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Study on Clinical Features, Detection of Risk Factors and Causes of Anaemia in Children in a Tertiary Care Hospital of Bangladesh

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Abstract:

Background: *Anaemia is a common childhood health problem. Among the causes of anaemia besides the nutritional anaemia congenital hemoglobin disorder such as thalassemia and haemoglobinopathies has a great role which can be combated by increasing awareness in the population.*

Objective*: To detect clinical features, common causes, risk factors of childhood anaemia and to make awareness among the population to prevent the deadly effects of anaemia in children as well as in the society.*

Methodology: *A cross-sectional study was carried out at outpatient department of Delta Medical College and Hospital over a period of 3 years. Children aged between 6 months to eighteen years who visited outdoor for acute illness and were clinically pale and CBC supporting the condition were included. Children with malignancy and haemorrhagic diseases were excluded from the study. Total 200 cases were collected.*

Results*: Among 200 cases 62.5% were male. Most vulnerable age group was 6 months to 2 years (63%). Most common cause of anaemia was iron deficiency anaemia (64.5%). Congenital haemoglobin disorder was the second most common cause (28%). Among haemoglobinopathies Hb E trait contributes (82.35%). Most common presentation of anaemic children was frequent attack of RTI. Low protein diet was the most common risk factor for iron deficiency anaemia. Under five years, males were more affected but thereafter females were more affected than male children. Among 200 cases only 32(15%) cases were malnourished. Most of the cases were term baby. Among inherited cases only one care giver had knowledge about thalassemia. Most cases came from lower middle class family (65%). Most common morphologic variant of anaemia was microcytic hypochromic anaemia (99%). RBC count was normal in iron deficiency anaemia.*

Conclusion: *Besides iron deficiency anaemia, haemoglobinopathies and thalassemia have a great contribution in childhood anaemia. Family education, increased awareness, screening out of thalassemia and haemoglobinopathies carrier can combat this heath problem in children and can reduce social burden.*

Keywords*: Anaemia, Bangladesh, Health problem, thalassemia and haemoglobinopathies.*

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Introduction:

Anaemia is a common health problem during childhood throughout the world. It is an indicator of poor nutrition and health as well as for the social and economic development of a population.[1] Anaemia is defined as a reduction of hemoglobin concentration or red cell volume below the range of values occurring

in healthy persons.[2]Mild anemia was defined as hemoglobin level of 10-12.9 g/dL in males and 10-11.9 g/dL in females, moderate anemia was defined as hemoglobin of less than 7-9.9 g/dL and severe anemia as hemoglobin less than 7 g/dL.[3] In Bangladesh 64% of children aged 6-23 months, 42% of children aged 24-59 months and 30% of adolescent girl are anaemic.[4]Several factors contribute to the occurrence of anemia. About half of the anemia cases in childhood are due to iron deficiency.[5] Other causes of anemia include folate, vitamin B12 and A deficiencies, malaria, intestinal helminthes, viral infections, chronic diseases, haemoglobinopathies, hemolysis, and bone marrow disorders.[6]The incidence of iron deficiency anaemia is high in infancy but to a lesser extent it exists in school going children and preschool children.[7] An estimated 330,000 babies having clinically significant hemoglobin disorders are born every year,[8]whereas about 60,000–70,000 children are born each year with severe forms of thalassemia.[9]Iron deficiency anemia was defined when concentration of serum ferritin level was less than 12 microgram/L.[10]Two most common causes of microcytic hypochromic anaemia are iron deficiency anemia(IDA) and thalassemia trait which are sometimes difficult to differentiate clinically.[11,12]RBC indices are blood tests that provide information about the hemoglobin content and size of red blood cells.[13]Abnormal values indicate the presence of anemia and type of anemia. Mean corpuscular volume (MCV) is the average volume of a red blood cell and is calculated by dividing the hematocrit (Hct) by the red blood cells. Normal range is 75-95 fl. Mean corpuscular hemoglobin (MCH) is the average amount of hemoglobin (Hb) per red blood cell and is calculated by dividing the hemoglobin by the red blood cells. Normal range is 27-31 pg. Mean corpuscular hemoglobin concentration (MCHC) is the average concentration of hemoglobin per unit volume of red blood cells and is calculated by dividing the hemoglobin by the hematocrit. Normal range is 32-36 g/dL.[14,15]

This study was aimed to detect clinical features, risk factors and common causes of childhood anaemia and to make awareness in society so that the deadly effects of anaemia in children can be prevented and social burden can be reduced.

