Gross Anaemia in Children : A Report of 200 Cases

M. Imran,* M.B., B.S., F.A.A.P., D.C.H. (Lond.), D.C.H. (Dublin), Dip. Amer. Board of Paed.,
and
M.A. Siddiqui,** M.B.,B.S., D.C.P.,

Postgraduate Medical Institute, Lady Reading Hospital, Peshawar, Pakistan

Summary

200 patients with gross anaemias in children have been worked up in detail. A classification has been given on the basis of etiology. Five groups have been identified into nutritional (41%), hemolytic (27%), hemorrhagic (7%), aplastic (5.5%) and undiagnosed (4.5%). The nutritional group is further divided in pure iron deficiency (27%), megaloblastic (7%) and mixed (7%). The hemolytic group is again divided into thalassemia major (19%), chronic malaria (4%), G–6–PD deficiency (2%), thalassemia trait with sickle cell (1%), thalassemia trait with Hb C/E (0.5%) and ABO incompatibility (0.5%); other groups of anaemias are discussed in detail. A review of literature has been made. Details of diagnosis of anaemia in children have been given and certain conclusions have been drawn.

Introduction

Anaemia is a common problem in the children population of our country. The incidence is much higher in the lower socio-economic groups. We have observed that almost half of the children attending out-patient department in general hospitals are anaemic, mainly due to nutritional deficiency, blood loss, hemolysis due to infections or other causes. Similarly the incidence of severe anaemia leading to cardiac decompensation requiring blood transfusion is also not uncommon. This paper is presented with a view to study children admitted with gross anaemia, to find out the exact cause of anaemia and to classify them accordingly.

* Professor and Head, Department of Paediatrics, Postgraduate Medical Institute and Consultant Paediatrician, Lady Reading Hospital.

** Clinical Pathologist, Postgraduate Medical Institute, Lady Reading Hospital.

Material and Methods

This is the final report of 200 cases of gross anaemia in children. This study was carried out in children ward of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar during a two years period. All these patients had moderate to severe anaemia with a hemoglobin of less than 8 gm and most of them had to be transfused with whole blood. All these patients were examined thoroughly and a detailed history taken by the investigators. Most of the investigations were carried out in the main laboratory, PGMI/LRH, Peshawar; however some investigations were performed in the Research Centre, Peshawar and Armed Forces Institute of Pathology, Rawalpindi. All the patients were worked up in detail with complete blood counts of Hb, TLC, DLC, RBC counts, absolute values, reticulocyte counts, platelet count and red blood cell and white blood cell morphology. Thick and thin smears were thoroughly checked for malarial parasites in all cases. Bone marrow was aspirated in all cases and examined.

Blood and bone marrow smears were stained with Giemsa. Iron stain on bone marrow was performed in all cases to see the content of iron in the marrow. Hemoglobin estimation was done by cynmethaemoglobin method. Where necessary, other investigations were carried out like repeated stool examination, X-rays of chest, urine examination and Hb. electrophoresis. The results of Hb. electrophoresis were double checked from Research Centre, Karachi or A.F.I.P., Rawalpindi. Serum iron, TIBC, folic acid and B_{12} estimations could not be done due to lack of facilities. The diagnosis of iron deficiency anaemia was made on the basis of RBC morphology in the peripheral blood smear; decreased bone marrow iron content by iron staining method and absolute values. The diagnosis of megaloblastic anaemia was mainly based on RBC morphology and megaloblastic changes in the bone marrow. The differentiation between folate and B_{12} deficiency could not be made because of lack of facilities for measurement of these substances. For the diagnosis of thalassemias, acid elution test was used to differentiate between adult and fetal hemoglobin, which was confirmed by Hb. electrophoresis. Repeated stool examinations were carried out when intestinal parasites were suspected or when high eosinophil count in blood smear suggested worm infestation. Coombs' test and sickle cell preparations were done in all hemolytic anaemias.

Results

Results of extensive investigations in 200 cases of gross anaemia are given in Table I.

TABLE I

CLASSIFICATION ACCORDING TO ETIOLOGY OF ANAEMIA IN CHILDREN

Classification	Total No. of cases	Percentage (out of 200)
Nutritional anaemia	82	41%
Hemolytic anaemia	54	27%
Hemorrhagic anaemia	14	7%
Aplastic anaemia	11	5.5%
Miscellaneous anaemia	30	15%
Undiagnosed	9	4.5%
TOTAL	200	100%

The classification is among five major groups of anaemias: nutritional 41%, hemolytic 27%, hemorrhagic 7%, aplastic 5.5%, miscellaneous group 15% and undiagnosed cases 4.5%.

