To Study Hemogram and Bone Marrow Morphology (Aspiration/Biopsy) in Cases of Pancytopenia at GMC & H Nagpur – Two Year Observational Study

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Abstract

Pancytopenia is defined by reduction of all the three formed elements of bloodbelow the normal reference. It may be a manifestation of a wide variety of disorders, which primarily or secondarily affect the bone marrow. Hematological investigation forms the bedrock in the management of patients with pancytopenia and therefore needs detailed study. This study was carried to identify the underlying etiopathology of pancytopenia and to study various morphological features of bone marrow in cases of pancytopenia. This observational study of two hundred & ten patients were studied during the period, September 2011 to September 2013, in the department of pathology, Government Medical College & Hospital Nagpur in Maharashtra. Patients of all age groups admitted in Hospital, with a hematological diagnosis of pancytopenia were included in the study followed by bone marrow aspiration and/or biopsy were included in the study. Among 210 cases studied the commonest cause of pancytopenia was megaloblastic anemia. Macrocytic anemia was the predominant blood picture. The commonest bone marrow finding was megaloblastic erythropoiesis. Pancytopenia is a relatively common entity with inadequate attention in Indian subcontinent. A comprehensive clinical and hematological study of patients with pancytopenia will usually help in the identification of the underlying cause. However in view of wide array of etiologies, pancytopenia continues to be a diagnostic challenge for hematologists.

Keywords: Pancytopenia, bone marrow aspiration, bone marrow biopsy, megaloblastic anemia, aplastic anemia.

INTRODUCTION

Pancytopenia is defined by reduction of all the three formed elements of blood below the normal reference[1].

The criteria applied for pancytopenia were:

⇒ Hemoglobin (Hb) < 10g/dl,
⇒ Total leucocytes count (TLC) < 4000/cumm,
⇒ Platelet count < 1 lakh/cumm.

The severity of pancytopenia and the underlying pathology determines the management and prognosis of the disease. Hence the finding of correct etiopathology in a given case is crucial.

It is not a disease entity but triad of findings that may result from number of processes primarily or secondarily involving the bone marrow. Hence bone marrow examination is extremely helpful in evaluation of pancytopenia.

i) This study was carried to identify the underlying etiopathology of pancytopenia.
ii) To study various morphological features of bone marrow in cases of pancytopenia.

MATERIALS AND METHODS

This observational study of two hundred & ten patients were studied during the period, September 2011 to September 2013, in the department of pathology, Government Medical College & Hospital Nagpur in Maharashtra. Patients of all age groups admitted in Hospital, with a hematological diagnosis of pancytopenia were included in the study followed by bone marrow aspiration and/or biopsy were included in the study.

Selection of cases:

Inclusion criteria:

- Patients of all age groups admitted in Government medical college & hospital, with a haematological diagnosis of pancytopenia followed by bone marrow aspiration or biopsy were included in this study.
- The criteria applied for pancytopenia were:
  - ⇒ Hemoglobin (Hb) < 10g/dl,
  - ⇒ Total leucocytes count (TLC) < 4000/cumm,
  - ⇒ Platelet count < 1 lakh/cumm.

Exclusion criteria:

- Patients who showed malarial parasite on peripheral smear were excluded.

⇒ Patients who did not give consent for bone marrow aspiration or biopsy.

Clinical history recording and examination of all the identified cases of pancytopenia were done.

Investigations done:

These patients were subjected to routine haematological investigations like;

⇒ Complete blood count.
⇒ Peripheral smear study.
⇒ Bone marrow smear study.
⇒ ESR
⇒ Other investigations as necessary such as;
⇒ Bone marrow trephine biopsy.

Serological study:

⇒ For HIV infection.
⇒ Hepatitis B surface antigen (HbsAg)
⇒ For leptospirosis.
⇒ For Dengue.

