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A RETROSPECTIVE STUDY OF MORPHOLOGICAL AND PHYSIOLOGICAL PATTERN OF SEVERE ANAEMIA IN CHILDREN OF AGE GROUP 6 MONTHS TO 12 YEARS IN TERTIARY CARE RURAL HOSPITAL OF MAHARASHTRA.

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ABSTRACT

Background: Anemia is a very common hematological disorder in pediatric age group. In India and other developing countries, incidence of nutritional anemia is as high as 60- 80% of the childhood population. Anemia occurring during infancy affects the physical and neurological development of the child. It exposes the infant to the risk of infection which aggravates anemia so that there is a vicious cycle of anemia, infection, anemia. This can be prevented if anemia is detected early and treated properly. This study, was conducted to evaluate the factors causing anemia in children aged between 6 months to 12 years of age.
Material and methods: The retrospective study was conducted in Dr. Vitthalrao Vikhe Patil Pravara Rural Hospital, Loni over period of two years from September 2015 to September 2017. Patients between the age group of 6 months to 12 year admitted with anemia and hemoglobin <7g/dl were included in the study. Previously diagnosed hemolytic anemia was excluded from the study. The hemogram, PBS and Retic counts were compared and studied.
Results: Out of the 300 children enrolled in the study, 238 had Nutritional Anemia, and remaining had Hemolytic and anemia due to other causes. Both, the cases with Nutritional Anemia and Hemolytic Anemia have Microcytic Hypochromic picture, but are differentiated on the basis of Reticulocyte counts, as high retic counts are characteristic of Hemolytic Anemia.
Conclusion: Nutritional Anemia are more common and aggressive action at Anganwadi and schools for supplementation of Iron and Folic Acid along with Vitamin B12 can prevent it. Also severe complications, and hospital admissions can be reduced if proper Nutritional advise is given.

ORIGINAL RESEARCH ARTICLE

INTRODUCTION

Anemia is a very common hematological disorder in pediatric age group. Child is said to be anemic when the hemoglobin and or hematocrit is two standard deviations below the mean for that particular age and sex.

Low economic status, less education, and poor health and nutrition of mothers due to meagre dietary intake are the main causes of anemia. Other less common causes of microcytic anemia in children are thalassemia, and anemia of chronic disease, cause of the latter can be either acute leukemia, aplastic anemia (to be ruled out by bone marrow biopsy), hemolytic anemia and hemoglobinopathies

Iron deficiency is the most common cause of nutritional anemia worldwide followed by folic acid and Vitamin B12 deficiency anemia, globally 1.62 billion people are anemic, while among the preschool children the prevalence of anemia is 47.4%. In India the prevalence rates are as high as 70% and the efforts to tackle with the problem remain futile. Despite the existence of a national anemia-control program the prevalence of anemia in India between 2000 and 2005 increased from 75.3% to 80.9% in children aged 6 to 36 month. Nearly half the children aged 6-59 months in Uttar Pradesh have moderate to severe anemia. Iron deficiency reduces the learning capacity of the children aged below five years, decreases attentiveness, and causes low intelligence and thus, ultimately negatively impacts on the development of the country. In this context, the present study is an effort to determine the patterns and various hematological as well as morphological types of anemia in children

The WHO guidelines of hemoglobin and hematocrit levels below which anemia are present in a population is given as: -

Table No 1. WHO guidelines of hemoglobin and hematocrit for Anemia

S. No	Age Group	Hb%	HCT (%)
1.	Children 6 month to 59 month	11 gm%	68.3%
2.	Children 5 years to 11 years.	11.5gm%	71.3%
3.	Children 12 years to 14 years.	12gm %	74.5%

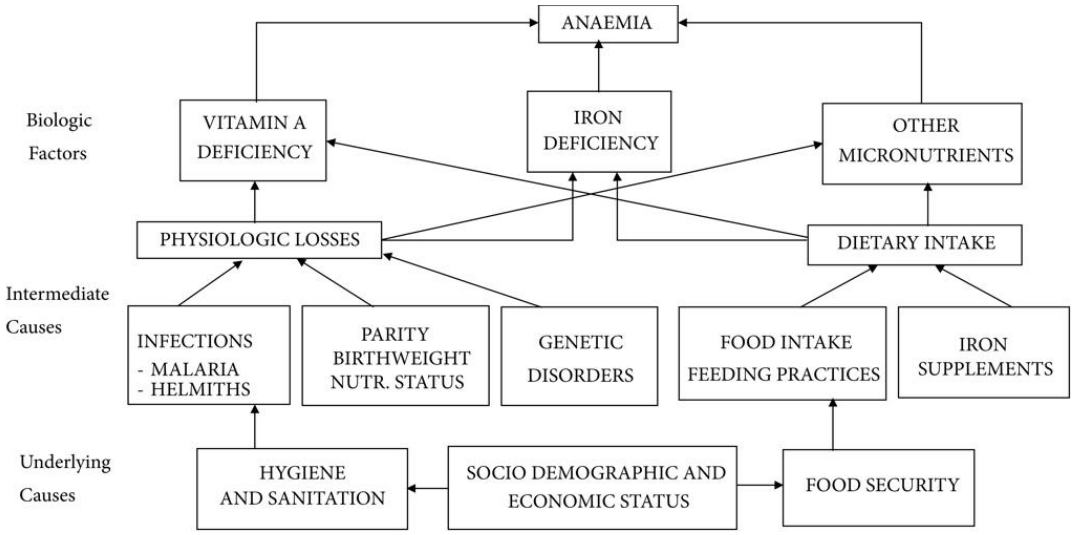
Hemoglobin level bellow 7gm/dl is considered severe anemia,7 to 9.9gm/dl moderate and 10 to 10.9gm/dl as mild anemia. Anemia in infancy can be physiological or pathological.

