ORIGINAL ARTICLE

SPECTRUM OF HEMATOLOGICAL DISEASES IN PEDIATRIC PATIENTS PRESENTING WITH ANEMIA BASED ON BONE MARROW EXAMINATION

Zahid Gul, Samreen Ahmad, Anwar Zeb Jan, Fahad Liaqat, Gauhar Ali Khan
Department of Pediatrics, Rehman Medical Institute, Peshawar, Pakistan

ABSTRACT

Background: This study was conducted to identify the different acquired causes of anemia on the basis of bone marrow examination in children admitted to the pediatric Unit of Rehman Medical Institute Peshawar.

Material & Methods: It was a retrospective descriptive study conducted at Pediatric Department of Rehman Medical Institute Peshawar on data of 5 years from 1st January, 2008 to 31st December, 2012. A total of 249 cases were included in the study that presented with anemia. Patients with hereditary blood disorders and recent history of blood transfusion were excluded from the study. They were assessed clinically by general physical and systemic examination. Complete blood count, peripheral smear and bone marrow examination was performed in all cases.

Results: During the study period 14,642 patients were admitted, 249(1.7%) cases presented with hematological disorders on the basis of bone marrow examination. In the etiological pattern, aplastic anemia 71(28.51%) was the most common etiology followed by leukemia 59(23.69%), megaloblastic anemia in 48(19.27%), other less common problems like idiopathic thrombocytopenic purpura 19(7.63%), iron deficiency anemia 9(3.61%), visceral leishmaniasis 8(3.21%), anemia of chronic disorder 6(2.41%) and malaria in 6(2.41%) cases. Common clinical presentations were fever, pallor, body aches, petechial hemorrhages and epistaxis.

Conclusion: Anemia secondary to acquired causes is a disorder with serious consequences. Bone marrow examination is helpful in the diagnosis of most of these cases.

KEY WORDS: Bone Marrow examination; Aplastic anemia; Nutritional; Megaloblastic anemia.

This Article may be cited as: Gul Z, Ahmad S, Jan AZ, Liaqat F, Khan GA. Spectrum of hematological diseases in pediatric patients presenting with anemia based on bone marrow examination. Gomal J Med Sci 2014; 12:60-3.

INTRODUCTION

Anemia is present when the hemoglobin level is below the lower extreme of the normal range for the age and sex of the individual.[1] In the developing country like Pakistan, it is still one of the common and remediable morbidities.[2] The etiological factor of anemia is multi-factorial involving different factors like nutritional deficiencies, genetic red blood cells disorders and infectious disorders.[3]

Anemia is major health problem globally. According to World Health Organization approximately 43% of the world's population is suffering from anemia, it is predicted that 2.2 billion individuals worldwide are suffering from anemia half of whom are apprised to have iron deficiency anemia.[4] The effects of anemia include physical and mental hindrance, fatigue, low efficiency at work and impairment of reproductive functions.[5] As the disease is common with associated serious adverse outcomes, so it is not only important to contrivance prevention strategies like food fortification but also to make efforts for early diagnosis and adequate replacement therapy.[6]

Vitamin B12 and folate deficiency are the commonest causes of megaloblastic anemia which is associated with neurological discrepancies. Children with neurological discrepancies and neuro-developmental retardation should be thoroughly evaluated to prevent persistent neurological damage because of the deficiencies.[6]Acquired aplastic anemia usually has an autoimmune basis that is diminution of the hematopoietic stem cells by direct toxicity mostly due to radiations, drugs, chemicals and viruses.[7] Anemia of chronic disease is a mild to moderate anemia that occurs mostly in infections and inflammatory disorders[8] and is frequently found in chronic kidney insufficiency, dialysis patients, congestive heart failure and renal transplantation.[9]

Visceral leishmaniasis, also known as Indian Kala-azar, is a parasitic disease caused by Leish-

