

A Study on the Clinico-Haematological and Biochemical Profile of Anaemia in Pediatrics

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Abstract

Objectives: This present study was to evaluate the clinico-haematological and biochemical profile and associated factors of anaemia in various age group of children.

Methods: Parents /guardians of children were interviewed for the demographic, socioeconomic status, medical history and previous history of taking any medications and supplements. Venous blood specimens were collected and was transferred to a tube containing ethylenediaminetetraacetic acid (EDTA), and within 4 hours a whole blood count was performed using an automated cell counter. Notation was made. Haemoglobin estimation was done by automated hematology analyzer and peripheral blood smear was prepared simultaneously by a trained lab technician. Estimation of serum B12, folate and ferritin were performed by the Chemiluminescence method and estimation of TIBC was done by Ferene method in a semi-automatic machine.

Results: A total of 100 children with age 1 to 15 years were enrolled in this study. Most of the children 46(46%) were in age of 01-05 years and 56(56%) males. Most of the children 49(49%) had microcytic hypochromic anaemia. 33(33%) had normocytic normochromic anaemia. Dimorphic anaemia was 12(12%). 87 patients out of 100 cases were found to have significant correlation between red cell indices and peripheral blood smear. Out of 49 microcytic hypochromic anaemia, 42(85.71%) cases had reduced red cell indices.

Conclusions: Iron deficiency anaemia is the most common in young children. Males were preponderance than females. Microcytic hypochromic and normocytic normochromic anaemia are the most common in paediatric age group. Hence, for the prevention from the anaemia, paediatric health check-up camp should be organise in rural as well as urban area for the awareness and counselling of the parents/guardians for child feeding practices, immunization and sickness recognition from the first year of life and also for the proper screening/assessment of anaemic children.

Keywords: Pediatrics age group, Gender, Anaemia.

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Introduction

Anaemia is one of the chief significant conditions of blood in the children early stages of the life. It leads to morbidity and mortality in children and establish a public health problem of substantial importance [1]. Anemia in children differs from those of adults as they tend to be more pronounced and develop rapidly [1].

It is the commonest disease affecting humankind and is responsible for morbidity and mortality among general population. About 30% or nearly one third of world's population is suffering from anemia due to various causes [2,3]. Anaemia can be of various types, but most common in developing countries is nutritional anaemia. Nutritional anemia can be due to Iron deficiency (most common cause), Folic acid deficiency, Vitamin B12 deficiency or may be combination of these factors, which can present with dimorphic picture. These conditions are seen in all types of medical practice ranging from neonatology to geriatrics and public health and are an ongoing concern to all physicians. Other types include hemolytic anemia, which can be either congenital or acquired. Iron deficiency is the most common and widespread nutritional disorder in the world [4]. Iron deficiency impairs the cognitive development of children from infancy through adolescence. It also damages immune mechanisms and is associated with increased morbidity rates. The importance of iron deficiency and anaemia as a public health problem has been increasingly recognized by health authorities and policy makers. Although efforts are targeted primarily to prevent iron deficiency, it is still the most common nutrient deficiency all over the world [5].

Most children with anaemia are asymptomatic and have abnormal hemoglobin or hematocrit levels on routine screening. Thorough elicitation of history

and physical examination can reveal the underlying cause of anemia [6]. Objectives of our study was to evaluate the clinico-haematological and biochemical profile and associated factors of anemia in various age group of children.

Material & Methods

This study was conducted in the Department of Pediatrics in Al-Falah School of Medical Science & Research Centre and Hospital, Faridabad, Haryana during a period from October 2018 to May 2019.

Attendants of entire subjects signed an informed consent approved by institutional committee of Al-Falah School of Medical Science & Research Centre. A total of 100 Children with severe pallor with age group 0 to 15 years admitted in the Paediatric ward were enrolled in this study.

