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CLINICO HEMATOLOGICAL STUDY OF PANCYTOPENIA IN A TERTIARY CARE CENTER: A ONE-YEAR EXPERIENCE

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Abstract: Background: Pancytopenia, characterized by the reduction of all three blood cell lines (red cells, white cells, and platelets), can result from a variety of conditions ranging from transient marrow suppression due to infections to serious diseases such as leukemia. Accurate etiological diagnosis is crucial for targeted treatment and prognosis. **Aims and Objectives**: This study aimed to evaluate the clinical and hematological profile of pancytopenic patients in a tertiary care hospital in North India. **Materials and Methods**: This cross-sectional comparative prospective study was conducted over one year (June 2015 to May 2016) at the Department of Pathology, Santosh Medical College, Ghaziabad, UttarPradesh. Detailed clinical histories, physical examinations, and hematological parameters, including bone marrow aspiration and biopsy, were recorded for pancytopenic patients. In total, bone marrow aspirations were performed on 27 patients and biopsies on 6 patients. **Results**: A total of 104 pancytopenic cases were studied. The most common cause was megaloblastic anemia (40 cases), followed by mixed nutritional anemia (24 cases). Other causes included iron deficiency anemia (4 cases), dengue infection (4 cases), multiple myeloma (2 cases), and metastatic carcinoma (3 cases). Less common causes included tropical splenomegaly, myelodysplastic syndrome, non-Hodgkin lymphoma, aleukemic leukemia, hemophagocytosis, leishmaniasis, and ITP, with one case each. **Conclusion**: Pancytopenia is a common hematological problem encountered in clinical practice. A thorough clinical and hematological workup, including bone marrow studies, is essential for early diagnosis and management.

Keywords: pancytopenia, etiology, bone marrow biopsy, megaloblastic anemia

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INTRODUCTION:

Pancytopenia is a significant clinico-hematological condition often seen in clinical settings. [1] Its clinical presentation can vary widely, influencing treatment strategies and outcomes. Pancytopenia is defined as the simultaneous reduction of hemoglobin (Hb < 9 gm/dL), total leukocyte count (TLC < 4x10^9/L), and platelet count (< 140x10^9/L). [2] It is not a standalone disease but a triad of findings indicative of various serious and potentially life-threatening conditions. [3] While some studies have focused on adult patients with pancytopenia, there remains a paucity of comprehensive data. [4-5] This study examines the clinical presentations of pancytopenia across a broad age range (12-70 years) in a tertiary care hospital in North India, evaluating hematological parameters, including bone marrow aspiration and biopsy.

MATERIALS AND METHODS:

Study Design

This is a cross-sectional prospective analytical study conducted over a period of one year at Santosh Medical College, Ghaziabad, UttarPradesh

Sample Size

104 cases were included in the study.

Inclusion Criteria

- All patients diagnosed with pancytopenia through complete hemogram referred to the Department of Pathology,
- Detailed clinical history and physical examination were performed for each case.

Exclusion Criteria

- Patients previously diagnosed with pancytopenia/bicytopenia.
- Patients who had recently received blood transfusions.
- Patients who did not consent to bone marrow aspiration or biopsy if indicated.

blood smear examination. Peripheral blood smears were stained with Romanowsky stain for microscopic evaluation. Bone marrow aspiration and trephine biopsies were conducted as clinically indicated. Bone marrow aspirates and trephine biopsies were performed from the posterior superior iliac spine (PSIS). Standard protocols were followed for the bone marrow procedures and staining.

RESULTS:

A total of 104 cases of pancytopenia were analyzed. There was a male predominance with a male-to-female ratio of 1.32:1. The most common clinical presentation was generalized weakness, followed by fever, abdominal pain, cough, nausea, vomiting, bleeding, abdominal distention, and palpitations. Physical examination commonly revealed pallor, followed by splenomegaly, hepatomegaly, icterus, and multiple fractures.

Hemoglobin Levels

- < 3 gm/dL: 3 cases (4%)
- 3.1 - 6 gm/dL: 50 cases (67.56%)
- 6.1 - 7 gm/dL: 21 cases (28.37%)

Total Leukocyte Count

- 500 - 1000 cells/cumm: 1 case (1%)
- 1100 - 2000 cells/cumm: 11 cases (11%)
- 2100 - 3000 cells/cumm: 39 cases (39%)
- 3100 - 4000 cells/cumm: 49 cases (49%)

Platelet Count

- 4000 - 20000 cells/cumm: 2 cases (2%)
- 21000 - 50000 cells/cumm: 35 cases (35%)
- 51000 - 100000 cells/cumm: 63 cases (63%)

Peripheral Smear

- Dimorphic picture: 39.10%
- Microcytic hypochromic: 32.40%
- Normocytic normochromic: 14.3%
- Macrocytic: 13.97%

