

## **Etiology of Iron Deficiency Anemia in the Pediatric Outpatient Department at a Tertiary Care Hospital in Dhaka**

Marium Begum<sup>1</sup>, Munima Haque<sup>2</sup>, Dipa Shaha<sup>3</sup>, Tasnim Ahmad<sup>3</sup>, Wahida Hasin<sup>3</sup>, Mahmuda Hasan<sup>4</sup>, Shameema Ara Begum<sup>5</sup>, Md. Kamrul Ahsan Khan<sup>6</sup>

### **ABSTRACT:**

**Background:** Anemia is a regular challenge in infancy, particularly children of six months to twenty-four months of age. Generally, in Bangladesh, 68% of patients between 6 to 59 months are anemic. Anemia affects natural growth, reduces physical activity and academic functioning in infants who may indicate a delayed development. **Objective:** To investigate the etiology of iron deficiency anemia among 6 to 36 months old child. **Methodology:** This cross sectional study was done at Bashundhara Ad-din Medical College Hospital (BAMCH), Dhaka, Bangladesh at outpatient department (OPD). A 110 anemic children, 6 to 36 months with Hb <11gm/dl were enrolled purposively in this study during September 2017 to June 2018. Other than CBC, additional investigation e.g. stool R/E, Hb electrophoresis, and serum ferritin for anemic patients were investigated to find out the cause of anemia. **Results:** Amongst 110 enrolled patients, 66 (60.0%) were male, while 44 (40.0%) were female. Most of them had moderate anemia (75%). Moderate and severe anemia was found more among 6-12 months' age group who were belongs to poor and middle socioeconomic status. Weight <11kgs, iron deficient diets, pre-lacteal feeding were found significant risk factors for moderate and severe anemia and among them anorexia, palpitation, recurrent infection was found common presentation. **Conclusion:** A considerable percentage of OPD children from 6 to 36 months were anemic. Low socioeconomic status and mal feeding were found significant risk factors for moderate to severe anemia.

**Keywords:** Anemia, hemoglobin, iron deficiency, children.

(The Insight 2020; 3(1): 20-26)

### **INTRODUCTION:**

Anemia is described to be a decrease of concentration of the hemoglobin or red-blood cell

volume compared to a healthy individual <sup>1</sup>. It has been predicted that amongst children below age four, 12% and 51% are anemic in developed and developing countries respectively <sup>2</sup>. Anemia is

1. Associate Professor, Department of Pediatric Medicine, Bashundhara Ad-din Medical College Hospital, Bangladesh
2. Research Fellow, Relevant Science & Technology Society, Bangladesh
3. Assistant Professor, Department of Pediatric Medicine, Bashundhara Ad-din Medical College Hospital, Bangladesh
4. Professor, Ad-din Women Medical College Hospital, Dhaka, Bangladesh
5. Assistant Professor, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh
6. Assistant Professor (Neonatology), Sheikh Sayera Khatun Medical College. Gopalganj.

prevalent in 64% children from 6-23 months' age and 42% children from 24-59 months old in Bangladesh<sup>3</sup>. Additional study in Bangladesh led in 2004 found in general 68% children from 6 to 59 months old were anemic<sup>4</sup>.

Etiology of anemia in hot-humid countries is multifactorial. Infants breastfed for over six months of not obtaining iron-fortified complementary foods or supplementation are in danger of acquiring iron deficiency anemia (IDA)<sup>5,6</sup>. Other endanger aspects for anemia comprise abnormal perinatal hemorrhage, low birth weight, lengthy intake of high quantities of cow's milk, and intestinal infection, examples are diarrhea and hookworms<sup>2</sup>.

Iron deficiency is related to nutritional scarcity in developed and developing countries<sup>7,8</sup>. World Health Organization reported that IDA have an effect on 43% of the children globally<sup>2</sup>, whereas UNICEF documented that about two billion persons in the world are ill with anemia having the highest proportion enduring IDA, of 40% - 50% children in developing countries aged less than five years have iron deficiency<sup>9</sup>. Moreover, slight anemia may reduce easiness of performing physical activity and functioning of intelligence in children. In addition, anemia might instigate developmental retardation in children. In addition, iron deficiency directing to anemia is linked to cell anomalies facilitated protection and the neutrophils capability for exterminating various kinds of bacteria, besides inferior psychomotor growth, also behavior variations in children<sup>10,11</sup>. Our study is aimed to investigate the occurrence of anemia in children between 6 to 36 months old who were enrolled owing to certain disease and also having observable anemia trends.