Children guardians were interviewed for the demographic, socioeconomic status, medical history and previous history of taking any medications and supplements. Demographic data obtained from patient included age, sex, height and weight, and body mass index.

Inclusion criteria were the children presenting with anemia in age group 0-15 years with adequate clinical details.

Exclusion criteria were the patients had anaemia due to malaria, children already on iron/ multivitamin supplements, and suffering from any chronic illnesses. And children had known history of coagulation and bleeding disorders.

Procedures:

Venous blood specimens were collected and within 20 seconds from blood sampling, blood was transferred to a tube containing ethylenediaminetetraacetic acid (EDTA), and within 4 hours a whole blood count was performed using an automated cell counter. Notation was made. if clots were seen in the blood sample or if the amount of blood in the

tube was grossly inadequate such that a disproportionately high concentration of EDTA would be present; these samples were excluded from the study. Haemoglobin estimation was done by automated hematology analyzer and peripheral blood smear was prepared simultaneously by a trained lab technician. WHO guidelines were used to diagnose anemia and its severity. Anaemia was defined as Hb < 11.5 g/dL in children between 5 - 10 years < 12 g/dL in those between 12 to 15 years. Red Cell indices were analysed and recorded.

Estimate biochemical parameters: 6 ml of fasting blood sample in a plain vial was collected. After the sample has clotted completely, centrifugation was done at 3000 rpm for 6 minutes. The supernatant serum was collected. It was used for the estimation

of Serum vitamin B12, folate, ferritin and Total iron binding capacity (TIBC). Estimation of serum B12, folate and ferritin was done by the Chemiluminescence method and estimation of TIBC was done by Ferene method in a semi-automatic machine.

Statistical Analysis

Data was analysed by using simple statistical methods with the help of MS-Office software. All data was tabulated and percentages were calculated.

Results

A total of 100 children with age group 01 to 15 years were enrolled in this study. Most of the children 46(46%) were in age group of 01-05 years. And majority of the patients 56(56%) were males.

