ORIGINAL RESEARCH PAPER

Pathology

AN ANALYSIS OF LABORATORY, BONE MARROW AND PBS FINDINGS IN DIMORPHIC ANEMIA

Bibhuti Bhusan Prasad	Associate Professor, Department of Pathology, Vardhman Institue of Medical Science, Pawapuri, Nalanda, Bihar-803115.
Subhash Chandra Jha	Hematologist, New Gardiner Road Superspeciality Hospital, Patna :800001.
Deepak Kumar*	Associate Professor, Department of Pathology, Jawaharlal Lal Nehru Medical College, Bhagalpur-812001 *Corresponding Author

ABSTRACT

Introduction: Dimorphic anemia (DA) is defined by two different cell populations in peripheral blood smear and deficiency of two biochemical parameters i.e. deficiency of serum iron and vitamin B12 or Folic acid . One population is of microcytic hypochromic and other being either normocytic or macrocytic. **Material and Methods:** A retrospective study was undertaken to correlate and compare the clinico-hematological parameters in DA done over a period of one year. All cases of anemia diagnosed during this period were analyzed and all cases diagnosed as DA in the peripheral blood smear (PBS) were included in the study. **Result:** In PBS, dual population was seen in 85.5% of cases of dimorphic anemia , comprising microcytic hypochromic with normocytic normochromic red blood cells in 37.1% of cases (66) or macrocytes in 62.9% of cases . Biochemically, 90% had B12 deficiency, 80% had Folic acid deficiency and all patients(100%) had iron and ferritin deficiency. Pancytopenia was seen in 80% cases and bicytopenia in 20% patients. All cases had bone marrow correlation. All marrows were hypercellular showing megaloblastic change in all series but prominent megaloblastic erythropoiesis. **Conclusion:** DA is one of the common anemia in developing countries especially in Indian vegetarian Hindus . In developing countries ,early diagnosis and treatment is essential to prevent morbidity and mortality.

Introduction:

Dimorphic anemia (DA) is characterized by two different cell populations. One population is of microcytic hypochromic and other being either normocytic or macrocytic .[1] DA is one of the common anemia in India, but under reported due to paucity of published literature regarding this entity in Bihar. One study conducted in India showed the incidence of DA is found to be 12.5%.[2] This anemia should be recognized accurately since the treatment may be ineffective if not treated for dual deficiency. Therefore, this retrospective study was conducted to find out the prevalence and to correlate the clinico-hematological parameters in diagnosed DA on peripheral smear and validated with biochemical findings.

Materials and Methods:

The study was conducted in the Department of Pathology of Government Medical Colleges and tertiary Superspeciality Hospital of Bihar over a period of 1 year from January, 2020, to January 2021. This was a hospital based retrospective study. Only those 10 cases reported as DA on the peripheral blood smear (PBS) and correlated with serum vitamin B12 or Folic acid and serum iron were included in retrospective study. Two milliliters of ethylenediaminetetraacetic acid (EDTA) blood was collected for complete blood counts (CBC) using an automated five-part coulter machine. Finger prick Peripheral blood smears were made and Bone marrow aspirations (BMAs) were done to know morphology of Bone marrow.

Result:

The age of the patients ranged from 13 to 76 years, with a mean age of 48.8 years. The male to female ratio was 1:1. Pallor was seen in all the cases (100%), followed by fever, and bleeding [Table 1]. Pancytopenia was seen in 70% (7) cases and bicytopenia in 30% (3) patients. Pancytopenia is a common hematological condition with varied etiology and dimorphic anemia (DA) is common differential of pancytopenia.[7].Dual population was seen in all 10 cases. Microcytic hypochromic red blood cells (RBCs) with normocytic normochromic RBCs were seen in 37.1% of cases and microcytic hypochromic RBCs with macrocytes were seen in 62.9% of cases (Figure 1).

Macrocytes, macroovalocytes, and hypersegmentation of neutrophils were seen in 90% (9) patients. Macrocytosis and hypersegmented neutrophils in PBS are strong indicators of Vitamin B12 deficiency.[2] Thrombocytopenia and leucopenia were seen in 42.6% (76) and 26.9% (48) patients, respectively [Table 2]. Only 8 patients gave consent for bone marrow aspiration. All marrows were hypercellular, showing erythroid hyperplasia with megaloblastic erythropoiesis (100%). Giant metamyelocytes were seen in all the bone marrow.