Nutritional Anaemias

The analysis of nutritional group of anaemias is given in Table II. These anaemias were either due to dietary deficiency, worms, malabsorption or multiple causes.

TABLE II

NUTRITIONAL ANAEMIAS IN CHILDREN (41%)

Group	Total No. of cases	Percentage (out of 200)
Fe Deficiency group	54	27%
Megaloblastic group	14	7%
Mixed group	14	7%
TOTAL	82	41%

The commonest group was Fe deficiency anaemia (27%) which is further sub-divided into pure iron deficiency anaemia group (Table III) consisting of hookworm infestation (14.5%), roundworm infestation (3%), milk anaemia due to deficiency of iron in milk (4.5%),anaemia secondary to gross anaemia in mother (2%) and multiple causes were seen in 3% cases.

TABLE III

NUTRITIONAL ANAEMIAS (CONTINUED)
PURE Fe DEFICIENCY ANAEMIA (27%)

Causes	Total No. of cases	Percentage (out of 200)
Hookworm infestation	29	14.5%
Roundworm infestation	6	3%
Milk anaemia (dietary)	9	4.5%
Maternal causes	4	2%
Multiple causes	6	3%
TOTAL	54	72%

The next group 7% was pure megaloblastic anaemia (Table IV) which was due to deficient diet (3%), tapeworm infestation (0.5%), goat's milk anaemia (2%), giardiasis with malabsorption (1%) and multiple causes were seen in 0.5%.

TABLE IV

NUTRITIONAL ANAEMIAS (CONTINUED)
MEGALOBLASTIC ANAEMIA

Causes	Total No. of cases	Percentage (out of 200)
Dietary causes	6	3%
Tapeworm infestation	1	0.5%
Goat's milk anaemia	4	2%
Giardiasis	2	1%
Multiple causes	1	0.5%
TOTAL	14	7%

Mixed Fe deficiency and megaloblastic anaemia (7%) is given in Table V. This group consisted of dietary causes (5%), multiple causes (1.5%) and goat's milk anaemia (0.5%).

Hemolytic Anaemias

The next major group was hemolytic anaemia consisting of 27%. This group is subdivided in Table VI.

TABLE V

NUTRITIONAL ANAEMIAS (CONTINUED)
MIXED NUTRITIONAL GROUP

Causes	Total No. of cases	Percentage (out of 200)
Dietary cause	10	5%
Multiple causes	3	1.5%
Goat's milk	1	0.5%
TOTAL	14	7%

Thalassemia major was the most common hemolytic anaemia. (19%) in this group. All these cases were diagnosed on the basis of clinical features and family history with positive acid elusion test, confirmed by Hb. electrophoresis.

TABLE VI

HEMOLYTIC ANAEMIAS IN CHILDREN (27%)

Causes	Total No. of cases	Percentage (out of 200)
Thalassemia major	38	19%
Chronic malaria	8	4%
G–6–PD deficiency	4	2%
Sickle cell thal. trait	2	1%
Thalassemia HbC/HbE	1	0.5%
ABO incompatibility	1	0.5%
TOTAL	54	27%

Four per cent were due to chronic malaria diognosed on the basis of clinical picture, splenomegaly and positive malaria parasite in blood smears.

G–6–PD deficiency anaemia was seen in 2% cases. Diagnosis was based on typical picture of acute hemolytic crises and positive G–6–PD dye decolorization test.

A combination of sickle cell and thalassemia trait was seen in 1% of cases while thalassemia with Hb C/E was seen in 0.5%. The differentiation of Hb. C and Hb. E was not possible in our laboratory.

Late anaemia due to ABO incompatibility was seen in 0.5%. This patient got his blood exchanged twice for ABO incompatibility and he presented again at age 2 months with severe anaemia.

Hemorrhagic Anaemias

The next group (7%) was of hemorrhagic anaemias (Table VII). It consisted of Von-willibrand disease (2%), hepatitis with bleeding (1%) and hemorrhagic disease of the newborn (2%). Diagnosis of idiopathic thrombocytopenic purpura was made in 1% and similarly hemophilia A was seen in 1%.