Bone Marrow Aspiration Findings (51 Cases)

- Megaloblastic anemia: 26 cases (50.98%)
- Mixed nutritional anemia: 7 cases (13.72%)
- Hypoplastic anemia: 5 cases (9.8%)
- Iron deficiency anemia: 2 cases (3.92%)
- Multiple myeloma: 2 cases (3.92%)
- Metastatic carcinoma: 2 cases (3.92%)
- Tropical splenomegaly: 1 case (1.96%)
- Myelodysplastic syndrome (RA): 1 case (1.96%)
- Non-Hodgkin lymphoma: 1 case (1.96%)
- Aleukemic leukemia: 1 case (1.96%)
- Hemophagocytosis: 1 case (1.96%)
- Leishmaniasis: 1 case (1.96%)
- ITP: 1 case (1.96%)

Bone Marrow Biopsy Findings (7 Cases)

- Metastatic carcinoma: 2 cases
- Multiple myeloma: 2 cases
- Non-Hodgkin lymphoma: 1 case
- Leishmaniasis: 1 case
- Megaloblastic anemia: 1 case

Etiology of Pancytopenia (`104 Cases)

- Megaloblastic anemia: 40 cases (41%)
- Mixed nutritional anemia: 24 cases (20%)
- Hypoplastic marrow: 5 cases (7%)
- Malaria: 5 cases (7%)
- Iron deficiency anemia: 4 cases (5%)
- Dengue: 3 cases (4%)
- Metastatic carcinoma: 3 cases (3%)
- Multiple myeloma: 2 cases (3%)
- Tropical splenomegaly: 1 case (1%)
- Aleukemic leukemia: 1 case (1%)
- Non-Hodgkin lymphoma: 1 case (1%)
- Hemophagocytosis: 1 case (1%)
- Hypersplenism due to kala azar: 1 case (1%)
- Myelodysplastic anemia (RA): 1 case (1%)
- ITP: 1 case (1%)
- Undiagnosed: 2 cases (3%)

- **Study Overview:** Our study focused on the clinico-hematological and etiological profile of pancytopenia in a tertiary care hospital in North India. The age distribution of cases ranged from 2 to 80 years, with the most commonly affected age group being the 1st to 3rd decade (21-30 years). This is consistent with similar studies conducted by Tilak et al. [6] and B.N. Gayathri et al. [7]

- **Gender Preponderance:** Our study observed a male preponderance, aligning with findings from other investigations by Qazi et al. [8], Khunger et al. [9], Niazi et al., [2] and Tilak et al [6].

- **Common Presenting Symptoms:** Generalized weakness (94%) emerged as the predominant symptom in our study, followed by fever (59%). Other presenting symptoms included breathlessness, abdominal pain and distension, easy fatigability, weight loss, chills, rigors, bleeding disorders, and bone pain. Notably, B.N. Gayathri et al. [7] and Osama et al. [10] also reported generalized weakness as a common presenting feature.

- **Etiological Profile:** Megaloblastic anemia (47%) was the leading cause of pancytopenia in our study, followed by infections (17%), iron deficiency anemia (4%), mixed nutritional anemia (8%), aplastic anemia (5%), acute leukemia (7%), metastatic carcinoma (2%), and multiple myeloma (2%). A small proportion of cases (2%) remained undiagnosed. Interestingly, studies from India [11-13] and other developing countries consistently identified megaloblastic anemia as the most common cause, in contrast to western countries where aplastic anemia predominated.

- **Implications and Recommendations:** The presence of pancytopenia warrants vigilant clinical attention. Timely workup and recognition of underlying conditions are crucial for patient management. Early investigations, including immunophenotyping and cytogenetic studies, are essential for accurate diagnosis. Identifying underlying conditions promptly can significantly impact patient outcomes.

CONCLUSION:

- In summary, our study sheds light on the multifaceted nature of pancytopenia, emphasizing the need for comprehensive evaluation and timely intervention. The most common cause in our study was megaloblastic anemia followed by mixed nutritional anemia. The other causes in descending order of occurrence were iron deficiency anemia, dengue infection, multiple myeloma, and metastatic carcinoma. The less common causes included tropical splenomegaly, myelodysplastic anemia, non-Hodgkin lymphoma, aleukemic leukemia, hemophagocytosis, Leishmaniasis, and ITP. This study highlights the fact that the presence of pancytopenia should be taken with great clinical concern and timely workup of such patients will aid in pointing toward diagnosis or planning further investigations such as immunophenotyping and cytogenetic studies in the majority of the cases. In addition, an early recognition of the underlying conditions will have an impact on the mortality and morbidity in vulnerable patients.

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- Ethical clearance was obtained.

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CONFLICT OF INTEREST:

Authors declared no conflict of interest

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