Corresponding Author:
Dr. Zahid Gul
Department of Pediatrics,
Rehman Medical Institute, Peshawar, Pakistan.
E-mail: gulljee92@gmail.com

mania donavani and transmitted by the bite of the sand fly vector *Phlebotomus argentipes*.[10] This is potentially a fatal infection causing anemia, fever, cachexia, hepatosplenomegaly and pancytopenia.[11]

Anemia can be due to malignant or non-malignant underlying pathology and in both cases affects the health of the children and result in impaired psychomotor development, poor cognitive performance.[12] The main purpose of assessing anemia is to make a decision on the type of measures to be taken to prevent and control anemia.[13]

This study was conducted to identify the different acquired causes of anemia in children admitted to the Pediatric Unit of Rehman Medical Institute Peshawar.

MATERIAL AND METHODS

This Retrospective descriptive study was conducted in the Pediatric Department of Rehman Medical Institute Peshawar on data of 5 years from January 1, 2008 to December 31, 2012. A total of 249 cases were included who presented with anemia. They were assessed clinically by general physical and systemic examination. Patients with hereditary blood disorders and recent history of blood transfusion were excluded from the study. Personal details of patients like name, age, sex and hospital registration were recorded. Complete blood count, peripheral smear and bone marrow examination was perfromed in all cases.

RESULTS

Out of total 14,642 patients, 249 (1.7%) presented with hematological disorders. Out of these 249 patients, 162 (65.06%) were males and 87 (34.94%) females, with male to female ratio of 1.8:1. Age ranged from one month to 14 years. Maximum number of patients 112 (44.97%) were in the age group of 6 month to 5 years, followed by 84 (33.74%) 6 to 10 years age group while minimum number 53 (21.29%) were those with more than 11 years age. All age groups had a male predominance. (Table 1)

The most common symptom was pallor in 170 (82.92%) cases and fever in 135 (62.85%), other symptoms included bruises, epistaxis, malena, petechial hemorrhages, hematuria and joint pains. (Table 2)

A patient having more than one clinical feature is counted in each category. Hence the sum is more than the total number of cases.

Considering the etiological pattern; aplastic anemia 71 (28.51%) was the most common etiology followed by leukemia 59 (23.69%) and megaloblastic anemia in 48 (19.27%), followed by less common problems like idiopathic thrombocytopenic purpura

Table 1: Distribution of patients according to gender and age.

Age	Male	Female	Total
6 months – 5 years	73 (45.1%)	39 (44.83%)	112 (44.97%)
6-10 years	54 (33.3%)	30 (34.48%)	84 (33.74%)
11 - 14 years	35 (21.60%)	18 (20.69 %)	53 (21.29%)
Total	162	87	249 (100%)

Table 2: Clinical feature of hematological disorder at presentation (n=249).

Clinical Feature	Number of cases	Percentage
Pallor	170	82.92
Fever	135	62.85
Bruises	128	62.44
Petechial hemorrhage	40	19.51
Malena	30	14.63
Hematemesis	20	9.75
Joint/leg pain	60	29.27
Bleeding from gums	50	24.39
Epistaxis	60	29.27
Hematuria	25	12.19

19 (7.63%) iron deficiency anemia 9 (3.61%), visceral leishmaniasis 8 (3.21%), anemia of chronic disorder 6(2.41%) and malaria was found in 6 (2.41%) of cases. (Table 3)

Regarding the pattern of hematological presentation based on complete blood picture, pancytopenia 193 (77.51%) was the most common presentation followed by bicytopenia 56(22.49%). (Table 4)

DISCUSSION

Hematological diseases are frequently encountered in pediatric patients and in order to get a confirmatory diagnosis bone marrow is of great help to pediatrician. A total of 249 patients with confirmed diagnosis on the basis of bone marrow were included, out of which 65.06% were males while 34.94% females with a male to female ratio of 1.8:1, another study in Peshawar[14] with 198 cases showed a male to female ratio of 1.5:1, while a study done in Abbottabad[15] including 110 cases showed a male to female ratio of 1.2:1 and a study done in Srilanka[16] including 248 children, reported the male to female

Table 3: Etiological pattern of hematological disorder (n=249).

