

Pancytopenia in Pediatric Population: An Etiological and Haematological Analysis in a Tertiary Care Hospital, TS

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Abstract

Pancytopenia is a haematological condition rather than a disease, where the RBC, WBC and platelets are decreased in a patients blood. If one has pancytopenia it means there is an underlying cause responsible for it .Diagnostic evaluation of pancytopenia requires detailed clinical history, physical examination, haematological investigations including thorough peripheral blood smear and bone marrow examination. Pancytopenia is a serious condition, which should not be ignored. Prompt treatment is required. The etiological causes vary from simple causes to life threatening conditions. So early recognition of the causes helps in improving the prognosis of the patients.

Keywords: Pancytopenia, haematological investigations, children

Introduction

Pancytopenia is an haematological condition with a triad of findings which may result from a number of disease conditions affecting the bone marrow

primarily or secondarily resulting in pancytopenia¹.

Pancytopenia can be diagnosed incidentally when it is mild or it can be seen in few critically ill conditions such as in sepsis.²

Table no. 1: Etiology of Pancytopenia

Decreased production	Peripheral destruction	Decreased production and Peripheral destruction
Aplastic anemia-congenital and acquired	Autoimmune haemolytic, pancytopenia	Paroxysmal nocturnal hemoglobinuria
Bone marrow infiltrating conditions	Splenic sequestration	SLE Drugs leukemia
Malignancy		Hemophagocyticy mphohistiocytosis
Primary and autoimmune myelofibrosis		

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Granulomatous disorders		Transfusion associated graft versus host disease
Metabolic disorders		Infections
Nutritional deficiencies		
Vitamin B12		
Folic acid		
Copper		
Myelodysplastic syndrome		

Pancytopenia defined as Hb<or equal to 10g/dl, total WBC count<4000*10⁹, platelet count< or equal to 150*10⁹/L

The reticulated platelet count or immature platelet fraction though not used commonly, can also help distinguish if the pancytopenia is due to impaired production or increased consumption.³

Pancytopenia etiology in children may vary from transient bone marrow suppression because of simple viral infections to infiltration of marrow by life threatening conditions like malignancy .⁵

Bone marrow cellularity, morphology and composition in cases of pancytopenia vary according to the underlying cause.

Primary production defect is associated with hypocellular marrow.

Cytopenias resulting from defective/improper hematopoiesis, increased peripheral utilization or destruction of cells is usually associated with normocellular or hypercellular marrow.

The Pancytopenia etiology varies in patients from transient bone marrow suppression because of viral infections to infiltration of bone marrow by life threatening conditions like malignancy.⁵

Pancytopenia may be induced iatrogenically due to certain medicines, chemotherapy or radiotherapy for malignancies.⁵

The composition and cellularity in cases of pancytopenia vary according to the underlying cause.

Primary production defect is associated with hypocellular marrow.

Cytopenias resulting from defective hematopoiesis or increased peripheral destruction is usually associated with normal or increased cellularity of the bone marrow.¹

Our study has been initiated to identify simple treatable and also to find out reversible causes leading to pancytopenia.

Consent: Informed written consent from parents/guardians.

Conflict of interest: We authors have no conflict of interest.

Materials and Methods

Ours is a retrospective study which was carried out in our hospital and all records of patients admitted in Dept. of Pediatrics with an initial diagnosis of Pancytopenia during a duration of 1 year 7 months, between January 2021 and august 2022 were reviewed.

Cases who had history of previous blood transfusion were excluded.

A thorough clinical examination, findings, haematological parameters-CBC, retic count and peripheral smear, BMA/BM Biopsy were recorded.

The blood counts were performed on an automated cell counter [sysmex XN 1000] and abnormal findings confirmed by a hematopathologist.

All peripheral blood smears, bone marrow aspirates or trephine biopsy were processed as per standard techniques.¹

This study has been carried out to find causes which can be easily treated and also find out the reversible causes leading to pancytopenia.

