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Clinico-etiological profile of pancytopenia in paediatric patients with special reference to bone marrow examination: A tertiary care centre based study

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Abstract
Context: Pancytopenia is a consequence of varied aetiology in paediatric age group. The aetiology can be determined by bone marrow assessment and clinical profile of patient.
Aim: The aim of the study was to assess clinical profile, bone marrow morphology and to identify easily treatable and reversible causes of paediatric pancytopenia cases.
Setting: Tertiary care centre in Rajasthan
Study design: Prospective
Methods and material: The study was conducted at the Department of Pathology, RNT Medical College, Udaipur, Rajasthan from January 2019 to December 2019. Patients aged 2 months to 15 years who had pancytopenia on peripheral blood smear and were admitted for bone marrow examination were included in the study. Detailed history and clinical profile were taken in all cases.
Results: Out of 54 patients presenting with pancytopenia, the most common presenting complaint was generalized weakness (92.6%) followed by fever (77.78%). The most common physical finding was pallor (100%), followed by splenomegaly (42.60%) and hepatomegaly (40.74%). Megaloblastic Anaemia was the most common aetiology (48.15%) followed by Aplastic Anaemia (16.67%) and Acute Leukaemia (11.11%).
Conclusion: As megaloblastic anaemia is the most common cause of pancytopenia and being an easily treatable condition, it should be taken into consideration before the more serious conditions like leukaemia and aplastic anaemia.

Keywords: Pancytopenia, Bone Marrow examination, Megaloblastic Anaemia

Introduction
Pancytopenia is an important clinico-haematological entity encountered in our day-to-day clinical practice. Pancytopenia is not a disease entity but a triad of findings in which all blood cell lineages i.e. leukocytes, erythrocytes and platelets are reduced in blood [1]. It is quite a common finding among children.
Pancytopenia is defined as haemoglobin <10 gm/dl, total white cell count < 4.0 x 10^9 /L, absolute neutrophil count (ANC) < 1,500/µl, and platelet count < 100,000/µl [2].
Presenting symptoms are usually attributable to anaemia, leucopoenia or thrombocytopenia. Anaemia leads to fatigue, dyspnoea and cardiac symptoms. Thrombocytopenia leads to bruising, mucosal bleeding and neutropenia leads to sharply increased susceptibility to infection [3]. The common clinical manifestations of pancytopenia are usually fever, fatigue, dizziness, weight loss, anorexia, night sweats, pallor, bleeding, splenomegaly, hepatomegaly, and lymphadenopathy [4].
The aetiology of pancytopenia varies widely in children, ranging from transient marrow suppression due to viral infection to marrow infiltration by life-threatening malignancy. It may also be caused iatrogenically, secondary to certain drugs, chemotherapy or radiotherapy for malignancies or due to nutritional deficiency [5].
Bone marrow aspiration is important for knowing the exact aetiology and to aid in specific treatment and prognostication of certain diseases. In case of pancytopenia bone marrow cellularity and composition differ in relationship to underlying pathological condition ranging from hypocellular to hypercellular.

The marrow is generally hypocellular in cases of pancytopenia caused by a primary production defect whereas cytopenia resulting from ineffective haematopoiesis, increased peripheral utilization or destruction of cells, and bone marrow invasion by malignant cells are usually associated with a normocellular or hypercellular marrow [6].

Although pancytopenia is a common clinical finding with extensive differential diagnosis, there is a paucity of data on paediatric age group, especially with regards to clinical and etiological findings, in Udaipur region of Rajasthan.

The aim of this study was to identify easily treatable and reversible causes of pancytopenia.

Method

This was a prospective study, conducted at the Department of Pathology, RNT Medical College, Udaipur, Rajasthan from January 2019 to December 2019. Patients under 15 years of age having pancytopenia at presentation were analysed. Pancytopenia was defined as haemoglobin <10 gm/dl, total white cell count < 4.0 x 10^9 /L, absolute neutrophil count (ANC) < 1,500/µl, and platelet count < 100,000/µl. The data were collected by convenience sampling from the pathology department of the hospital. The patient's identities were kept anonymous and only the serial number, gender, and aetiology for pancytopenia were noted. Patients aged 2 months to 15 years, who had pancytopenia on a peripheral blood smear and followed by bone marrow examination were included in the study. Children aged more than 15 year, already diagnosed cases of aplastic anaemia and leukaemia, children with history of recent blood transfusion and those receiving chemotherapy and radiotherapy were excluded. The details of complete clinical profile and haematological parameters at presentation were recorded. All those cases in which the diagnosis could be confirmed were included in the final analysis.

Results

In the present study 54 patients of pancytopenia were evaluated for Bone marrow examination and they were ranged from 2 months to 15 years of age. Out of 54 patients, 31 (57.41%) were males and 23 (42.60 %) females, with male to female ratio of 1.35:1 (Table 1), their ages ranged from 2 months to 15 years. Maximum number of patients 23 (42.60%) were in the age group of 11 year to 15 years, followed by 20 (37.04%) in the 6 to 10 years age group while minimum number 11 (20.40%) were upto 5 years of age.