Consent:

Whole procedure was explained and written consent of patient was taken in each case either from patient or relative before starting the procedure

Procedure:

Bone marrow aspiration was performed from Posterior superior iliac spine under all aseptic conditions by bone marrow aspiration needle (klima needle)

- Bone marrow biopsy was performed (by Jamshidi bone marrow biopsy needle of gauge 11- for adults and gauge 13- for children) in following conditions:
  - ⇒ Dry tap or diluted marrow aspirate
  - ⇒ To confirm diagnosis established on BM aspirate such as in aplastic anaemia.

The peripheral smear was studied after staining with Leishman's stain.

- Routine stains like Leishman stain or MGG stain, Haematoxylin and eosin.
- Special stains: like reticulin, PAS, Peroxidase, Prussian blue used as per requirements.

RESULTS

The total number of cases studied was 210.

1. In the present study Megaloblastic anaemia (65.71%) was the commonest cause of pancytopenia, followed by Aplastic anaemia (22.38%), Acute Lymphoblastic Leukemia (3.33%), Acute Myeloid Leukemia (2.38%), Acute Leukemia-unclassified (0.47%), Hypersplenism (2.38%), Gauchers Disease(0.47%), Gelatinous bone marrow transformation (0.95%), Myelodysplastic syndrome (0.47%), Deposits of epithelial malignancy(0.47%), Granulomatous disease (0.47%), Multiple Myeloma (0.47%).
2. Most of the patients were in the age group of 11-20 yrs with M: F ratio of 1.65:1
3. Generalized weakness and fatigue were the commonest presenting complaints
4. Hemoglobin % varied from 1g%- 10g% with majority 95 (45.23%) of them in the range of 4g%-6g%.
5. TLC was in the range of 500 – 4000cells/cumm. Majority 71 (33.80%) of them had 3000 –4000cells/cumm.
6. Platelet countof maximum patients 82 (39.04%) lies between Platelet range of 70,000-1 lakh/cumm
7. Reticulocyte count of maximum patients 75 (35.71%) lies between Reticulocyte count range of 2-5 %.
8. The bone marrow cellularity was hypocellular in (14%), hypercellular in (75%), and normocellular in (11%) of the patients.

Table 1: Showing presenting complaints in pancytopenia patients

Presenting complaints	a	B	c	d	e	F	g	h	I	J	k
Megaloblastic anaemia (138 cases)	115	54	10	50	6	12	-	1	3	3	7
Aplastic anaemia (47 cases)	37	11	-	30	11	4	-	-	1	2	3
Acute Lymphoblastic Leukemia (7 cases)	4	-	-	3	-	1	-	-	1	1	-
Acute Myeloid Leuke-mia (5 cases)	3	2	-	-	1	1	-	-	2	-	-
Acute Leukemia (1 case)	1	1	-	-	1	-	-	-	-	-	-
Miscellaneous (12 cases)	7	-	-	6	1	-	-	1	1	2	-

Complaints :

a. Generalized weakness
b. Easy fatigability
c. Giddiness
d. Fever
e. Bleeding tendencies
f. Breathlessness
g. Lymphadenopathy
h. Bone pain/joint pain
i. Abdominal lump/pain
j. Weight loss/loss of appetite
k. Yellowish discolouration of eyes

Table 2: Distribution of Hb% in pancytopenia

Hb gm%	<4	4-6	6-8	8-10	Total
Megaloblastic anaemia	52	66	16	4	138
Aplastic anaemia	14	21	10	2	47
Acute Lymphoblastic Leukemia	1	4	0	2	7
Acute Myeloid Leukemia	2	2	1	0	5
Acute Leukemia (unclassified)	1	0	0	0	1
Miscellaneous	0	4	4	4	12
Pancytopenia	75	95	31	9	210