Inclusion criteria:

Children of age group- 1 to 15 years

Pancytopenia on peripheral smear.

Patients with consent [informed]

Exclusion criteria:

Children below 1 year and greater than 15 years.

Known cases of leukemias or aplastic anemia.

On treatment-chemotherapy / radiotherapy.

Past history of blood transfusion.

Not given consent

Results

In our study period of 20 months age group 0 to 15 admitted for pancytopenia were evaluated.

Table 2: Patients distribution according to sex and age.

Age	Male	Female	Total
0-5 years	5	7	12
6-10 years	11	10	21
11-15 years	7	2	9
Total	23	19	42

Out of 42 patients,23 were males and 19 were females.

Males to females ratio 1.2:1

Age range-1to 5 years -12[28.5%]

6 to 10 years-21[50%]

11-15 years-9[21.4%]

Table 3: Etiology table

S. no.	Diagnosis	Number [%]
1	Megaloblastic anemia	28.57%
2	Acute leukemia [ALL]	26.19%
3	Aplastic anemia	2.38%
4	Erythroid hyperplasia	4.76%
5	MDS	2.38%
6	Secondary deposits	2.38%
7	HLH	2.38%
8	Hypoplastic marrow	19.04%

Megaloblastic anemia was the commonest cause

of pancytopenia making upto 28.5% of all cases, followed by haematological malignancies accounting for 26.19% of all cases.

Hypoplastic marrow was another important cause accounting for 19.04% of pancytopenia cases.

The other causes included:

Myeloid hyperplasia-11.9%

Erythroid hyperplasia 4.76%

Aplastic anemia-2.38%

MDS -2.38%

Secondary deposits-2.38%

HLH-2.38%

There was adry tap in 2 cases[4.76%] for which bone marrow biopsy was done.one turned out to be ALL and another one megaloblastic anemia.

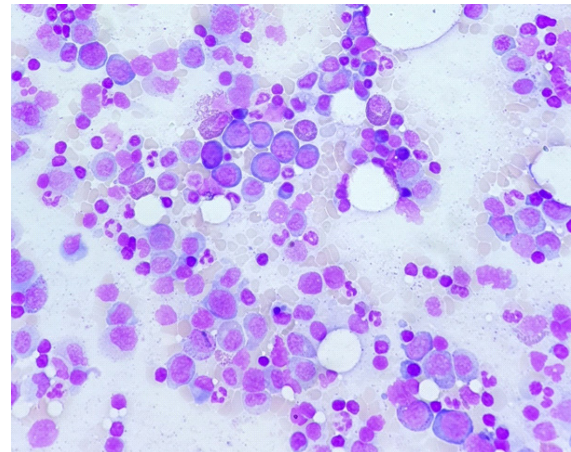


Fig 1: Megaloblastic anemia bone marrow.