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

Age Range (Years)	Male	Female	Total
Less than 1 year	1	0	1
1 TO 5	8	2	10
6 TO 10	9	11	20
11 TO 15	13	10	23
	31	**23**	**54**

Table 2 shows the aetiology of cases with pancytopenia. Megaloblastic anaemia was seen in 26 cases (48.15%) – being the most common cause of pancytopenia. Aplastic anaemia constituted 9 cases (16.67%) being the second most common cause of pancytopenia.

Acute Leukaemia was another important cause of pancytopenia (which included acute lymphoblastic leukaemia and acute myeloid leukaemia,) and constituted 6 cases (11.11%).

Iron deficiency Anaemia and Dimorphic Anaemia were seen in 4 cases (7.41%) and 2 cases (3.70%) respectively.

Among the infectious causes Malaria is most common entity seen in 4 cases (7.41%).

Other causes included 1 case each of metastasis, gelatinous transformation and immune thrombocytopenic purpura with megaloblastic anaemia.

Table 2: Aetiology of pancytopenia

Diagnosis	No. of Cases
Aplastic Anaemia	9
Iron Deficiency Anaemia	4
Malaria	4
Megaloblastic Anaemia	26
Megaloblastic Anaemia with Iron deficiency Anaemia	2
Acute Leukaemia	6
Metastasis	1
Gelatinous transformation	1
Megaloblastic Anaemia with Immune Thrombocytopenic Purpura	1
Total No. of Cases	**54**

Table 3 shows clinical profile of cases. The most common presenting complaint in current study was generalized weakness (92.6%) followed by fever (77.78%), weight loss (37.03%) and bleeding manifestation (38.9%). The most common physical finding was pallor (100%), followed by splenomegaly (42.60%) and hepatomegaly (40.74%).

Table 3: Clinical profile of pancytopenia children

Clinical Profile	No. of Cases
Generalised Weakness	50
Dyspnoea	15
Fever	42
Bleeding Manifestation	21
Pallor	54
Weight loss	20
Hepatomegaly	22
Jaundice	12
Splenomegaly	23

Marrow were hypercellular in 40 (74.10%) cases. Megaloblastic anaemia was most common cause showing hypercellular marrow in all the 26 cases (65%).The second most common cause was acute Leukaemia 6 cases (15%) while other causes included Malaria 4 cases (10%), Dimorphic Anaemia 2 cases(5%), Megaloblastic Anaemia with Immune thrombocytopenic purpura 1 case (2.5%) and Metastasis of round cell tumour 1 case (2.5%).

Hypocellular bone marrow was observed in 14 cases (25.92%), out of which 9 cases (64.28%) of suspected Aplastic anaemia confirmed by bone marrow biopsy were seen. Thus, Aplastic Anaemia was the most common cause of hypocellular marrow in our study. Other causes included Iron deficiency anaemia 4 cases (28.57%) and gelatinous transformation due to malnutrition 1case (7.14%). Table 4 shows the bone marrow cellularity and aetiology of pancytopenia.

Table 4: Bone marrow cellularity in pancytopenia cases.

Bone marrow cellularity	No. of cases
Hypercellualr marrow	
Megaloblastic anemia	26
Dimorphic anemia	2
Acute leukemia	6
Malaria	4
Megaloblastic anemia with itp	1
Metastasis	1
Hypocellular marrow	
Aplastic anemia	9
Iron deficiency anemia	4
Gelatinous transformation	1
Total	54

Discussion

Pancytopenia is not a rare presentation in children. It is not a disease by itself; rather it describes simultaneous presence of anaemia, leucopoenia and thrombocytopenia resulting from a number of disease processes [7].

A thorough history taking, physical examination, and the right laboratory investigations can lead to proper diagnosis and management of the aetiology.

Diagnosis of pancytopenia requires microscopic examination of a bone marrow biopsy specimen and a marrow aspirate to assess overall cellularity and morphology [8].

In current study, we came across 54 paediatric pancytopenia cases and overall male dominated female with male to female ratio of 1.35:1, this observation is in accordance with the study done by Ameileena C *et al.* and Goel RG *et al.* [9, 10].

Our study showed that megaloblastic anaemia 26 cases (48.15%) is the most common aetiological factor of pancytopenia. This is consistent with studies done by Ayub T Khan FR. in Pakistan and Bhatnagar *et al.* in India [11, 12].

Aplastic anaemia constituted 9 cases (16.67%) being the second most common cause of pancytopenia. However, studies done by Gupta *et al.*, Naseem *et al.* and Bhatnagar *et al.* in India and Memon *et al.* in Pakistan showed aplastic anaemia as the most common cause of Pancytopenia [12, 13, 14, 15].

Acute Leukaemia constituted 6 cases (11.11%) being the third most common cause of pancytopenia. Gupta *et al.* and Naseem *et al.* in India and Memon *et al.* in Pakistan showed acute leukaemia as the second most common cause of Pancytopenia [13, 14, 15].