Iron deficiency is the most common cause of anemia in infancy, while inherited disorders of hemoglobin synthesis, the Hemoglobinopathies form, by far the largest group of genetically determined anemia. There is considerable sex difference in iron status during infancy. Boys are at 10-time higher risk of being classified as having iron deficiency anemia at 9 months. Common signs and symptoms of anemia are Progressive pallor, Edema, Tremors, Refusal of feed, failure to thrive, Irritability, Recurrent fever, Delayed development. Pigmentation, vomiting, diarrhea, cough, cold, breathlessness.

The clue to the diagnosis can be obtained by proper history and routine investigations like complete blood count, hemoglobin percentage, peripheral blood smear, blood indices, red cell distribution width, reticulocyte count, osmotic fragility, sickling test, Hb - electrophoresis, etc. and renal function tests, liver function tests. The peripheral blood smear may help to type the anemia on the basis of morphology. It may also have evidence of hemolysis, sepsis etc.

The liver function test may be altered with increased bilirubin, in hemolytic anemia. Similarly, renal function test and liver function test may be deranged in chronic diseases

Anemia has adverse effect on children especially in first two years of life such as behavioral delay, reduced cognitive development, low immunity and growth, weight, fatigue, difficulty with concentration, lethargy, increased mortality and susceptibility to infection. Anemia exposes the infant to risk of infection with aggravates anemia so that there is a vicious cycle of anemia and infection. All this can be prevented if anemia is detected early and treated properly. Hence this study is done in rural settings to study clinic investigational profile of severe anemia in age group of 6months to 12 years ,who are admitted in our hospital.



METHOD

The present retrospective study was conducted in Department of Paediatrics, Dr. Vitthalrao Vikhe Patil Pravara Rural Hospital Loni, Maharashtra, India for a period of 2 years (September 2015 to September 2017).

All patients in the age group 6 months to 12 years with hemoglobin <7 gm /dl were included in the study. Previously diagnosed hemolytic anemia cases were excluded from the study.

Data collection for this study included a retrospective review of hospital medical records of all children aged 6months to 12 years who were admitted to pediatric ward. Laboratory investigations reports such as complete hemogram, peripheral blood smear, reticulocyte count were done.

Various data like sex, and clinical profile were noted.

The hemogram, peripheral blood smear, and reticulocyte counts were analyzed. The cases were categorized physiologically as, nutritional and hemolytic anemias. Pathologically on PBS they were categorized as Normocytic Normochromic, Microcytic Hypochromic, Macrocytic Normochromic and Dimorphic Anemias.

Reticulocyte counts were categorized as normal and raised.

The prevalence of these different categories were compared and studied. Statistical tests for significance were applied.

RESULTS

A total of 7562 children were admitted to pediatric ward during the study period. As per the diagnostic criteria defined for severe anemia according to hemoglobin level and after fulfilling the inclusion and exclusion criteria, a total of 300 children were enrolled

in the study. These children were assessed for Hemogram and Peripheral Blood Smear.

The Distribution of anemia was studied as per their Physiological and Morphological types. The Hemogram and peripheral blood smear was also reviewed and following results were obtained.

Table no 2 distribution as per physiological types and gender

Sex	**Physiological Type**		
	Nutritional	**Hemolytic**	**Others**
Male	99 ((76.2%))	18(13.8%)	13(10%)
Female	139 (81.8%)	25 (14.7%)	6 (3.5%)
Total	238 (79.3%)	43 (14.3%)	19 (6.3%)

Out of total 300 children, 238 (79.3%) were Nutritional Anemias

Out of 130 male anemic cases maximum i.e. 76.2% cases were of Nutritional Anemia and 18 children, i.e. 13.8% were Hemolytic Anemia. Only 10 % male anemic cases were due to other causes.

Out of 170 female anemic cases, maximum i.e. 139 females (81.8%) were of Nutritional Anemia while 25 cases (14.7%) were Hemolytic Anemias, and 6 females (3.5%) were due to other causes. Out of 300 anemic cases in study, 49.7% had microcytic hypochromic anemia, 19.6% had normocytic normochromic type of anemia, 16.7% comprised of macrocytic normochromic while blood picture of Dimorphic anemia is in 14% cases.