Materials and methods**:**

A cross-sectional study was carried out at out-patient department of Delta Medical College & Hospital over a period of 3 years from 1st January 2019 to 31st December 2022. Children aged between 6 months to eighteen years who visited outdoor due to any problem and who were clinically anaemic and complete blood count suggestive of anaemia were included in this study. Children with malignant condition and those who were suffering from haemorrhagic diseases were excluded from the study. After enrolment a detailed case history was taken and thorough physical examination was performed and recorded on the standard case recording form. Detailed history was taken including chief complaints, gestational age, and birth weight, any history of blood loss, feeding history, and socioeconomic condition. Socioeconomic condition is classified according to income as follows: low income-$1,025 or less; lower middle income-$1,026 to $4035; upper middle income-$4036 to $12,475; and high income-$12,476 or more per capita.[16] After clinical confirmation of anaemia complete blood count(CBC) was done for all cases. A blood sample (2 ml) was collected by vene puncture into an ethylene diamine tetra acetic acid (EDTA) coated tube. In addition, if peripheral blood film suggests microcytic hypochromic RBC, further investigations for serum ferritin (2ml blood, collected in a plain test tube for the measurement of serum ferritin by immune enzymometric examination) and hemoglobin electrophoresis were performed after improvement of acute illness. Stool for routine microscopic examination and occult blood test, Vitamin D_3 level, thyroid function test and infection screening tests were also done in selective cases where necessary. Ethical permission was taken from Ethical committee of Delta medical college. Informed written consent was obtained from primary caregivers of the children before enrolment. Results of laboratory tests were communicated to the parents. Advice for prevention of anaemia was given and correction was done according to cause. In case of thalassemia and haemoglobinopathies genetic counseling was done thoroughly.

Results:

Among 200 cases 125 (62.5 %) were male and 75 (37.5%) were female. Children between 6 months to 2 years of age were mostly affected age group. In teen age group female were affected more than male child. Most common presentation was frequent attack of fever and which was mostly due to respiratory tract infection (55%). Others were GIT problem (22.5%), CNS problem (17%), pica (9.5%), growth retardation (9%), musculoskeletal problem (7.5%) and pallor (3%).

Eighty one percent children were well nourished though they were anaemic. Maximum children were term baby (90%). Child with exclusive breast feeding up to six month were more in number (68%). Most of the children came from lower middle class family(65%). Moderately anaemic children were more in number (54%). Microcytic hypochromic anaemia was the most common morphologic variant of anaemia (99%). Most common cause of anaemia was Iron deficiency anaemia-IDA (64.45%). Second most common cause was congenital haemoglobin disorder (including haemoglobinopathies: Hb E- trait, Hb D trait, Hb E disease and thalassemia).Others were vitamin-D insufficiency, protein energy malnutrition, hypothyroidism, drug induced anaemia and infection. Hb E –β thalassemia was the most common variant of thalassemia. All cases of thalassemia patient had non consanguineous parents.

Table-I

Age and sex distribution of anaemia cases

Age	Sex	
	Male	Female
	125 (62.5%)	75 (37.5%)
6 month- 2 year	85 (68%)	43 (57.3%)
>2 year-5 year	36 (28.8%)	20 (26.6)
>5 year- 10 year	2(1.6%)	4 (5.3%)
>10 year	2 (1.6%)	8 (10.6%)

Table-II

Symptoms of anaemia

Symptoms	No of patient
Frequent attack of respiratory tract infection (RTI)	110 (55%)
Anorexia	63 (31.5%)
GIT problem (mouth ulcer, diarrhea, vomiting, constipation, abdominal pain, itchy anus)	45 (22.5%
CNS manifestation (Breath holding spell, insomnia, irritability, febrile convulsion and self mutilation)	34 (17%)
Pica	19 (9.5%)
Not growing well	18 (9%)
Musculoskeletal problem (generalized weakness and lethargy, limb pain)	15 (7.5%)
Pallor	6 (3%)

Table-III

Nutritional status of anaemic children

Nutritional status	Number of cases
Protein energy malnutrition	32 (16%)
Obesity	6 (3%)
Well nourished	162 (81%)

Table IV

Distribution of anaemic children according to gestation age

Gestational age	Number of cases
Preterm baby	20 (10%)
Term baby	180 (90 %)

Table V

Birth weight of anaemic child

Birth weight	Number of cases
Low birth weight	15(7.5%)
Age appropriate (normal)	185 (92.5%)

Table VI

Exclusive breast feeding

Status of exclusive breast feeding (EBF)	Number of cases
EBF up to 6 month	136 (68%)
EBF < 6 month	54 (27%)
EBF > 6 month	10 (5%)

Table VIII

Socioeconomic status of anaemic cases

Socioeconomic condition	Number of cases
Lower class	0
Lower middle class	130 (65%)
Upper middle class	60 (30%)
Higher class	10 (5%)