TABLE VII

HEMORRHAGIC ANAEMIAS (7%)

Causes	Total No. of cases	Percentage (out of 200)
Von-Willibrand diseases	4	2%
Hepatitis with bleeding	2	1%
Hemorrhagic diseases of newborn	4	2%
I. T. P.	2	1%
Hemophilia	2	1%
TOTAL	14	7%

Aplastic Anaemias

The details of group of apalstic anaemia (5.5%) is given in Table VIII. Diagnosis of aplastic anaemia was made on clinical picture, pancytopenia in blood smear and bone marrow examination. Aplasia was mainly due to drugs like chloromycetin (2%), septran (0.5%) and tetracycline (0.5%). One patient had aplastic anaemia due to acute severe diptheratic infection (0.5%) and died. Etiology in 4 patients (2%) of aplastic anaemia could not be traced to any drug or infection etc.

Miscellaneous Group

The miscellaneous group (15%) is given in Table IX. This group of anaemias was due to leukemia (7.5%), chronic urinary tract or tubercular infection (3.5%), hodgkin's disease (1%), kwashiorkor (1%), neuroblastoma (1%) and wilm's tumor (0.5%). One investigated case was due to sideroblastic anaemia (0.5%) diagnosed on the basis of bone marrow stain for sideroblasts.

TABLE VIII

APLASTIC ANAEMIAS (5.5%)

Causes	Total No. of cases	Percentage (out of 200)
Chloromycetin	4	2%
Septran	1	0.5%
Diphtheria	1	0.5%
Tetracycline	1	0.5%
Unknown cause (allopathic drugs)	4	2%
TOTAL	11	5.5%

TABLE IX

MISCELLANEOUS ANAEMIAS (15%)

Causes	Total No. of cases	Percentage (out of 200)
Leukemia	15	7.5%
Infection	7	3.5%
Hodgkin's disease	2	1%
Kwashiokor	2	1%
Neuroblastoma	2	1%
Wilm's tumor	1	0.5%
Sideroblastic anaemia	1	0.5%
TOTAL	30	15%

Comparing the various age groups, in which these patients presented with anaemias (Table X), it is evident that most of the cases presented after the age of 6 months in the group of nutritional anaemia which coincides with the utilization of iron stores in the body, transplacentally acquired from the mother. In the hemolytic group of anaemia, the usual age was over 2 years.

The most common complaint was pallor, cough and fever in all types of anaemia (Table XI). The bleeding manifestations (Table XII) were epistaxis, melena, hematuria, purpura and hematemesis. Behaviour changes were seen quite frequently in all types of anaemia (Table XIII): these were irritability, anorexia,

TABLE X

ANAEMIA IN CHILDREN
AGE GROUP

Age-group	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
6 months	8	5	4	—	1	—
6–12 months	7	7	2	—	2	1
12–18 months	11	9	—	—	1	—
18–24 months	3	5	—	—	—	—
24–above	53	28	8	11	11	8
TOTAL	82	54	14	11	15	9

TABLE XI

CHIEF COMPLAINTS

Chief Complaint	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
Fever	15	8	2	—	1	—
Fever + cough + pallor	44	29	2	6	14	4
Vomiting + diarrhoea	7	—	—	3	—	3
Others	13	5	—	2	—	—

TABLE XII

BLEEDING MANIFESTATIONS

G. I. T. Disturbances	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
Epistaxis	8	7	6	5	2	2
Melena	16	6	5	4	4	—
Hematuria	3	3	2	—	—	1
Purpura	4	—	6	6	2	—
Hematemesis	2	—	5	2	1	—

inactivity, fatigueability and history of pica. A comparison of the monthly income of parents(Table XIV) showed a remarkable increase in the incidence of nutritional anaemia in children when the income was low. However this difference in income did not vary in other groups of anaemias. Similarly personal hygiene (Table XV) was poor in most cases of nutritional anaemia while with better personal hygiene, the incidence of nutritional anaemia decreased sharply. Table XVI shows various features on physical examination on admission as regards the state of nutrition, lymphadenopathy and duration of the illness. A small number were in acute distress due to congestive heart failure. The findings of hemoglobin, P.C.V., M.C.V. and M.C.H.C. are given in Tables XVII to XX.

TABLE XIII

BEHAVIOUR CHANGES

Behaviour Changes	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
Irritability	38	23	4	5	9	4
Anorexia	37	17	3	8	8	2
Inactivity	45	27	3	4	12	3
Fatigability	41	25	—	—	10	4
Pica	22	10	2	3	3	2

TABLE XIV

MONTHLY INCOME

Monthly Income	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
Below Rs. 500	10	5	2	—	1	—
Rs. 500–1000	31	16	4	3	8	3
Rs. 1000–1500	27	7	4	3	4	2
Rs. 1500–2000	3	1	2	—	—	—
Over Rs. 2000	11	17	2	5	2	2

Comments

We reported 99 cases of gross anaemias, previously.[1] The present paper deals with the final report of 200 cases of anaemias in children. Not much work has been done to classify anaemias in the NWFP. However there are some reports from other parts of Pakistan. A report on haematological disorder in

children was published from Karachi in 1970 by Rahim Toola and Hashmi.[2] We have some interesting comments to make, after the completion of our study of 200 cases, on anaemias.

