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Clinical Profile of Anemia in Children

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Abstract: *Anemia is considered as a worldwide problem, affecting all age groups. Anemia in children is one of the social health problems because the children have reduced exercise capacity, slower growth and impaired cognitive development. The present study was conducted to quantify the magnitude of anemia and its association with malnutrition.*
Keywords: *Anemia, magnitude of anemia, malnutrition.*

I. Introduction

About half of the population in the developing countries has iron deficiency anemia. Preschool, school and adolescent children and women in childbearing age are at increased risk. Iron deficiency anemia affects 30% of the world population [1, 2]. The prevalence of anemia among children under 5years of age is estimated to be about 20% in industrialized countries and 39% in non-industrialized countries [3]. Iron deficiency anemia is a leading cause of morbidity and mortality worldwide [1]. In India, the national program for prevention and control of anemia focuses on pregnant women and young children less than 5years. However, the status of anemia in children is not well documented [1].

II. Materials And Methods

This study was conducted during the period November 2007 - May 2009 in BJMC Ahmedabad, Gujarat, India. Patients having severe nutritional anemia with hemoglobin <7gm% were evaluated.
Exclusion criteria: Patients having mild to moderate anemia, severe anemia due to hemolysis, malaria, aplastic anemia and patients collapsed due to congestive cardiac failure within 12 hours of admission were excluded.
Detailed history regarding symptoms and signs, diet and socioeconomic status of family and detailed anthropometry were recorded. Investigations for anemia and its causes i.e., peripheral smear, serum vitamin B12, serum folic acid, stool for worm infestation were done in all patients. The typing of anemia was done based on these reports. Hemoglobin was estimated by Sahli's method and expressed in gm%, peripheral smear was stained by Leishman's stain, and PCV, MCV, MCH, MCHC and RDW were determined by automated cell counter. Normal values were taken as follows: PCV 35-45%, MCV 77-95fl, MCH 25-33pg, MCHC 31-37gm/dl and RDW 14.5-18.5.Reticulocyte count was done by Brilliant crystal stain method, serum iron determination was done by Ramany's dipyridyl method, Total iron binding capacity was determined by Ramsay's method, serum vitamin B12 and folic acid was determined by Architect method. Results were analyzed by GraphpadInstat3 software program. *P* value less than 0.05 was taken as statistically significant.

III. Results

A total of 9124 patients were admitted to pediatric ward at our institute from November 2007 - May 2009, of which patients having anemia were 7412(81.2%), severe anemia were 202; prevalence of severe anemia being 2.2%.

3.1. Age wise distribution of patients with severe anemia – Fig. 1

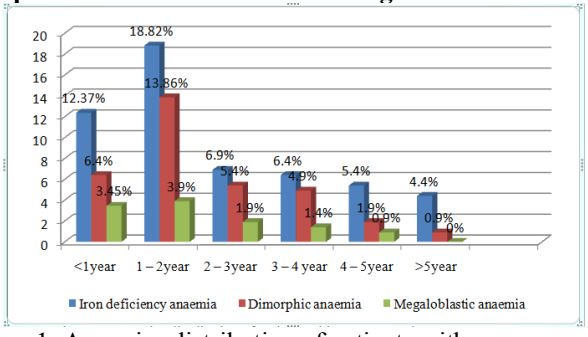

Figure 1: Age-wise distribution of patients with severe anemia

It is observed from above table that all three types of anemia were more in 1-2years of age group.

3.2 Sex wise distribution of anemia – Table -1

Table -1: Sex-wise distribution of anemia

	Iron deficiency anemia	Megaloblastic anemia	Dimorphic anemia	Total
Male	52(25.7%)	37(18.3%)	10(4.9%)	99(49%)
female	58(28.7%)	31(15.3%)	14(6.9%)	103(50.99%)

For iron deficiency anemia, incidence is more in females i.e., 28.7% against males 25.7% while for megaloblastic anemia incidence is more in males i.e., 18.3% against 15.3% in females and for dimorphic anemia incidence in females is more i.e. 6.9% against males 4.9% which is not statistically significant (P value >0.05).