Table no 3. Morphological cause of anemia as per PBS

Microcytic Hypochromic	**Normocytic Normochromic**	**Macrocytic Normochromic**	**Dimorphic**
149 (49.7%)	59 (19.7%)	50 (16.7%)	42 (14%)

Table No 4. Relation between physiological cause of anemia and reticulocyte count

Physiological Type of Anemia	**Reticulocyte counts**		
	Normal	**Increased(100%)**	**Decreased**
Nutritional	73 (83.9%)	13 (30.2%)	152 (89.4%)
Hemolytic	10 (23.3%)	30 (69.8%)	3 (1.7 %)
Other	4(21.1%)	-	15 (78.9%)
Total (300)	87	43	170

All 300 children were evaluated for Reticulocyte Counts and a majority, 56.7% children had a decreased Reticulocyte count, 29% children had Normal Reticulocyte Counts and 14.3% children had increased reticulocytes.

Out of 43 Children who had Increased Reticulocyte counts, a vast majority i.e., 30 (69.8%) children had hemolytic anemia. Whereas, 13 (30.2%) children had Nutritional Anemia.

In 170 children with decreased Reticulocyte Counts, a majority 152 (89.4%) children had Nutritional Anemia. 3(1.7%) children had Hemolytic Anemia and 15 (8.8%) children had Anemia due to other causes.

Remaining 87 (29%) children had Normal reticulocyte counts. Of which majority

73 (83.9%) children had Nutritional Anemia, 10 (11.4%) children had hemolytic Anemia, whereas 4(4.6%) of them had Anemia due to other causes.

DISCUSSION

Anemia is a very common disorder in all age groups and that too in periods of rapid growth like infancy and adolescent. Most patients of mild degree anemia are without any symptoms or sign and they are brought to the pediatrician when some other acute infection, which in a normal infant has very low mortality, is complicated or increased in severity due to underlying anemia. Anemia has also got significant influence on the normal brain growth during infancy. Though anemia can be treated but it is believed that the neurodevelopmental sub-normality due to anemia (iron-deficiency) is irreversible. Thus to have a gross overview of this situation in rural area, this study was undertaken in a Rural hospital.

The subjects for this study were infants of age group (6 months - 12 years) admitted to pediatric ward in whom anemia was detected on clinical examination. 300 such cases were selected.

Table No 5. Comparison of Prevalence of Severe Anemia among Various Studies

Study	**Total no. of admission**	**Severe anemia cases**	**Prevalence (%)**
Venkatesh G et al[118]	7412	202	2.2%
Rangrao maroti bhise et al[125]	310	19	6.1%
Present study	7562	300	3.9%

Present study shows prevalence of severe anemia is 3.9%, which correlate with Venkatesh G et al[118] and contrast with Rangrao maroti bhise et al this may be due to their small sample size.

Table No. 6 Comparison of Morphological Type of Anemia Among Various Studies

Morphologic Type	Microcytic Hypochromic	Normocytic normochromic	Macrocytic Normochromic	Dimorphic
Kapur D. et al	33.9%	27.5%	1.6%	37.1%
Aneela zareen et al	90.5%	6.5%	1%	2%
Venkatesh G et al	54.4%	-	33.6%	11.8%
Saba et al	49%	22%	4%	24%
PRESENT STUDY	49.7%	19.6%	16.7%	14%

In this study the anemias were morphologically classified on the basis of peripheral blood smear into 4 subclasses. The commonest type of anemia was microcytic hypochromic (149 cases out of 300 i.e. 49.7%). This includes both nutritional (Iron deficiency anemia) and hemolytic anemia. Normocytic normochromic was the second common type comprising 59 (19.6%) of total cases closely, followed by Macrocytic normochromic type 50 (16.7%). The dimorphic picture was seen in 42 (14%) of cases.

Observation in our study correlates with the study of Aneela zareen et al and Venkatesh G et al with commonest type being microcytic hypochromic anemia.

Observation in our study differs from those of Kapur D. et al in which dimorphic type was the commonest 37.1% followed

closely by microcytic hypochromic type 33.9%. This may be due to they had taken only nutritional anemia in study group.

Saba et al**,** in their study found microcytic hypochromic picture in 49%, dimorphic in 24%, normocytic normochromic in 22% and macrocytic in 4% cases.

In our study 14.3% cases had an increased Reticulocyte Count.

Abhay et al. reported increased Reticulocyte count in 22.7% cases.

The less proportion may be due a greater number of Nutritional Anemia cases found in our study.

CONCLUSION

Anemia is one of the most common issue in Paediatric population. Microcytic Hypochromic Anemia is the most common Morphological Type of Anemia. And physiologically, Nutritional Anemia is most common cause of Anemia of which most common cause is, Iron Deficiency Anemia.

Preschool and school going children for supplementation of iron especially in rural areas.

Megaloblastic Anemia is the second most common cause of Nutritional Anemia in children.

Supplementation of Folic Acid and Vitamin B12 can help to tackle it.

Hemolytic anemias are also prevalent in children; however, their prevalence is less as compared to Nutritional Anemias. Reticulocytosis is an important differentiating factor between Nutritional and Hemolytic Anemia.

Conflict of interest: We have no conflict of interest

Ethical approval: The study was approved by the Institutional Ethics Committee.

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