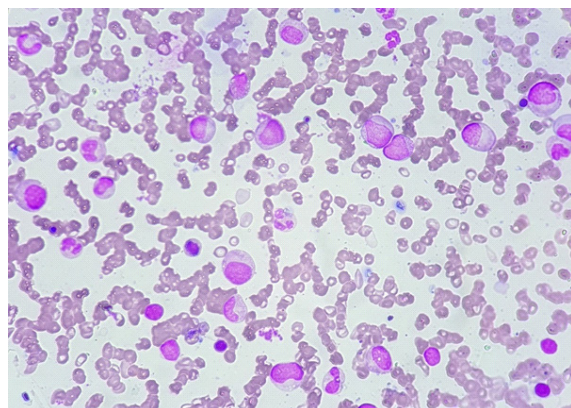


Fig 2: Myeloid hyperplasia bone marrow

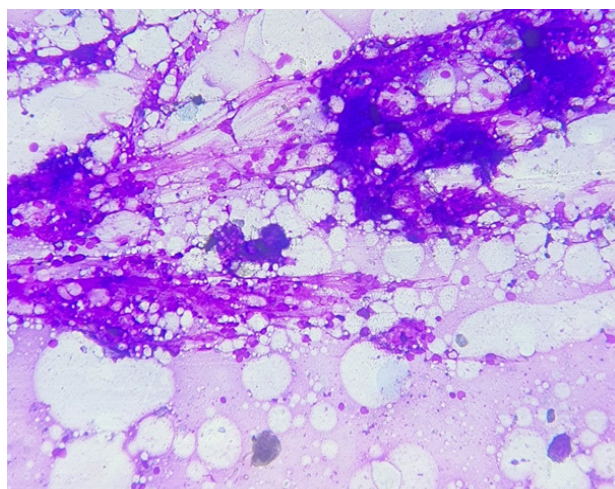


Fig 3: Hypoplastic marrow bone marrow

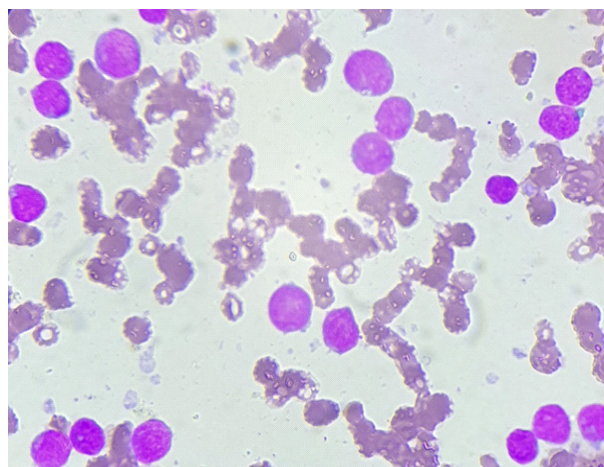


Fig 4: Acute leukemia

Discussion

On observing the results of our study, pancytopenia can be a presentation for a wide variety of illness in pediatric population.

A comparison to similar studies of pancytopenia in adults from india has been done and our study is comparable to most of them.

Megaloblastic anemia was the commonest cause of pancytopenia[28.5%]

Similar to tilak and jain et al⁴

Various studies reported megaloblastic anemia as an important cause of pancytopenia like ours.

Indian studies-bhatnagar et al³, khunger etal³

And other African studies Savage et al⁶

Bone marrow aspiration was an extremely helpful investigation to come to an definitive diagnosis in majority of the cases [95.2%] and was inconclusive[dry tap] in 2 cases[4.76%]

Bone marrow biopsy was done in these 2 cases and diagnosed as ALL and megaloblastic anemia.

Male preponderance noted in our study similar to makajuetal, jha etal⁷

Myeloid hyperplasia causing pancytopenia accounting for 11.9% in our study.

Various causes include infectious etiology, reactive marrow, stress and drugs.⁸

Hypoplastic marrow causing pancytopenia accounting for 19.04% in our study. Various causes include post viral suppression, infections, medications, toxins, herbal medicines, congenital bone marrow failure syndromes.⁹

MDS causing pancytopenia accounting for 2.38% in our study diagnosed as fanconis anemia.

Secondary deposits of small round cell tumor in a27 day old female was another cause leading to pancytopenia in our study.

HLH causing pancytopenia was seen in a one year male post dengue infection.

Acute leukemia causing pancytopenia accounting for 26.19% in our study.¹⁰

Conclusion

Patients of Pancytopenia may present in emergency room due to thrombocytopenia as severe bleeding. These sick appearing pediatric patients can have a simple, benign and treatable underlying cause. Due to easy availability of automated hematology cell counters, megaloblastic anemia which is an important cause of pancytopenia could be easily picked up. Though Pancytopenia is an important and frequent cause which can lead to morbidity and mortality in pediatric patients, early recognition of the cause may certainly have an impact on their outcome.

Ethical clearance: taken from college ethical committee.

Source of funding: Self.

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