3.3. Prevalence of different types of anemia. Fig. 2

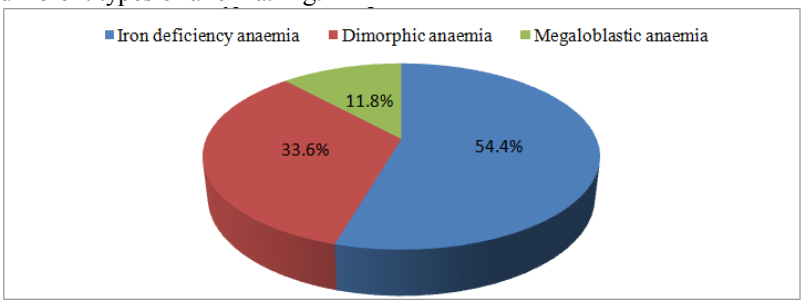

Figure -2: Prevalence of different types of anemia

In the current study iron deficiency anemia is most common followed by dimorphic anemia and megaloblastic anemia.

3.4 Relationship between exclusive breastfeeding and anemia. Fig. 3

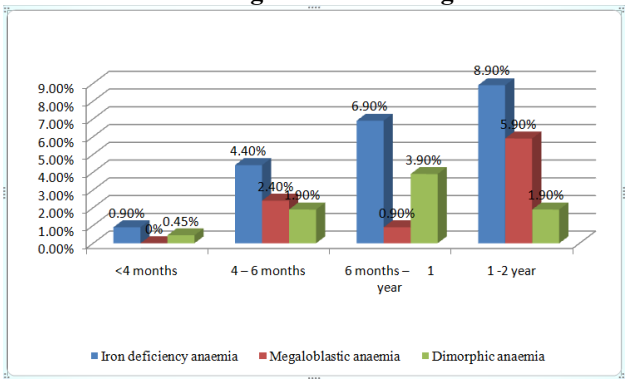

Figure – 3: Relationship between exclusive breastfeeding and anemia

In the present study, maximum numbers of patients are in 1 – 2 year age group. Exclusive breast feeding up to 4-6 months helps in controlling anemia of infancy through breast milk. Although breast milk has very low iron content it has high bioavailability which is seen in present study.

3.5 Symptoms

Fever is seen in 59.4% of patients followed by weakness in 53.9% of patients, cough in 35.6%, diarrhea in 16.3%, breathlessness in 11.88%, pica in 9.9%, worm infestation in 8.9%, vomiting in 7.9%, tremor in 6.4% and blood in stool in 1.4%.

3.6 General examinations

Pallor is seen in 100% of patients, vitamin deficiency in 54.4%, knuckle pigmentation in 29.7%, edema in 21.7% and koilonychia in 10.8%.

3.7 Relation of RBC indices in anemia. Table – 2

Table -2: Relation of RBC indices in anemia

Parameter	Iron deficiency anemia	Megaloblastic anemia	Dimorphic anemia
PCV↓	110(54.4%)	24(11.8%)	68(33.6%)
MCV↓	110(54.4%)	-	30(14.8%)
MCV↑	-	24(11.8%)	38(18.8%)
MCH Normal	-	-	40(19.8%)
MCH↓	110(54.4%)	24(11.8%)	28(13.8%)
MCHC Normal	16(7.9%)	16(7.9%)	32(15.8%)
MCHC↓	94(46.5%)	8(3.9%)	36(17.8%)
RDW↑	110(54.4%)	8(3.9%)	60(29.7%)
RDW↓	-	16(7.9%)	8(3.9%)

PCV, packed cell volume; MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; RDW, red cell distribution width.

In Iron deficiency anemia PCV, MCV, MCHC, MCH are decreased and RDW is increased. In megaloblastic anemia PCV and MCH are decreased, MCV and MCHC are increased. In dimorphic anemia PCV is decreased in all patients and variation is seen in all other indices.