TABLE XV

PERSONAL HYGIENE

Personal Hygiene	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
Poor	33	13	2	5	7	6
Fair	5	1	1	—	2	—
Good	2	9	1	—	—	—

TABLE XVI

GENERAL PHYSICAL EXAMINATION

General Exam	Nutritional	Hemolytic	Haemorrhagic	Aplastic	Misc. Leukemia
Well nourished	30	21	12	2	5
Mal-nourished	52	25	1	8	9
Comfortable	66	49	11	5	12
Distressed	17	4	1	5	3
Chronically ill	52	36	1	6	2
Acutely ill	6	6	2	5	2
Anaemia	82	54	14	11	30
Glands	18	15	3	2	11

TABLE XVII

HAEMOGLOBIN

Hb	Nutritional	Hemolytic	Haemorrhagic	Aplastic	Misc. Leukemia
1–2 gms	7	1	—	3	—
2–4 gms	36	23	1	4	6
4–6 gms	36	21	7	2	7
6–8 gms	3	8	6	2	2

TABLE XVIII

PACKED CELL VOLUME
(P. C. V.)

P.C.V.	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
1–6	9	1	—	3	—	—
6–12	38	23	1	4	6	1
12–18	20	21	7	2	7	1
18–24	9	7	1	2	2	2
24	3	1	5	—	—	2

TABLE XIX

MEAN CORPUSCULAR VOLUME
(M. C. V.)

M.C.V.	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
76 cu	43	25	5	4	10	2
76–96 cu	24	18	5	4	5	3
96– cu	15	8	1	1	—	1

TABLE XX

MEAN CORPUSCULAR HAEMOGLOBIN CONCENTRATION
(M. C. H.C.)

M.C.H.C.	Nutritional	Hemolytic	Hemorrhagic	Aplastic	Misc. Leukemia	Misc. Infection
32%	24	9	1	1	2	1
32–37%	36	24	6	3	8	5
37%	22	18	4	5	5	—
TOTAL	82	51	11	9	15	6

Nutritional anaemia is the biggest group of anaemias in children. This group consists of pure iron deficiency, megaloblastic and mixed anaemias. Hook-

worm infestation is the most important cause of iron deficiency anaemias. Tapeworms, giardiasis and ingestion of goat's milk are contributory to megaloblastic and mixed types of anaemias. World Health Organisation has also defined nutritional anaemia as the end result of a severe nutrient deficiency, usually iron and less frequently folic acid and vitamin B_{12}.[7]

Thalassemia major is the commonest cause of anaemia in the hemolytic group. This is true for N.W.F.P. in particular and the whole of Pakistan in general.[2] Consanguenity plays a major role in this disease and it is associated with an increase in the mortality alongwith it being a burden on the socio-economic status of the people. Chronic malaria and G–6–PD deficiency anaemias are also important in this group, while other hemoglobino-pathies such as Hb–S, Hb–C/E also contribute to a lesser extent.

After thalassemia, G–6–PD deficiency anaemia is the second most important cause of hemolytic anaemias in Pakistan. This has been well documented by us and other workers.[3],[4] Sickle cell anaemia has been previously reported from this region of Pakistan. The first report of the presence of hemoglobino-pathies and G–6–PD deficiencies came in 1958,[5] and then in 1961 sickle cell anaemia in a Pathan seaman was reported from the village of Kooza Banda in the former state of Swat.[6]

Conclusion

Five groups of anaemias have emerged from this study. Slightly less than half of the anaemias are related to the nutritional group where iron deficiency makes the main bulk of the problem. Megaloblastic anaemias of folic acid and vitamin B_{12} deficiencies are also important. Hemoglobino-pathies lead to the most frequent type of hemolytic anaemia in this country. Thalassemia being the commonest, G–6–PD deficiency anaemia is the next common hemolytic anaemia. Hb–S, C/E in combination with thalassemia traits are seen occasionally. Aplastic anaemias due to infections and drugs like chloramphenicol are also not uncommon. The usual causes of hemorrhagic anaemias are hemophilias, liver diseases, hemorrhagic diseases of the newborn and idiopathic thrombocytopenic purpura. The miscellaneous group is mainly due to leukemias, lymphomas and renal or tubercular infections.

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