## **METHODS AND MATERIALS:**

This cross-sectional study was done at the pediatric OPD at BAMCH in Dhaka from September 2017 to June 2018. Patients from 6 to 36 months old having anemia were selected. Those who have chronic illness (e.g., severe malnutrition, persistent diarrhea, hematological and renal disorders, and others) were excluded from the study. At enrollment, specified events were recorded, while systematic tests were carried out and noted on

regular document forms. Patients' basic data (age, sex, living place), historical data comprised socioeconomic condition (education of mother, occupation, monthly income), history of child birth (maturity, birth-weight) comprised the questionnaire forms. Socioeconomic status was classified related to monthly earnings in Bangladeshi Taka (Tk.) as low income Tk. <10000/month, lower middle income Tk.10000 to 20000/month, and upper class income Tk. >20000/month. Patient history included birth weight, immunization, deworming, co-morbidity. Detailed dietary habits in infants were recorded which included breastfeeding (pre-lacteal feed, exclusive breastfeeding, mixed feeding), complementary feeding (early: <6months, late: >10 months), iron and protein intake. Clinical Examination of the infants included symptoms of irritability, anorexia, pica, palpitation. Signs are Anemia (mild, moderate, severe), Koilonychias, Angular stomatitis, Tongue (smooth, pale).

Complete blood count (CBC) with peripheral blood film were performed for all patients. Stool R/E, S. Ferritin and Hb. Electrophoresis were done for moderate to severe anemic patients. Anemia was labelled as severe for Hb <7 gm/dl, moderate for Hb from 7-9.99 gm/dl, and mild for Hb ranging 10-10.99 gm/dl<sup>12</sup>. Ethical approval was obtained from BAMCH ethical team. Permission was taken from guardians of the children enrolled in this study. The data analyzed utilizing SPSS software 17.0 Windows (SPSS Inc., Chicago, IL, USA). A Chi-square ( $\chi^2$ ) test was computed, where  $p < 0.05$  is measured as statistically substantial.

## **RESULTS:**

A total of 110 patients were found to be clinically anemic, majority (75%) of the cases (82/110 cases) had moderate anemia: 7-9.99 gm/dl and 16% (18) had severe anemia (<7 gm/dl). Sixty-six (60.0%) were male, while 44 (40.0%) were female. Among the study population 52 (47.3%) of them were 6-12 months' range, while rest of 44 (40.4%) were of 13-24 months. Most of the cases age 6-12 months had moderate (76.92%) and severe anemia (11.53%). In this study most of the mothers were graduated 36 (32.7%), primary education level was for 28

(25.5%) of cases. No significant relation found between level of anemia and parental educational status. Most of the patients 46 (41.8%) come from middle class, 32 (29.1%) from poor family, and 32 (29.1%) from affluent family. Cases from poor and middle socioeconomic status had moderate and severe anemia than others (Table I).

Majority of the patients 86 (78.2%) had normal birth weight ranged 2.5-4kg weight, rest of the 24 patients were low birth weight <2.5 kg, and none of them were large for gestational age. Immunization was completed as per EPI schedule for 42 (38.2%), ongoing for 68 (61.8%). Deworming was done for 18 (16.4%) of them. Dietary habits for patients show that early complementary feeding was given to 26 (23.6%) patients, while 84 (76.4%) were given late. Seventy-two (65.5%) children were exclusively

breastfed, 36 (32.7%) had mixed feeding, while 80 (72.7%) had pre-lacteal feed. Weight <11 kg, iron deficient diet, pre-lacteal feeding and low serum ferritin level were found significant risk factor for moderate and severe anemia (Table II)

Regarding clinical manifestation, various types of anemia related symptoms were documented for the patients. Among them 38 (34.5%) patients had irritability, 94 (85.5%) had anorexia, 80 (72.7%) had pica, 30 (27.3%) had palpitation, and 64 (58.2%) had other symptoms. Various signs were also recorded. Koilonychias was seen in 30 (27.3%), angular stomatitis in 36 (32.7%), and tongue was found pale in 88 (80.0%) children. Among the study cases, anorexia, palpitation, recurrent infection, koilonychias were found more in moderate and severe anemia group than mild anemia (Table III)