3.8 Peripheral smear examination

Microcytic hypochromic anemia is seen in 54.4%, macrocytic hypochromic anemia is seen in 11.8% and dimorphic anemia is seen in 36.6% of patients.

3.9 Relationship between anemia and PEM. Fig. - 4

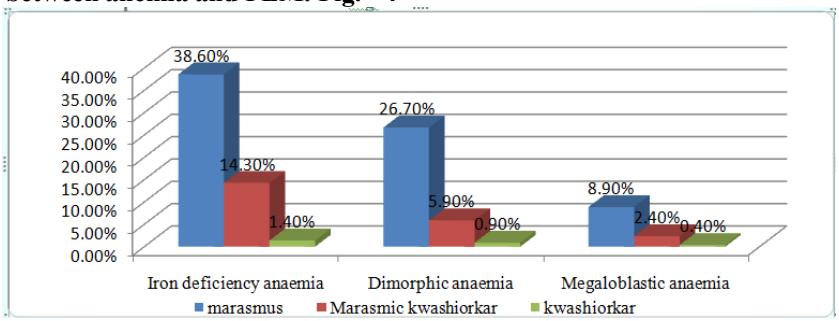

Figure – 4: Relationship between anemia and PEM

In iron deficiency anemia, patients in marasmus group are 38.6% against 14.3% in marasmic kwashiorkor. In dimorphic anemia, patients in marasmus group are 26.7% against 5.9% in marasmic kwashiorkor group. In megloblastic anemia 8.9% patients are in marasmus group as compared to 2.4% in marasmic kwashiorkor.

3.10 Relation of socio economic class in anemia patients

Most of the patients are in class V socioeconomic group i.e. 53.9%, class IV - 24.2%, class III –14.8%, class II - 1.9% and class I - 0%. This is according to Kuppuswamy socioeconomic scale and this is in contrast to study conducted by Fadila A Assiri et al (16, 17).

3.11 Stool for ova and cyst examination. Table – 3

Table – 3: Stool for ova and cyst examination

Stool examination	Iron deficiency anemia	Dimorphic anemia	Megaloblastic anemia
Positive	32(15.8%)	9(4.4%)	8(3.9%)
Negative	78(38.6%)	59(29.2%)	16(7.9%)

Stool examination for ova and cyst was positive in 15.8% of iron deficiency anemia, 4.4% of dimorphic anemia and 3.9% of megaloblastic anemia. Stool examination was negative in 38.6% of iron deficiency anemia, 29.2% of dimorphic anemia and 7.9% of megaloblastic anemia. In present study 79% of patients presented with infection and 11.8% of patients presented with congestive cardiac failure due to severe anemia.

3.12 Treatment given for anemia. Table - 4

Table – 4: Treatment given for anemia

Treatment	Iron deficiency anemia	Dimorphic anemia	Megaloblastic anemia
Transfusion	72(35.6%)	43(21.2%)	5(2.4%)
Oral iron	110(54.4%)	68(33.6%)	24(11.8%)
Folic acid	-	68(33.6%)	24(11.8%)
Methicobalamine	-	68(33.6%)	24(11.8%)

In present study 35.65% patients with iron deficiency anemia, 21.2% patients with dimorphic anemia and 2.4% patients with megaloblastic anemia were transfused packed cell volume. Remaining patients were managed by oral hematinics.

IV. Discussion

4.1 Prevalence

Prevalence of anemia in our study was 81.2%, which is in accordance to study conducted by Margaret F et al, whereas study conducted by Ahmed Mubarak et al [11] and Shally Awasthi et al [1], found prevalence of 37-38%, study by Bijan Keikhaei et al [3] found prevalence of 43.9% and the study conducted by Peter R Dallman et al [4] showed prevalence of 6%. Prevalence of severe anemia in current study was 2.2%, which is in accordance to the study conducted by Shally Awasthi et al [1], whereas a study conducted by Job C.J.Calis et al [5] found prevalence of 12-29%.