Etiology	Number of cases	Percentage
Aplastic anemia	71	28.51
Leukemia	59	23.69
Megaloblastic anemia	48	19.27
Idiopathic thrombocytopenia purpura	19	7.63
Iron deficiency anemia	11	4.42
Visceral leishmaniasis	8	3.21
Anemia of chronic disorder	6	2.41
Hypersplenism	5	2.01
Malaria	6	2.41
Hemolytic anemia	8	3.21
Myelodisplastic syndrome	3	1.20
Gaucher's disease	2	0.84
Niemann-Pick disease	3	1.20

ratio of 1:2.1.

In our study most of the patients presenting with anemia were in the age group 6 months to 5 years, contributing up to 44.97% patients while 33.74% of patients were in the age group 6 years to 10 years. In a study done in Abbottabad reported the high number of cases 55.45% in the age group of 6 months to 3 years.[15]

In our study aplastic anemia was the most common acquired non-malignant cause of anemia in children accounting for 28.51% of all the cases, followed by nutritional anemia 23.69% (including megaloblastic anemia 19.27% and iron deficiency anemia 4.42%) and visceral leishmaniasis for 3.21% while malignant conditions contributed to 23.69%. These findings are consistent with a study conducted in Peshawar[14] on pancytopenia in children below 15 years of age, they reported aplastic anemia to be the most common cause of anemia followed by nutritional i.e. megaloblastic anemia and iron deficiency anemia.[14] Hematological malignancies, visceral leishmaniasis and idiopathic thrombocytopenic purpura were found in descending order.[17] A study done in India by Bhatanger[18] including 109 children in study presenting as pancytopenia the incidence of megaloblastic anemia was 28.4%. Another study of 200 cases by Khunger[19] reported megaloblastic anemia in 72% of cases. Shazia et al[20] including 230 children in the study reported the incidence of megaloblastic anemia in 17.39% cases.

Idiopathic thrombocytopenic purpura accounted for 7.63% of cases in our study. It is also one of the commonest causes of purpura. Other studies have

Table 4: Pattern of presentation of hematological disorders apart from anemia on complete blood picture (n=249).

Etiology	White cell count			Platelet count		
	Low	Normal	High	Low	Normal	High
Aplastic anemia (n=71)	67	4	0	68	3	0
Leukemia (n=59)	49	3	7	51	2	6
Megaloblastic anemia (n-48)	40	5	3	43	4	1
ITP (n=19)	16	2	1	19	0	0
Iron deficiency anemia (n=11)	1	6	4	2	7	2
Visceral leishmaniasis (n=8)	6	1	1	7	1	0
Anemia of chronic disorder (n=6)	4	2	0	4	1	1
Hypersplenism (n=5)	4	0	1	5	0	0
Malaria (n=6)	5	1	0	5	0	1
Hemolytic anemia (n=8)	2	4	2	1	5	2
Myelodisplastic syndrome (n=3)	3	0	0	3	0	0
Gaucher disease (n=2)	1	1	0	1	0	1
Niemen pick disease (n=3)	3	0	0	2	0	1

shown 32% to 48% frequency. While study done in Peshawar by Khan et al reported it to be 15.7%.[14,21]

CONCLUSION

Anemia secondary to acquired causes is a disorder with serious consequences. Bone marrow examination is helpful in the diagnosis of most of these cases.