Table VIII

Causes of anaemia

Causes of anaemia	Number
Iron deficiency anaemia (IDA) .	129(64.45 %)
IDA with other association (haemoglobinopathies , thalassaemia trait & vitamin D insufficiency)	18 (9%)
Haemoglobinopathies :	34 (17%)
Hb E- trait	28 (82.35%)
Hb D- trait	3 (8.8%)
HbE-disease	3 (8.8%)
Thalassemia:	22 (11%)
Hb E-β thalassemia	3 (13.64%)
Hb β thalassemia- trait	18 (81.82%)
β - thalassemia major	1 (4.54%)
Vitamin D insufficiency	3(1.5%)
Hypothyroidism (Acquired)	1 (0.5%)
Drug induced (Dapsone) anaemia	1 (0.5%)
Protein energy malnutrition	3 (1.5%)
Unknown - Infection	7 (3.5%)

Table IX

Grading/Severity of anaemia

Grading of anaemia	No of cases
Mild	71 (35.5%)
Moderate	108 (54%)
Severe	21 (10.5%)

Table X

Morphologic variation of anaemia

Types	Number of cases
Microcytic hypochromic anaemia	198 (99%)
Macrocytic anaemia	1 (0.5%)
Normocytic normochromic anaemia	1 (0.5%)

Table XI

Serum ferritin level

Serum ferritin level	No of cases
Deficiency (<10 ng/dl)	112 (56%)
Borderline deficiency (10-20 ng/dl)	43 (21.5%)
Sufficient (20-350ng/dl)	45 (22.5%)

• (According to hospital lab report)

Discussion:

We have done the study on Bangladeshi children-aged between 6 months to 18 years, who were anaemic to detect the clinical features, risk factors and causes of anaemia. One recent study showed that the prevalence of anemia among pre-school children in Bangladesh was noted to be 52.10% (rural 53.70% and urban 51.70%). This was remarkably higher than the global prevalence of anemia of 24.8%.[17] In our study children between 6 months to 2 years age group were mostly affected age group. This may be due to increased demand of the body for rapid growth and development and it is the time period for weaning. Physiologic anaemia has also a great role in this age group for enhancing anaemia. This result was consistent with other studies done by Kundu S et al, Khan JR et al and Campbell RK.[18,19,20] Male children were more affected than female children from under 5 year age group. Another study done by Singh S et al showed same result.[21] In this study most of child had a history of exclusive breast feeding up to six month. Another study done by Li H et al supports this result.[22] From adolescent age group females were more in number than male. Most likely cause may be menstrual blood loss and dietary deficiency. Another studies done by Cairo DARC et al and Balcý YI et al also presented same result.[23,24] Maximum children presented with frequent illness (RTI). This result is consistent with a study result done by Vaidya SS et al.[25] In our study low protein diet was one of the most important risk factor. Another study done by Singh S et al shows same result.[21] Children from middle class family were affected more than other classes. So socioeconomic status had insignificant effect on childhood anaemia. This result has similarities to other studies done by Rocky M et al and Ngesa O et al.[26,27] In our study well- nourished children were more affected group. This result goes against a study done by Yusuf A et al.[28] In our study number of moderately anaemic children were more. One study done in China by Huang Y et al where number of mildly anemic child was more.[29] In this study most of baby was term baby. Most common cause of anaemia was iron deficiency anaemia. Second most important cause was congenital haemoglobin disorder. Most common morphologic variant of anaemia was microcytic hypochromic anaemia.This result is consistent with other study result done by Quaderi HR et al.[30] Among haemoglobinopathies and thalassemia Hb E- trait and E-β thalassemia cases were more in number

respectively. One study done by Islam MM et al consistent with this result.[31]In case of iron deficiency anemia, blood picture showed relatively high to normal RBC count and typically low MCV and MCH values and low to normal MCHC and increased RDW-CV. In case of congenital haemolytic anaemia low RBC count with low MCV, MCH as well as MCHC values. Other study done by Barve S et al also shows same result.[32]In case of normocytic anaemia (Acquired hypothyroidism) values of RBC count, MCV, MCH,MCHC, RDW-CV all were within normal range. This result is consistent with the result done by Maheshwari UK et al.[33]In our study macrocytic anaemia induced by drug (dapsone) shows low RBC count with high MCV, normal MCH, low MCHC and high RDW-CV values. One study done by Shin H K et al supports this result.[34]

Conclusion:

In most of the cases parents can't recognizes anaemia in their child in early stage. CBC and RBC indices play a primary role in diagnosing and differentiating different types of anemia. Early detection and treatment of anaemia cases can reduce growth and developmental impairment in children. Early detection of thalassemia trait and haemoglobinopathies can reduce prevalence of thalassemia and haemoglobinopathies throughout the world.

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