Table 3: Total Leucocyte count level in pancytopenia

TLC cumm	< 1000	1000-2000	2000-3000	3000-4000	Total
Megaloblastic anaemia	3	28	52	55	138
Aplastic anaemia	8	20	10	9	47
Acute Lymphoblastic Leukemia	1	1	0	5	7
Acute Myeloid Leukemia	2	1	2	0	5
Acute Leukemia (unclassified)	0	1	0	0	1
Miscellaneous	1	5	4	2	12
Pancytopenia	15	56	68	71	210

Table 4: Platelet Count in cases of pancytopenia

Platelet Count	<	10000-	40000-	70000-	Total
Megaloblastic anaemia	0	21	48	69	138
Aplastic anaemia	5	29	6	7	47
Acute Lymphoblastic Leukemia	1	3	1	2	7
Acute Myeloid Leukemia	0	3	1	1	5
Acute Leukemia	0	1	0	0	1
Miscellaneous	0	6	3	3	12
Pancytopenia	6	63	59	82	210

Table 5: Distribution of total cases as per causes of Pancytopenia

Sr. No.	Category	Subcategory	Number of cases	Total
1.	Anaemia	Megaloblastic anaemia	138 (65.71%)	185 (88.09%)
		Aplastic anaemia	47 (22.38%)	
2.	Leukemia	Acute Lymphoblastic Leukemia	7 (3.33%)	13 (6.19%)
		Acute Myeloid Leuke-mia	5 (2.38%)	
		Acute Leukemia (unclassified)	1 (0.47%)	
3.	Miscellaneous	Hypersplenism	5 (2.38%)	12 (5.72%)
		Gauchers Disease	1 (0.47%)	
		Gelatinous bone mar-row transformation (GMT)	2 (0.95%)	
		Myelodysplastic syn-drome	1 (0.47%)	
		Deposits of epithelial malignancy	1 (0.47%)	
		Granulomatous disease	1 (0.47%)	
		Multiple myeloma	1 (0.47%)	
Total			210 (100%)	210 (100%)

Table 6: Causes of Pancytopenia in various studies

Sr. No	Study	Coun-try	Year	No. of cases	Commonest cause	Second most common cause
1	Tilak V and Jain R[2]	India	1998	77	Megaloblastic anaemia (68%)	Aplastic anaemia (7.7%)
2	Savage DG et al[3]	Zim-babw e	1999	134	Megaloblastic anaemia	Aplastic anaemia
3	Khodke et al[4]	India	2000	166	Hypoplastic Anaemia (29.51%)	Megaloblastic anaemia (22.3%)
4	Khunger J.M. et al[5]	India	2002	200	Megaloblastic anaemia (74%)%)	Aplastic anaemia (14%)
5	Mobina Ah-san Dodhy et al[6]	Paki-stan	2005	392	Megloblastic anaemia (35.95%)	Hypersplenism (16.3%)
6	Jha et al[7]	Nepal	2008	148	Hypoplastic Anaemia (29.5%)	Megaloblastic anaemia (23.64%)
7	B N Gayathri and Kadam Satyana-rayan Rao[8]	India	2011	104	Megloblastic Anaemia (74.04%)	Aplastic anaemia (18.26%)
8	Verma Nidhi et al[9]	India	2012	72	Megaloblastic anaemia (40.3%)	Aplastic anaemia (22.2%)
9	Present study	India	2013	210	Megaloblastic anaemia (65.71%)	Aplastic anaemia (16%)

DISCUSSION

In the present study Megaloblastic anaemia (65.71%) was the commonest cause of pancytopenia, followed by Aplastic anaemia (22.38%), Acute Lymphoblastic Leukemia (3.33%), Acute Myeloid Leukemia (2.38%), Acute Leukemia-unclassified (0.47%), Hypersplenism (2.38%), Gauchers Disease (0.47%), Gelatinous bone marrow transformation (0.95%), Myelodysplastic syndrome (0.47%), Deposits of epithelial malignancy(0.47%), Granulomatous disease (0.47%), Multiple Myeloma (0.47%).

