron store. (Grade-0) Pearl's stain (X1000)

Children between 1-5 years age group were maximally affected which is in concurrence with the study by Stellinga-Boelan et al<sup>[12]</sup>. Whereas, study done by Susan et al<sup>[13]</sup> do not mirror our findings, where school children (5-14) and infants were maximally affected respectively. Severe degree of anaemia was found in the maximum number of cases, this finding correlated well with the study findings of S.Jain et al<sup>[11]</sup>

The percent distribution of various morphological types of anaemias found in our study were microcytic hypochromic anaemia (59%), followed by normocytic hypochromic anaemia (22%), diamorphic anaemia (9%), normocytic normochromic anaemia and macrocytic and haemolytic anaemia (01%). This was similar to the observation made by Kapur et al<sup>[11]</sup> with maximum percentage of microcytic hypochromic anaemia.

In present study, 118 cases presented with leukocytosis. Among these maximum number of microcytic hypochromic anaemia cases (64%) were found to be associated with leukocytosis. This findings indicates that a detailed clinical and laboratory evaluation should be done in these patients in order to discern the exact underlying cause of leukocytosis. This warrants a proper workup particularly towards sepsis which is commonly encountered in this age group.

It was also observed that majority of anaemic children presented with symptoms of fever and pallor. However, Sahu T et al<sup>[14]</sup> observed that 28.7% of children presented with history of irregular fever and 33.6% children had pallor.

Our study observed that children between 1-5 years were found to be most affected, therefore it is highly recommended that this age group should be



compulsorily screened for anaemia to avoid its deleterious effects on growing children.

## CONCLUSION:

Anemia still continues to be a major health problem in developing countries like India and pediatric age group is most commonly affected. Several years elapse between onset of symptoms and in arriving at an accurate diagnosis due to lack of primary health care services, particularly in rural India. Rural population should be educated to improve their living standards and to recognize symptoms of illness at an early stage. It is highly recommended for the medical health personnels to make an appropriate diagnostic approach towards anaemia, wherein clinical examination and peripheral blood smear examination are at the baseline in the diagnostic algorithm and hold a key position. Also, technological advances should be looked upon. If properly implemented, these recommendations can definitely help in reducing the burden of anaemia in this age group and hence the morbidity and mortality.

## ACKNOWLEDGEMENT:

I/we would like to thank Dr. V.D. Dombale, HOD & Professor in department of pathology, S.N Medical College, Bagalkot for his support & valuable guidance and also the technical staff for their co-operation during the study period.

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**Cite this article as:** Pandey A, Pandey M, Dombale V D, Sawke G K, Sawke N, Khairker P, More S: Haematological Profile of Anaemia in Children of Age 1-12 Years in Southern Rural India  
*PJSR*;2016;9(1):48-52.

**Source of Support** : Nil, **Conflict of Interest**: None declared.