Other causes in our study included iron deficiency anaemia, dimorphic anaemia, malaria and immune thrombocytopenic purpura which was in accordance with other studies.

The most common presenting complaint in current study was generalized weakness (92.6%) followed by fever (77.78%), weight loss (37.03%) and bleeding manifestation (38.9%). The most common physical finding was pallor (100%), followed by splenomegaly (42.60%) and hepatomegaly (40.74%). These findings were similar with the studies conducted by Bhatnagar *et al.* and Chand R *et al.* Both studies reported generalised weakness, fever and weakness as most common presenting complain while pallor and hepatosplenomegaly as most common physical findings [12, 16].

In current study marrow was hypercellular in 40 cases (74.10%) and megaloblastic anaemia (65%) was most common cause showing hypercellular marrow. Bone marrow was hypocellular in 14 cases (25.92%) and aplastic anaemia (64.28%) was most common cause of hypocellularity of marrow. This was similar to results observed by different studies [3, 13, 16].

Conclusion

Pancytopenia is a common haematological problem encountered in paediatric cases and should be suspected in patients presenting with unexplained anaemia, weight loss, splenomegaly and prolonged fever. Detailed primary haematological investigations along with bone marrow examination in pancytopenia patients are helpful to diagnose the causes of pancytopenia.

Current study concluded megaloblastic anaemia as the most common cause of pancytopenia, followed by aplastic anaemia and acute leukaemia.

Thus, megaloblastic anaemia being an easily treatable condition should be taken into consideration while attending to pancytopenia patients before the more serious conditions like leukaemia and aplastic anaemia are thought of. In developing countries, infections like malaria should also be kept in mind in addition to other serious conditions.

We should also use bone marrow aspiration procedure wisely, by limiting its use in suspected cases of pancytopenia due to nutritional deficiency whereas it is essential in cases of pancytopenia associated with haematological malignancies.

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References

1. Bates I, Bain BJ. Approach to diagnosis and classification of blood diseases. In: Lewis SM, Bain BJ, Bates I, editors. Dacie and Lewis Practical Haematology. 10th ed. Philadelphia: Churchill Livingstone 2006, p. 609-24.
2. Frank F, Collin C, David P, Byran R, Editor. De Gruchey's clinical hematology in medical practice. 5thed. Blackwell: Berlin 2004, 1199.
3. Khunger JM, Arculselvi S, Sharma U, Ranga S, Talib VH. Pancytopenia: a Clinico-haematological study of 200 cases. Indian J Pathol Microbiol 2002;45(3):375-9.

4. Imbert M, Scoazec JY, Mary JY, Jouzult H, Rochant H, Sultan C, *et al.* Adult patients presenting with pancytopenia: a reappraisal of underlying pathology and diagnostic procedures in 213 cases. Hematol Pathol 1989;3:159-67.
5. Kar M, Ghosh A. Pancytopenia. J Indian Acad Clin Med 2002;3:29-34.
6. Niazi M, Raziq F. The incidence of underlying pathology in pancytopenia. J Postgrad Med Inst 2004;18:76-9.
7. Pizzo PA, D'Andrea AD. The Pancytopenias. In: Behrman RE, Kleigman RM, Jenson HB. (eds), Nelson Textbook of Pediatrics.16th edn. W.B. Saunders Co, Philadelphia 1999;1495-98.
8. Freedman MH. The Pancytopenias. In Behrman RE, Kleigman RM, Jenson HR (eds). Nelson textbook of Pediatrics 18th edn. WB Saunders Co Philadelphia 2007;2047-55.
9. Ameileena C, Vipan C, Anubhava P, Harish C. Clinicoaetiological profile of pancytopenia in pediatric practice. JIACM 2012;13(4):282-5.
10. Goel RG, Bhan MK, Azany S. A study of severe anemia in hospitalized children in Afghanistan. Indian Pediatr 1981;18:643-646.
11. Ayub T, Khan FR. Prevalence of megaloblastic anaemia in a paediatric unit. Gomal J Med Sci 2009;7:62-4.
12. Bhatnagar SK, Chandra J, Narayan S, Sharma S, Singh V, Dutta AK, *et al.* Pancytopenia in children: Etiological profile. J Trop Pediatr 2005;51:236-9.
13. Gupta V, Tripathi S, Tilak V, Bhatia BD. A study of clinico-haematological profiles of pancytopenia in children. Trop Doct 2008;38(4):241-3.
14. Memon S, Salma S, Nizamani MA. Etiological spectrum of pancytopenia based on bone marrow examination by children. J Coll Physicians Surg Pak 2008;18:163-7.
15. Naseem S, Varma N, Das R, Ahluwalia J, Sachdeva M, Marwaha R, *et al.* Pediatric patients with bicytopenia/pancytopenia: Review of etiologies and clinico-hematological profile at a tertiary center. Indian J Pathol Microbiol 2011;54(1):75-80.
16. Chand R, Singh N. Clinic-etiological profile of pancytopenia in children: a tertiary care centre-based study of Kumaun region, India. Int J Contemp Pediatr 2018;5(6):2173-2177.