4.2 Age wise distribution of anemia

It is observed from our study that all three types of anemia were more in 1-2 years age group, which is in accordance to previous studies [1,2,3,4,5,7,9,10,13,14]. It may be due to poverty, maternal anemia, continued exclusive breast feeding beyond 6 months and improper complimentary diet. As the age advances there is decrease in the incidence of anemia probably due to introduction of proper feeding.

4.3 Sex wise distribution

There is no statistical significant difference between the two sexes in the current study, which is in accordance to previous studies [1,3,5,11,16], whereas study conducted by Neeraj Jain et al [8] found higher incidence of anemia in girls and Rebecca J Stoltzfus et al [12] found higher incidence of anemia in boys.

4.4 Prevalence of different type of anemia

Iron deficiency anemia is most common in our study followed by dimorphic anemia and megaloblastic anemia, which is in accordance to previous studies [1,2,3,4,8,10,12,13,14,15].

There are several causes of iron deficiency anemia. The principal cause in children in developing countries is inadequate intake of usable iron, which is normally found in a well-balanced diet in the form of heme and non-heme iron. Several well controlled trials have been effective in reducing the prevalence of anemia in school-age children. Fortification is an attractive option for controlling iron deficiency anemia in countries where a significant number of groups are vulnerable to an ever increasing consumption of centrally processed foods [10].

4.5 Relation between exclusive breast feeding and anemia

Exclusive breast feeding up to 4-6 months helps in controlling anemia of infancy through breast milk which is seen in present study. This is in accordance to study conducted by Bijan Keikhaei et al [3].

4.6 Symptoms and signs

In the current study fever is the most common symptom followed by weakness, cough etc. This is in accordance to previous studies [1, 2, 3, 5, 9, 10, 11]. Pallor, vitamin deficiency was found in our study, which is in accordance previous studies [2, 5].

4.7 Relation of RBC indices in anemia

In Iron deficiency anemia PCV, MCV, MCHC, MCH are decreased and RDW is increased. In megaloblastic anemia PCV and MCH are decreased, MCV and MCHC are increased. In dimorphic anemia PCV is decreased in all patients and variation is seen in all other indices. This is in accordance to previous studies [3, 4]. In the current study microcytic hypochromic anemia is most common followed by dimorphic anemia and macrocytic hypochromic anemia; this is in accordance to the study conducted by Neeraj Jain et al [8].

4.8 Relationship between anemia and PEM

For iron deficiency anemia, patients in marasmus group are 38.6% against 14.3% in marasmic kwashiorkor. For dimorphic anemia, 26.7% patients are in marasmus group against 5.9% in marasmic

kwashiorkor group. For megloblastic anemia, 8.9% patients are in marasmus as compared to 2.4% in marasmic kwashiorkor group. Studies to compare the results were not found in other articles. It is therefore concluded that association of protein energy malnutrition is widely prevalent in preschool children in India. There is an association between anemia and malnutrition with lower hemoglobin levels in the underweight and stunted children.

4.9 Relation of socio economic class in anemia patients

In the current study patients are in class V socioeconomic status, which is in accordance to previous studies [1, 2, 3, 8, 13]; but the study conducted by Ahmed Mubarak et al [11] found more cases in average socioeconomic status group.

4.10 Stool for ova and cyst examination

In the current study, stool examination for ova and cyst was positive in 15.8% of iron deficiency anemia, 4.4% of dimorphic anemia and 3.9% of megaloblastic anemia patients, which is in accordance to the previous studies [5, 8]. The study conducted by Imelda T Angeles et al [6] and Rebecca J Stoltzfus et al [12] found higher parasitic infection in children.

4.11 Treatment

In the current study 35.65% patients with iron deficiency anemia, 21.2% patients with dimorphic anemia and 2.4% patients with megaloblastic anemia were transfused packed cell volume. Remaining patients were managed by oral hematinics.

V. Conclusion

Anemia in association with malnutrition is widely prevalent in our country. So there is a need for urgent community participation strategies in the form of counseling the parents for child feeding practices, immunization and sickness recognition from the first year of life. Preventive measures for anemia control in children must be accompanied by measures to prevent underweight and stunting by focusing on integrated child feeding, health and environmental core measures.

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