CONCLUSION

The commonest cause of pancytopenia in our study and studies done in India is megaloblastic anaemia. All these studies seem to reflect the higher prevalence of nutritional anaemia in Indian subjects.

The present study concludes that detailed primary haematological investigation along with bone marrow aspiration in pancytopenic patients are helpful for understanding the diasease process; to diagnose, or to rule out the cause of pancytopenia and in planning further investigations and management of patients.

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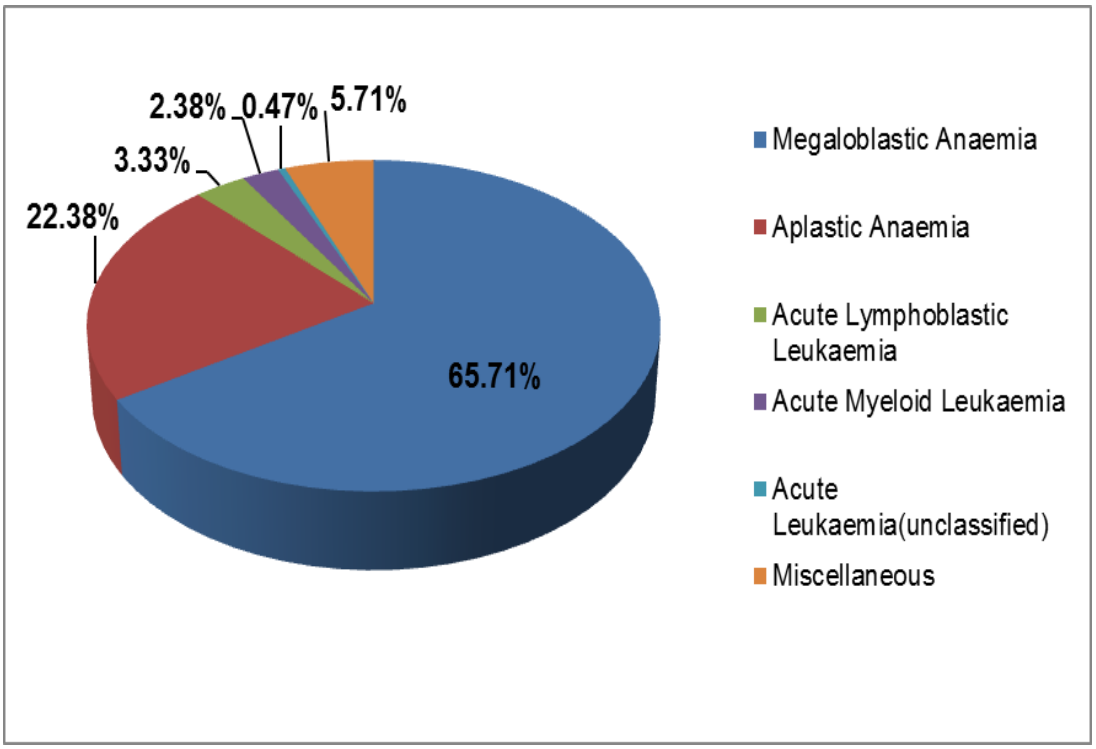