**Table I: Demographic profile among the study cases (N=110)**

Variables	Anemia			P value
	Mild (10)	Moderate (82)	Severe (18)	
<b>Age</b>				
<b>6-12 months (52)</b>	6 (11.53%)	40 (76.92%)	6 (11.53%)	0.448
<b>13-24 months (44)</b>	2 (4.54%)	32 (81.81%)	10 (55.56%)	
<b>25-36 months (14)</b>	2 (14.28%)	10 (71.42%)	2 (14.28%)	
<b>Sex</b>				
<b>Male (62)</b>	4 (6.45%)	50 (80.64%)	12 (19.32%)	0.362
<b>Female (44)</b>	6 (13.63%)	32 (72.72%)	6 (13.63%)	
<b>Socioeconomic status</b>				
<b>Poor (32)</b>	4 (12.5%)	22 (68.75%)	6 (18.75%)	0.003
<b>Middle (46)</b>	0 (0%)	34 (73.91%)	12 (26.08%)	
<b>Good (32)</b>	6 (18.75%)	26 (81.25%)	0 (0%)	
<b>Maternal education</b>				
<b>Primary (30)</b>	4 (13.33%)	18 (60%)	8 (26.67%)	
<b>The Insight</b>	<b>Volume 03</b>	<b>No. 01</b>	<b>January-June 2020</b>	

<b>Secondary (28)</b>	4 (14.28%)	20 (71.42%)	4 (14.28%)	0.193
<b>Higher secondary (8)</b>	0 (0%)	6 (75%)	2 (25%)	
<b>Graduate (44)</b>	2 (4.54%)	38 (86.36%)	4 (9.09%)	
<b>Paternal education</b>				
<b>Primary (30)</b>	4 (13.33%)	18 (60%)	8 (26.67%)	0.193
<b>Secondary (28)</b>	4 (14.28%)	20 (71.42%)	4 (14.28%)	
<b>Higher secondary (8)</b>	0 (0%)	6 (75%)	2 (25%)	
<b>Graduate (44)</b>	2 (4.54%)	38 (86.36%)	4 (9.09%)	

**Table II: Risk factors of anemia among the study cases (N=110)**

<b>Variables</b>	<b>Anemia</b>			<b>P value</b>
	Mild (10)	Moderate (82)	Severe (18)	
<b>Birth weight</b>				
<b>&lt;2.5kg</b>	2	16	6	0.433
<b>2.5-4 kg</b>	8	66	12	
<b>Present weight</b>				
<b>5-7kg (10)</b>	4 (40%)	6 (60%)	0 (0%)	0.000
<b>7.1-9 kg (56)</b>	4 (7.14%)	44 (78.57%)	8 (14.28%)	
<b>9.1-11 kg (30)</b>	2 (6.67%)	26 (86.67%)	2 (6.67%)	
<b>11.1-13 kg (6)</b>	0 (0%)	6 (100%)	0 (0%)	
<b>Pre lacteal feeding (80)</b>	8 (10%)	66 (82.5%)	6 (7.50%)	0.000
<b>Late complementary feeding (84)</b>	8 (9.52%)	66 (78.57%)	10 (11.90%)	0.076
<b>Iron deficient diet (24)</b>	2 (8.33%)	22 (73.33%)	0 (0%)	0.044
<b>Protein deficient diet (48)</b>	6 (12.5%)	36 (75%)	6 (12.5%)	0.393
<b>Un immunized (2)</b>	0 (0%)	2 (100%)	0 (0%)	0.24
<b>No deworming (82)</b>	8 (9.75%)	62 (75.60%)	12 (14.63%)	0.672
<b>Serum Ferritin (ng/ml)</b>				
<b>The Insight</b>	<b>Volume 03</b>	<b>No. 01</b>	<b>January-June 2020</b>	

<b>&lt;10 (90)</b>	2 (2.22%)	70 (77.77%)	18 (20%)	0.000
<b>10-95 (14)</b>	8 (57.14%)	6 (42.85%)	0 (0%)	
<b>&gt;95 (6)</b>	0 (0%)	6 (100%)	0 (0%)	