REFERENCES

1. Firkin F, Chesterman C, Peningston D, Rush B. de Grushy's Clinical Haematology in Medical Practice. 5th Ed. Blackwell Science Ltd. Oxford United Kingdom 1989. p. 25.
2. Iron Deficiency Anemia: Assessment, Prevention and Control: A guide for programme Managers. Geneva: WHO 2001.
3. Desai MR, Terlouw DJ, Kwena AM, Phillips- Howard PA, Kariuki SK, Wannemeuhler KA, et al. Factors associated with hemoglobin concentrations in pre-school children in Western Kenya: Cross-sectional studies. Am J Trop Med Hyg 2005; 72:47–59.
4. DeMaeyer E, Adiels-Tegman M. The prevalence of anaemia in the world. World Health Stat Quart 1985; 38:302–16.
5. Hassan K, Sullivan MK, Yip R, Woodruff BA. Factors Associated with Anaemia in Refugee Children. J Nut Metab 1997; 127:2194–8.
6. Mtvarelidze ZG, Kvezereli-Kopadze AN, Kvezereli-Kopadze MA. Megaloblastic-vitamin B12deficiency anaemia in childhood.[Article in Russian]. Georgian Med News 2009; 170:57–60.
7. Gaman A, Gaman G, Bold A. Acquired aplastic anaemia: correlation between etiology, pathophysiology, bone marrow histology and prognosis factors. Rom J MorpholEmbryol 2009; 50:669–74.
8. Matsumura I, Kanakura Y. Pathogenesis of anaemia of chronic disease. Nippon Rinsho2008; 66:535–9.
9. Silverberg DS, Wexler D, Blum B, Iaina A. Anaemia in chronic kidney disease and congestive heart failure. Blood Purif 2003; 21:124–30.
10. Ranjan A, Sur D, Singh VP, Siddique NA, Manna B, Lal CS et al. risk factors for Indian Kala-azar. Am J Trop Med Hyg 2005; 73:74-8.
11. Mella N, Mahajan RC. Pathophysiology of visceral leishmaniasis some recent concepts. Indian J Med Res 2006; 123:267-74.
12. Jain NB, Laden F, Guller U, Shankar A, Kazani S, Garshick E. Relation between blood lead organization levels and childhood anaemia in India. Am J Epidemiol 2005; 161:968–73.
13. De Benoist B, McLean E, Egli I, Cogswell M, (Eds). Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia. Geneva: WHO; 2008.
14. Khan A, Aqeel M, Khan TA, Munir A. pattern of hematological disease in hospitalized paediatric patients based on bone marrow examination. J Pak Med Inst 2008; 22:196-200.
15. Saima B, Gilani SYH, Shah SRA, Shawana B. Aetiological profile of acquired anemia in a pediatric tertiary care setting. J ayub Med Coll Abbottabad 2011; 23:69-72.
16. Hettiarachchi M, Liyanage C. Coexisting micronutrient deficiencies among Sri Lankan pre-school children: a community-based study. Matern Child Nutr 2012; 8:259–66.
17. Rehman HU, Fazil M, Khan FM. The etiology pattern of Pancytopenia in children upto 15 years. Pak Armed Forces Med J 2003; 53:183–7.
18. Bhatnagar SK, Chandra J, Narayan S, Sharma S, Singh V, Dutta AK. Pancytopenia in children: etiological profile. J Trop Pediatr 2005; 51: 236-9.
19. Khunger JM, Arulselvi S, Sharma U, Rangas S, Talib VH. Pancytopenia a clinicohaematological study of 200 cases. Indian J Pathol Microbiol 2002; 45:475-9.
20. Shazia M, Salma S, Akbar N. Etioloigcal spectrum of pancytopenia based in bone Marrow examination in children. J Coll physicians Surg Pak 2008;18:163-7.
21. Ng Sc, Kuperan P, Chans KS, Bosco J, Chan GL. Anemia: a review from University Hospital, Kuala Lumpur. Ann Acad Med Sing 1988; 17:261-4.

CONFLICT OF INTEREST
Authors declare no conflict of interest.
GRANT SUPPORT AND FINANCIAL DISCLOSURE
None declared.