Figure 1: Distribution of total cases as per causes of Pancytopenia

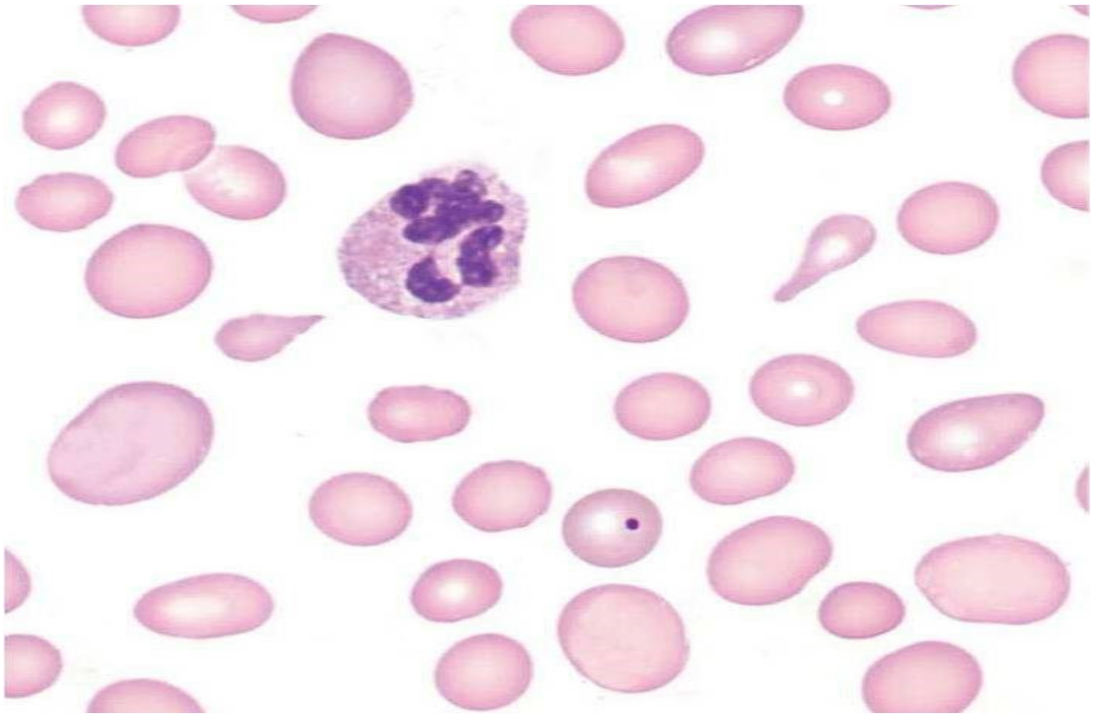

Figure 2: Megaloblastic anemia. Peripheral smear showing hypersegmented neutrophils and macroovalocytes. Leishman's stain – 10x X 100x