**Table III: Clinical manifestation among the study cases (N=110)**

Variables	Anemia			P value
	Mild (10)	Moderate (82)	Severe (18)	
<b>Irritability (38)</b>	4 (10.52%)	24 (63.15%)	10 (26.24%)	0.098
<b>Anorexia (94)</b>	10 (10.63%)	66 (70.21%)	18 (19.14%)	0.041
<b>Pica (80)</b>	8 (10%)	56 (70%)	16 (20%)	0.178
<b>Palpitation (30)</b>	6 (20%)	16 (53.33%)	8 (26.67%)	0.005
<b>Recurrent infection RTI/Diarrhea: (64)</b>	2 (3.12%)	50 (78.12%)	12 (18.75%)	0.034
<b>Koilonychias (30)</b>	0 (0%)	18 (60%)	12 (40%)	0.000
<b>Angular stomatitis (36)</b>	4 (11.11%)	24 (66.67%)	8 (22.22%)	0.405
<b>Smooth tongue (22)</b>	0 (0%)	20 (90.90%)	2 (9.09%)	0.112

## DISCUSSION:

The occurrence of anemia differs extensively amongst the countries. Different investigations done previously have indicated that anemia is an acute crisis in Bangladesh amongst all ages and factions<sup>2</sup>. In a study, it was found that, in general 68% of Bangladeshi children from 6 to 59 months old suffered from anemia<sup>4</sup>. The frequency of occurrence of anemia in India is 74.35% for 6 to 35 months, while Nepal has 78% aimed at 6 to 59 months and in Kazakhstan, this value is found to be 73.7% meant for 0-23 months old category<sup>13</sup>. The incidence of anemia in children from 0 to 4 years' age of World Health Organization affiliated countries, Africa has 67.6%, Southeast Asia 65.5%, and the eastern Mediterranean has 46.7%<sup>2</sup>.

Anemia incidence is insignificant in industrialized regions like Europe 21.7% and America 29.3%<sup>14</sup>.

In 1994, a project performed in Bangladesh, found the frequency of anemia was 92% amongst 6 to 11-month old fraction and 85% amongst 12 to 23-month. The mainly concerned category was 6 to 23 months old children (87%)<sup>3</sup>. The occurrence of anemia in boys was greater 123 (61.2%) than girls 78 (38.8%). These results are comparable to another research in Bangladesh, in which boys are further anemic compared to girl child<sup>15</sup>. In this study 66 (60.0%) of anemic children are boys, while 44 (40.0%) are girls, which is similar to previous findings in Bangladesh.

Anemia harmfully influences protection, evolution, and cognitive growth, which have an effect on

academic performance and communal growth<sup>16</sup>. The incidence of IDA amongst anemic children was reported as greater compared to further developing countries, like Africa having 62%<sup>2</sup>, Argentina having 46%<sup>17</sup>, and Pakistan being reported as 67%<sup>18</sup>. Higher frequency of iron adequacy can be credited to the greater occurrence of nutritional deficit, intestinal bug infestation, and the elevated consumption of sterilized unfortified cow's milk from the given areas of the world. The frequency of iron deficiency is lesser in developed countries such as the USA (9%)<sup>19</sup>, and European countries (7%)<sup>20</sup>. This is endorsed by some reasons: upgraded socio-economic condition, prevention of consumption of cow's milk in first year of childhood, and enhancement in iron diet for children afterwards, execution of complementary nutritional projects for women, and children<sup>21</sup>. This investigation further reconfirms anemia being widespread in the low socio-economic category. In this research greater part of the anemic children (70.9%) consist of middle-class and poor household whereas 29.1% are from an affluent household. It is interesting to see that there is considerable amount of anemia prevailing in affluent families also. The poor household have the same level of anemic children as affluent household (29.1%).

It is found that 36% of Bangladeshi infants are born having low birth weight<sup>4</sup>, and with low-body iron storage which is rapidly consumed in the first couple of months in childhood. In this study, about 22% infants were found to born with low body weight, which is lesser than the previous finding. Besides, 42% of infants in Bangladesh are entirely breastfed for first 6 months<sup>22</sup>, while the content, repetition and amount of supplementary nourishing is not sufficient to fulfill their needs starting at 6 months old. In comparison with this new study, 65.5% of infants are entirely breastfed for first 6 months, which is much higher than 42%. This is a positive indication that nowadays infants up to 6 months old are breastfed more in Bangladesh.