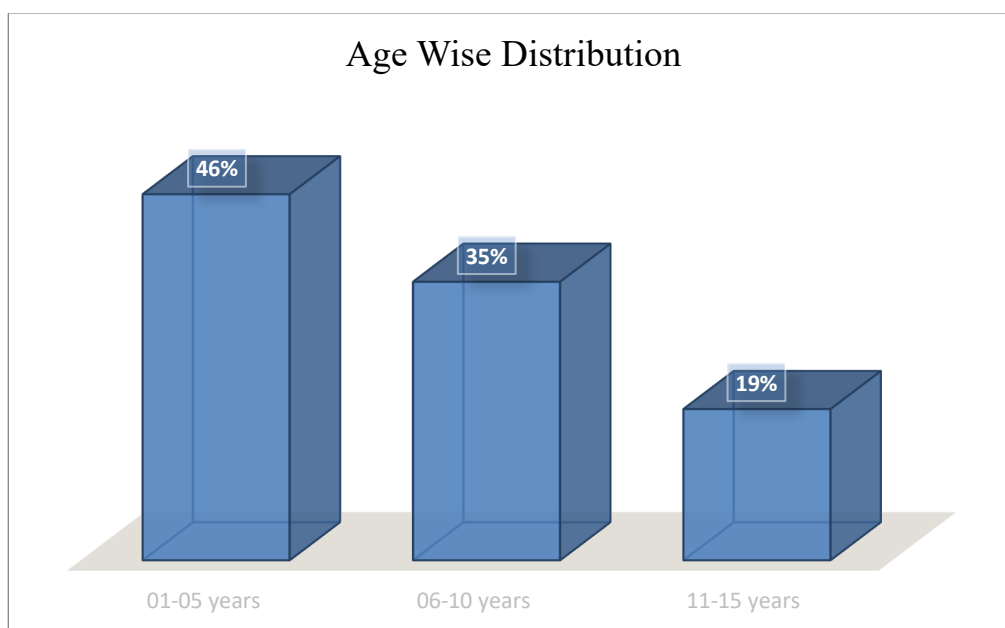


Figure 1: Age wise distribution of children

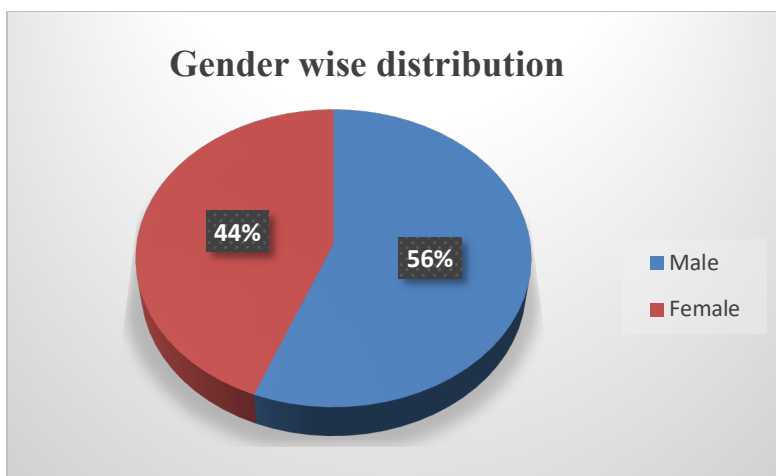


Figure 2: Gender wise distribution of children

In this present study, most of the children 49(49%) had microcytic hypochromic anaemia. 33(33%) patients had normocytic normochromic anaemia. Dimorphic anaemia was 12(12%).

Table 1: Distribution of the type of anaemia according to morphology

Type of anaemia	Percentages
Normocytic Hypochromic Anaemia	2(2%)
Macrocytic anaemia	4(4%)
Dimorphic anaemia	12(12%)
Normocytic Normochromic Anaemia	33(33%)
Microcytic Hypochromic Anaemia	49(49%)

In this present study, 87 patients out of 100 cases were found to have significant correlation between red cell indices and peripheral blood smear. Out of 49 microcytic hypochromic anaemia, 42(85.71%) cases had reduced red cell indices. Out of 33 normocytic normochromic children, 27(81.81%) cases showed normal red cell indices. Out of 4 macrocytic anaemia, 3(75%) children had significant correlation between red cell indices and macrocytic blood smear.

Table 2: Comparison of Red cell indices and peripheral blood smear (N=87)

Types of Anemia	Red cell indices	Percentage
Microcytic Hypochromic (N=49)	MCV<80	42(85.71%)
	MCH<27	
	MCHC<32	
Normocytic Normochromic (N=33)	MCV 80-100	27(81.81%)
	MCH 27-32	
	MCHC 32-36	
Macrocytic	MCV>100	3(3.45%)
	MCH-↑/↓/N	
	MCHC-N/↓	

Table 3: Distribution of anaemia on the basis of iron profile (N=100).

Type of Anaemia	S. Iron	TIBC	S. Ferritin	Percentatge
IDA	↓	↑	↓	43(43%)

According to IDA, anaemia was diagnosed when serum iron was decreased, TIBC increased and serum ferritin decreased. And thus, 43% children had iron deficiency anaemia.

Discussions

Anaemia is considered as a worldwide problem, affecting all age groups. The prevalence of anemia among children under 5 years of age is estimated to be about 20% in industrialized countries and 39% in non-industrialized countries [7]. The WHO has estimated that, globally 1.62 billion people are anaemic with the highest prevalence of anemia (47.4%) among preschool aged children, of these 293 million children, 89 million live in India while prevalence of anaemia among school children is 25.4% [8]. Iron deficiency anemia affects 30% of the world population [9,10]. Anaemia is a leading cause of morbidity and mortality worldwide [10].