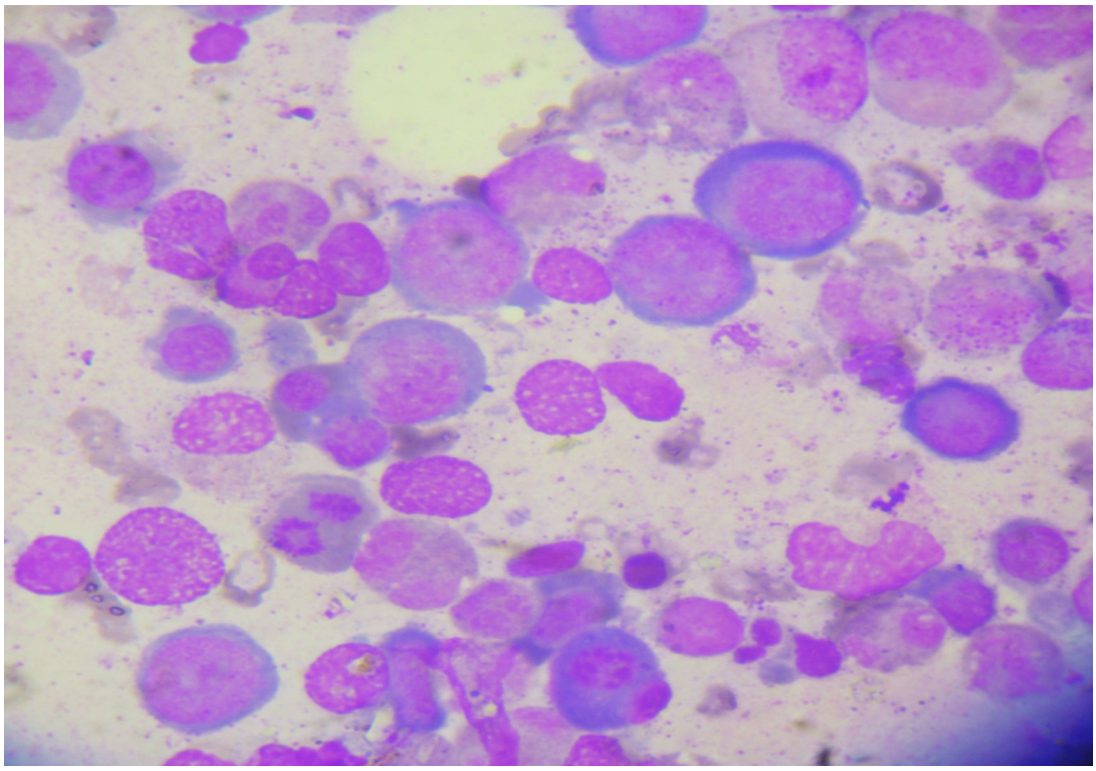

Figure 3: Bone marrow showing erythroid hyperplasia with megaloblasts

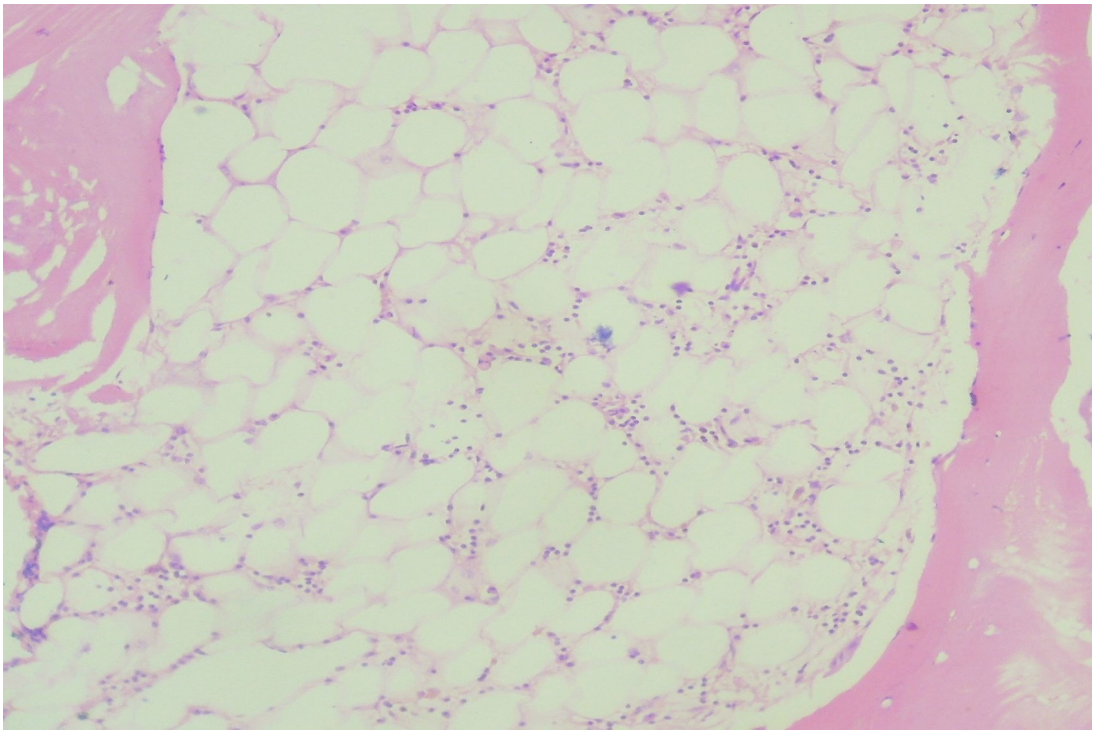

Figure 4: Bone marrow in aplastic anemia showing increased fat cells