This research can be extended to detailed investigations on wider children population to evaluate the etiology related to anemia, risk factors on greater populations, as well as treatment plans to be addressed in Bangladesh.

## CONCLUSION:

A significant percentage of patients visiting hospital under 3 years (36 months) were discovered anemic. This study highlights the significance of recognizing the risk aspects of anemia of children from 6 to 36 months old.

## REFERENCES:

1. Glader B. The anemias. In: Behrman RE, Kliegman RM, Jenson HB (eds). Nelson Text book of pediatrics. 18th ed. Philadelphia, WB Saunders co. 2003; 2017-30.
2. Maeyer E, Adiels TM. The prevalence of anemia in the world. World Health Stat Q. 1985; 38:302-16.
3. BBS & UNICEF. Report on anemia prevalence survey of urban Bangladesh and rural Chittagong Hill tracts 2003. Dhaka, BBS. 2004:11-22.
4. Hercberg S, Chauliac M, Galan P, Devanlay M, Zohoun I, Agboton Y. Prevalence of iron deficiency and iron-deficiency anemia in Benin. Public Health. 1988; 102:73-83.
5. Calvo EB, Galindo AC, Aspnes NB. Iron status in exclusively breast fed infants. Pediatrics. 1992; 90:375-379.
6. Simes MA, Salmenpera L, Perheentupa J. Exclusive breast-feeding for 9 months: risk of iron deficiency. J Pediatr. 1984; 104:196-9.
7. Dallman PR, Siimes MA, Stekel A. Iron deficiency in infancy and childhood. Am J Clin Nutr. 1980; 33:86-118.
8. Mills AF. Surveillance for anemia: risk factors in patterns of milk intake. Arch Dis Child. 1990; 65:428-31.
9. UNICEF: Spotlights; "Iron, the State of the World's Children, " United Nations Children's Fund: Focus on Nutrition. 1998; 78:1-12.
10. Martins S, Logan S, Gilbert RE. Iron therapy for improving psychomotor development and cognitive function in children under the age of three with iron deficiency anaemia. Cochrane Database of Systematic Reviews, 2001(Issue 2):22-33.
11. Walter T, De Andraca I, Chadud P, Perales CG. Iron deficiency anaemia: adverse effects on

- infant psychomotor development. *Pediatrics*. 1989; 84:7-17.
12. UNICEF (United Nations International Children's Emergency Fund), UNU (United Nations University), WHO (World Health Organization). Iron deficiency anaemia. Assessment, prevention and control: a guide for programme managers, Geneva; 2001. (WHO/NHD/01.3.)
  13. Hall A, Bobrow E, Brooker S, Jukes M, Nokes K, Lambo J. Anemia in schoolchildren in eight countries in Africa and Asia. *Public Health Nutr*. 2001; 4:749-56.
  14. Benoist DB, McLean E, Egli I, Cogswell, M. Worldwide prevalence of anaemia 1993-2005: WHO Global Database on Anaemia. Geneva: World Health Organization, 2008.
  15. Stallkamp G, Ached N, Keller H. The burden of anaemia in rural Bangladesh: the need for urgent action. *Sight and life*. 2006; 3:16-21.
  16. Grantham MGS, Ani C. A review of studies on the effect of iron deficiency on cognitive development in children. *J Nutr*. 2001; 131:649S-658S.
  17. Calvo EB, Galindo AC, Aspnes NB. Iron status in exclusively breast fed infants. *Pediatrics*. 1992; 90:375-9.
  18. Paracha PI, Hameed A, Simon J, Jamil A, Nawab G. Prevalence of anaemia in semi-urban areas of Peshawar, Pakistan: a challenge for health professionals and policy makers. *J Pak Med Assoc*. 1997; 47:49-53.
  19. Looker AC, Dallman PR, Carroll MD, Gunter EW, Johnson CL. Prevalence of iron deficiency in the United States. *JAMA*. 1997; 277: 973-6.
  20. Eden AN, Mir MA. Iron deficiency in 1- to 3-year old children. A paediatric failure? *Arch Pediatr Adolesc Med*. 1997; 151:986-8.
  21. Yip R, Binkin NJ, Fleshood L, Trowbridge FL. Declining prevalence of anaemia among low income children in the United States. *JAMA*. 1987; 258:1619-23.
  22. BDHS. Bangladesh Health and Demographic Survey. 2004:11-22.