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Investigation of clinical and haematological characteristics in patients with pancytopenia

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Abstract
Background and Objectives: Pancytopenia is a condition characterised by the simultaneous presence of anaemia, leucopenia, and thrombocytopenia, which can be caused by a wide range of factors. The study aimed to diagnose various illnesses that cause Pancytopenia based on clinical, haematological, and/or Bone Marrow Studies and to determine the prevalence of various disorders causing Pancytopenia.

Material and Methods: The study is conducted by collecting data from patients with pancytopenia in a planned and systematic manner. The research was conducted on pancytopenia patients who were hospitalised to the Department of General Medicine at Sambhram Institute of Medical Sciences and Research in BEML Nagar, Kolar Gold Fields, Karnataka, India. This study was a hospital-based prospective study done over a period of one year, from June 2017 to May 2018.

Results: The latest research indicates that the primary cause is megaloblastic anaemia, with hypersplenism being the second most common reason. Megaloblastic anaemia is characterised by the presence of hypersegmented neutrophils, and the frequency of this occurrence has shown variation across different research studies. This study examines the existence of hypersegmented neutrophils. Nucleated red blood cells, although not mentioned in traditional literature, were found in 24% of the megaloblastic population in our study.

Conclusion: The aforementioned study's findings also suggest that promptly identifying patients with megaloblastic anaemia and addressing the underlying cause in the early stages can decrease the occurrence of pancytopenia and its associated complications.

Keywords: Clinical-hematological, megaloblastic, neutrophils, pancytopenia

Introduction

Anaemia, leukopenia, and thrombocytopenia are the three blood diseases that make up pancytopenia. Both the worldwide and regional incidence rates range from 2-5 incidences per million persons annually. Nearly twice as many cases occur in Asian countries as in other regions [1]. People between the ages of 15 and 25 and 65 and 69 had the highest incidence. The causes of pancytopenia have been the subject of conflicting research. Both foreign nations and even areas within a single nation place a high importance on this diversity. Multiple studies in northern and southern India have shown that megaloblastic anaemia is the most common reason for pancytopenia. Aplastic anaemia was shown to be the most common cause of pancytopenia in the study. Diseases like leishmaniasis and malaria, in addition to aplastic anaemia, were the main reasons for pancytopenia in Bangladesh. The main causes of pancytopenia, according to research, are neoplastic diseases and radiation [2-4].

Beginning in the womb and continuing all the way into maturity, numerous bodily sites contribute to the production of red blood cells. In the first stage, the yolk sac produces new blood cells, later on, the liver synthesises red blood cells. Furthermore, the spleen is also involved in production to an extent. But starting about the seventh month of pregnancy, the bone marrow becomes the principal site of production, and it stays that way even after the foetus is born. While other organs are capable of producing lymphocytes, the bone marrow is the sole site where all other cells are produced. Spine, humerus, femur, skull, pelvis, and thoracic cage are the primary locations for bone marrow production in adults. The specific kind determines which lineages the hematopoietic stem cells differentiate into. In contrast to reticulocytes, which produce red blood cells, and megakaryocytes, which produce platelets, myeloid cells produce neutrophils, monocytes, and related cells [5-7].

Materials and Methods
The study relies on the prospective gathering of data from patients with pancytopenia. The study was conducted on pancytopenia patients who were hospitalised to the Department of General Medicine at Sambhram Institute of Medical Sciences and Research in BEML Nagar, Kolar Gold Fields, Karnataka, India. This study was a hospital-based prospective study done over a period of one year, from June 2017 to May 2018.

Inclusion criteria
- Ages 18 years and older, both sexes.
- Haemoglobin less than 10g/dl.

Exclusion criteria
- Every patient under the age of eighteen.

Results
This study population has identified multiple causes of pancytopenia. The most frequent cause is megaloblastic anaemia, which accounts for 50% of cases. Haematological malignancies were the second most prevalent causes, comprising 16% of the total. The subsequent decline in prevalence is observed in hypersplenism (10%), aplastic anaemia (8%), dengue fever with pre-existing iron deficiency anaemia (8%), systemic lupus erythematosus (4%), and hemophagocytic lymphohistocytosis (4%).

Table 1: Pancytopenia patients with various causes

Sr. No.	Causes	Patients
1.	Megaloblastic anaemia	24
2.	Hypersplenism	4
3.	aplastic anaemia	3
4.	Dengue fever with pre-existing iron deficiency anaemia	3
5.	systemic lupus erythematosus	1
6.	plasma cell dyscrasia	1
7.	myelodysplastic syndrome	1
8.	Hemophagocytic lymphohistiocytosis	1
9.	acute myeloid leukemia	1
10.	Non - hodgkins lymphoma	1
	Total	40

The study population has a malignancy incidence of 16%. These cancers were found in the people who were part of the research. What follows is a graphic depicting the average age of the research participants. It was expected that patients with SLE would have a lower mean age compared to others. The mean age of malignancies was found to be greater than the mean age of all causes combined.