In this present study, a total of 100 children were enrolled. Among them out of which 56% were males and 44% were females. These findings were in accordance with study done by Taskesen *et al* , Jain *et al* and Gupta S *et al* [11-13] .

In this present study, majorities of children 46 % were in age of 1 to 5 years. We were seen that children with age 1 to 5 years were more likely to be anaemic compared to the older children. This concurred with prior findings showing that at the younger age, there is high demand for nutrients to support the rapid body growth of children , which further increases their need for iron. Complementary foods are started when the children reach 6 months, if nutritionally poor complementary foods were introduced children were more likely to be anaemic [14,15]. Children above 2 years are able to eat more variety of foods, which put them at less risk of being anaemic [16].

Sastry C.P.V in his study found that peripheral smear examination showed Microcytic hypochromic anaemia in 81.8% (90/110) [23]. Venkatesh G observed Microcytic hypochromic anaemia in 54.4%, macrocytic hypochromic anaemias seen in 11.8% and dimorphic anaemia is seen in 36.6% of patients [17]. In our present study, we found 49% microcytic hypochromic anaemia, 33% normocytic normochromic anaemia, 12% dimorphic anaemia, 4% macrocytic anaemia and 2% normocytic hypochromic anaemia.

Asia comprises of 70% of world's malnourished children. Fifty percent of the preschool children are malnourished out of that 64% in Bangladesh and 16% in China. Due to protein energy malnutrition as well as micronutrient deficiency IDA affects 40-50% of preschool children [18].

In Pakistan IDA constitutes 83% of all anaemia and is a major nutritional problem. Studies on nutritional status of boys and girls have been conducted in 11 different countries and Anaemia prevalence was found to be 55% in India and 42% in Nepal. It is a problem mainly for infants, adolescent girls and women of child bearing ages in developing countries. In a study conducted in 2 districts in India, 72% of children aged (12-23 months) had low ferritin level. Highest prevalence of anemia was seen in children less than 10 years of age, seen specially in below 5 years of age [19].

In the present study, iron deficiency was the most common type of anaemia found in 43% of the subjects. Ferritin is the intracellular

storage form of iron found chiefly in the cytoplasm of the cells of the reticuloendothelial system. It can be quantitated in serum using immunoenzymatic assays. Serum ferritin concentrations have been documented to give an accurate indication of the amount of storage iron in healthy individuals and in patients with iron deficiency or iron overload [20].

It is the most specific biochemical test for iron deficiency anaemia (IDA) because it correlates with total body iron stores. Low serum ferritin concentration reflects depleted iron stores. When compared with other iron status parameter, serum ferritin is one of the lowest biologically varying iron status markers, thus making it one of the most useful parameters. Ali *et al* [20] also concluded that a low serum ferritin value probably indicates iron depletion, while an elevated value does not exclude that possibility.

In Iron deficiency anaemia PCV, MCV, MCHC, MCH are decreased and RDW is increased. Under iron deficiency condition, formation of Hb is reduced resulting in a reduction of MCH [16]. The transmembrane protein (ferroportin) is responsible for the transfer of iron from enterocytes and monocytes/macrophages to the circulation. It was found that ferroportin mRNA expression was significantly reduced in monocytes of anaemic subjects compared with controls [21].

Thus, anaemia poses a greatest challenge to country's development since it retards physical, mental growth and development especially in young children [22]. The most common cause for anaemia is malnutrition and iron deficiency make up the bulk of it. Nutritional anaemia can usually be prevented at a low cost [22].

Conclusions

This present study concluded that the iron deficiency anaemia is the most common in young children. Males were preponderance than females. Microcytic hypochromic and normocytic normochromic anaemia are the most common in paediatric age group.

Hence, for the prevention from the anaemia, paediatric health check-up camp should be organise in rural as well as urban area for the awareness and counselling of the parents/guardians for child feeding practices, immunization and sickness recognition from the first year of life and also for the proper screening/assessment of anaemic children.

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