Discussion:

Of 10 patients, 2 (20%) cases were mild, 4 (40%) cases were moderate, and 4 (40%) cases were labeled as severe anemia. Athar et al. found 12.5% of dimorphic anemia out of 41.4% total cases of anemia.[2] Rahim et al. found dimorphic anemia in 15% of cases, which is in concordance with our study. The male to female ratio was 1:1. Pallor was seen in all the cases (100%), followed by fever, organomegaly and bleeding [Table 2]. Thus, the clinical presentation of fever and organomegaly corroborates these findings. Pancytopenia was seen in 80% (8) cases and bicytopenia in 20% (2) patients. Athar et al. found pancytopenia in 18.96% and bicytopenia in 20.68% of cases.[2] Pancytopenia is a common hematological condition with varied etiology and DA is a known cause of pancytopenia.[7] Raphael et al. reported 8.75% of cases of DA presenting with pancytopenia, which is comparable to our study.[7] In PBS, dual population was seen in all 10 cases. Microcytic hypochromic red blood cells (RBCs) with normocytic normochromic RBCs were seen in 37.1% of cases and microcytic hypochromic RBCs with macrocytes were seen in 62.9% of cases . Macrocytes, macroovalocytes, and hypersegmentation of neutrophils were seen in 8 patients. Macrocytosis and hypersegmented neutrophils in PBS are strong indicators of Vitamin B12 deficiency.[2] Thrombocytopenia and leucopenia were seen in 42.6% and 26.9% patients, respectively [Table 1]. All marrows were hypercellular, showing erythroid hyperplasia with megaloblastic erythropoiesis (100%). Giant metamyelocytes were seen in all the bone marrow. The iron stores were reduced (Grade 0–1+) in only three cases and increased in

seven cases. Different cell populations, comprising microcytic hypochromic with normocytic normochromic RBCs or macrocytes were found in all cases. In low-resource settings, clinical and hematological parameters such as complete hemogram and PBS are the important initial tests for diagnosis and are of paramount importance in guiding further management.
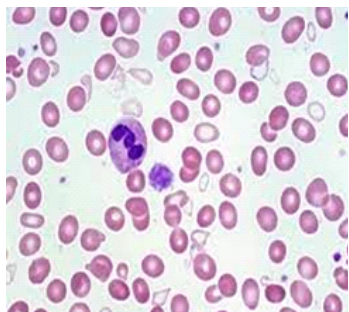

Figure 1. showing dual population of red blood cells

Table 1. showing biochemical parameters

CASE NO	GENDER	AGE	B12	FOLIC ACID	IRON	TIBC	SATURATION	FERRITIN	REMARK
1	F	76	150	1.1	30	187	6.5	6	TSH10.42, FT4 :0.59
2	F	55	87	6.38	17	531	3.2	15	
3	M	69	184	15.0	49	332	10.2	8	
4	F	47	162	8.7	38	530	9.6	4	
5	M	13	296	2.4	47	523	5.8	18	
6	M	37	98	6.7	33	520	7.2	9	
7	F	40	144	6.2	25	510	8.2	10	
8	M	58	164	6.9	40	500	11.1	13	
9	F	68	199	0.80	30	521	7.6	11	
10	M	25	98	6.80	22	556	3.9	7	

Folate >5.38ng/ml,B12:211-911 pg/ml, Iron : 50 - 170 µg/dL (TIBC) 120 - 470 µg/dL , Transferrin Saturation % :20-50% Ferritin:10-291 ng/mL

Table 2. showing hematological parameters

Case no	Gender	Age	WBC	RBC	HB	MCV	MCH	MCHC	PLATELETS
1	F	76	3.0	2.22	7.6	112.8	34.1	30.3	55
2	F	55	4.00	1.07	4.6	125	38.6	33.2	80
3	M	69	4.4	2.26	9.7	129.3	42.9	36.0	141
4	F	47	3.68	2.20	7.5	101	32.0	32.0	165
4	M	13	2.8	2.0	6.0	100	32.8	33.1	88
6	M	37	3.8	3.20	7.0	110	32.8	33.2	54
7	F	40	2.1	2.10	6.3	99	32.3	31.2	25
8	M	58	3.6	3.80	8.5	90.0	27.5	31.5	188
9	F	68	3.5	2.15	5.9	89	32.8	29.2	19
10	M	25	3.0	1.80	3.8	97	32.8	35.2	35

Table 3. Clinical And Hematological Manifestations

Clinical manifestations	%
Pallor	100
Splenomegaly	10
Hepatosplenomegaly	5
Hepatomegaly	3
Signs of bleeding	75
Fever	24
Hematological findings	
Microcytic hypochromic	80
Macrocytic	90
Macroovalocytes	55
Hypochromic macroovalocytes	75
Hypersegmented neutrophils	60
Leucopenia	80

Thrombocytopenia	80
Anemia	100
Pancytopenia	70

Conclusion:

Dimorphic anemia is common hematopathological diagnosis in Bihar . Its early diagnosis is essential on high suspicion to prevent major complication due to deficiency of B12 or Folic acid and iron deficiency. Thus in patients with pancytopenia with dimorphic picture on PBS , further biochemical tests like B12,Folic acid and iron prifile including serum iron, TIBC and ferritin must be done so that early treatment with hematinics might be started to prevent neurological and other complications.

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