Table 2: Various parameters range from min to max

Sr. No.	Parameters	Minimum	Maximum
1.	HB	1.00	10.00
2.	WBC	1.31	3.89
3.	Platelet	2.00	98.01
4.	MCV	53.00	132.00
5.	RDW	18.22	41.00
6.	MPV	9.00	12.12

Table 2 includes the minimum and maximum values for several parameters: HB (1-10), WBC (1.31-3.89), Platelets (2-98.01), MCV (53-132), RDW (18.22-41.00), and MPV (9-12.12).

Table 3: Analysis of blood cells in patients with pancytopenia

Sr. No.	Causes	Patients	A	B	C	D	E	F	G
1.	Megaloblastic anaemia	24	10	2	6	1	1	0	0
2.	Hypersplenism	4	2	0	0	0	0	0	0
3.	aplastic anaemia	3	2	0	1	0	0	0	0
4.	dengue fever with pre-existing iron deficiency anaemia	3	2	0	0	1	0	0	0
5.	systemic lupus erythematosus	1	1	0	0	1	0	0	0
6.	plasma cell dyscrasias	1	1	1	0	0	1	0	0
7.	myelodysplastic syndrome	1	1	1	1	1	0	0	0
8.	Hemophagocytic lymphohistiocytosis	1	1	0	0	0	0	0	0
9.	acute myeloid leukemia	1	0	1	0	0	0	0	0
10.	non hodgkins lymphoma	1	0	0	0	1	0	0	0
	Total	40	20	5	8	5	2	0	0

Table 3 shows the peripheral blood picture in pancytopenia patients. Acute myeloid leukaemia, non-Hodgkin lymphoma, hemophagocytic lymphohistiocytosis, plasma cell dyscrasias, myelodysplastic syndrome, and megaloblastic anaemia were the most common diagnoses, with ten patients affected.

Discussion
The majority of studies examining pancytopenia in adults have also included children. Because children and adults require different medical interventions, it is essential to study adults independently. Additionally, pancytopenia in children has quite different reasons than in adults. It has been repeatedly shown in many paediatric studies that pancytopenia is most commonly caused by cancer. Researchers found that acute leukaemia was the second most common cause of pancytopenia in children, at 25%, after aplastic anaemia (43%). Approximately 6.7% of children with pancytopenia had megaloblastic anaemia, making it the third most prevalent cause [14-16].

According to the research, 28.3% of pancytopenia cases were caused by aplastic anaemia. Next came megaloblastic anaemia at 19.5% and haematological malignancy at 23.9%. A different study was carried out in Pakistan by Khan *et al.* and looked at 279 kids who had pancytopenia. Pancytopenia was most often caused by acute leukaemia (32.2% of cases), aplastic anaemia (30.8% of cases), and megaloblastic anaemia (13.2%). Most studies on pancytopenia in adults have included a large number of paediatric patients, which is a major constraint despite the fact that there have been few studies on adults in general. There is a lack of clarity on the frequency of various causes of pancytopenia in adults due to this inclusion, which confuses the treating physician. Males make up a larger proportion of patient populations, according to most research. There were exactly as many men as there were females, according to our poll [17-19].

The most common causes of pancytopenia in studies done all around the world, with the exception of those in India. A thorough investigation confirms without a reasonable doubt that cancers are the main cause of pancytopenia. Based on our analysis, megaloblastic anaemia is the main cause of pancytopenia, followed by malignancies. Hypersplenism was found to be the main reason for pancytopenia, followed by megaloblastic anaemia. According to the research that has been reported, megaloblastic anaemia was the main reason. New evidence suggests that megaloblastic anaemia is the main cause of this illness, with hypersplenism as a secondary cause [20-23].

The frequency of hypersegmented neutrophils, which is linked to megaloblastic anaemia, has been found to differ between investigations. Comparatively, other studies have found hypersegmented neutrophil prevalence rates of 51.35 percent, 84.9 percent, and 68.5 percent, respectively. Our study discovered that 24% of patients with megaloblastic anaemia had nucleated red blood cells, which is not noted in the conventional literature. In the megaloblastic research population, nucleated red blood cells (RBCs) were found in around 12.5 percent of the subjects, according to various sources. Furthermore, within the megaloblastic subgroup of a particular study, some researchers have discovered a prevalence of nucleated RBCs as high as 24.5% [24-26].

Conclusion

Our findings suggest that megaloblastic anaemia is the most common cause of pancytopenia, although there are many other possible causes. Vitamin B12 insufficiency is the leading cause of megaloblastic anaemia. Being the most prevalent cause of megaloblastic anaemia and present in individuals who consume a varied diet, screening for b12 deficiency should thus be the initial screening test for evaluation of megaloblastic anaemia, regardless of the patient's diet. It is possible to proceed with additional investigations, such as a UGI scopy, depending on the clinical situation. When deciding what tests to run, it's important to rule out more serious causes, such as cancer, hypersplenism, or aplastic anaemia, the second most common in our study. Pancytopenia and its complications can be reduced by promptly identifying individuals with megaloblastic anaemia and treating the underlying cause in the first stage, according to the above study.

Conflict of Interest: None

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