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A Study on Prevalence of Vitamin B12 Deficiency in Patients with Pancytopenia in Western Part of UP State of India

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Abstract

A hematologic disorder called pancytopenia is defined by a reduction in all three peripheral blood cell lineages. Less than 12 g/dL of hemoglobin in women and 13 g/dL in males, less than 150,000 platelets per mcL or and an absolute neutrophil count of less than 1800 per milliliter are the characteristics that define it. Since pancytopenia can manifest in a variety of ways, a thorough assessment is carried out to determine its underlying cause. Study conducted prospectively in 50 patients of pancytopenia with age 18 years and above, who were presented to Department of Medicine in L.L.R.M MEDICAL COLLEGE, MEERUT during the period from May 2022 to May 2024. A complete clinical history and examination was carried out. They were evaluated for complete blood count with peripheral smear, liver function test, renal function test, vitamin B12 level and bone marrow examination in all patients. The etiological causes of pancytopenia were recorded as megaloblastic anaemia (84%)and aplastic anemia (16%).Most common presenting symptoms are pallor and easy fatiguability. About 52%, have hyper segmented neutrophils,46% of the population have macrocytosis, 44% of individuals have Macrovalocytosis and 26% of the subjects exhibited a dimorphic picture. About 78% of cases have hypercellularity and all patients with vitamin B12 deficiency improved after treatment with vitamin B12 supplement. Pancytopenia is not an uncommon clinical entity and has various etiologies. Most common cause of pancytopenia was B12 deficiency and most common symptoms and signs were easy fatiguability and pallor. Treatment for vitamin B12 deficiency was shown to improve hematological parameters.

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Key Words

Megaloblastic anemia, pancytopenia, vitamin b12 deficiency

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INTRODUCTION

A hematologic disorder called pancytopenia is defined by a reduction in all three peripheral blood cell lineages. <12 g/dL of hemoglobin in women and 13 g/dL in males, <150,000 platelets per mcL and an absolute neutrophil count of <1800 per milliliter are the characteristics that define it. The primary factors influencing these limits include age, gender and different clinical situations[1].

The major causes of pancytopenia are determined by sociocultural and geographic factors, particularly in the case of megaloblastic anemia. Gender predominance is rare in megaloblastic anemia cases. The higher frequency of infections, pancytopenia-causing medications and nutritional deficiencies in developing nations is probably the reason why there appear to be more cases in the north of India than in other directions.

Since pancytopenia can manifest in a variety of ways, a thorough assessment is carried out when a patient exhibits pancytopenia in order to determine its underlying cause[2].

Aims and Objectives: To investigate the prevalence of vitamin B12 deficiency in pancytopenia patients in the western region of the Indian state of Uttar Pradesh.

- To research pathogenic variables and clinical profile.
- To monitor the course of treatment for pancytopenia caused by vitamin B12 deficiency.

MATERIALS AND METHODS

This Study was conducted prospectively in 50 patients of pancytopenia with age 18 years and above, who were presented to Department of Medicine in L.L.R.M MEDICAL COLLEGE, MEERUT during the period from May 2022-May 2024.

Inclusion Criteria:

- Patient attending SVBP Hospital 18 year and above.
- Patient giving consent for study.
- Patient with pancytopenia.

Exclusion Criteria:

- Patient age <18 years.
- Patient not giving consent for study.
- Pregnant woman.
- Patients with leukaemia, lymphomas or any malignancy, tuberculosis, malaria, kalazar or HIV.
- Patients consuming chloramphenicol, metformin, proton pump inhibitors, colchicine, phenytoin, methyldopa, zidovudine, neomycin, OCPs.
- Chronic Smokers and chronic alcoholics.
- Patients recieving blood transfusion <3 months
- Patient having CLD or CKD.
- Patient on chemotherapy or radiotherapy.
- Patient with hypersplenism, septicemia or infection, granulomatous disease.
- Patient with MDS.

A complete history including presenting complaints, past history taken. General examination was carried out and specific emphasis was given to pallor, icterus, petechiae, clubbing, skin changes and lymphadenopathy. All systems were examined in detail.

Investigations done are Complete Hemogram, General blood picture, S. Ferritin, Serum folic acid, Serum Vitamin B12, Serum LDH, Liver function test, Kidney function test, USG Abdomen, Bone marrow Aspiration.

RESULTS AND DISCUSSIONS

The statistics of the total cases show that a significant portion, approximately 36%, belongs to the age group of 18-25 years, about 24% are in the age bracket of 26-35 years, 36-45 years and >45 years, both have an equal percentage of approximately 20%. The mean age of individuals affected by this condition was 36.34 years, with a standard deviation of 11.66 years, indicating variability in the age distribution. Of the total cases, about 56% were male and 44% were females. Hence, there is male predominance seen. Of the total cases, about 66% were vegetarian and about 34% were non vegetarian. In our study, 52% were from the lower middle class, 18% were from the upper lower class, 24% were from the upper middle class, and the remaining 6% came from the upper class.

Approximately 100% of the patients had pallor, and another 100% had easy fatiguability. About 28% of patients had glossitis, 26% had dyspnea, 24% had pigmentation on the knuckles, 18% had icterus, 12% had angular chelitis, another 12% had pedal edema, and 10% had CNS symptoms, while another 10% had bleeding, 8% had petechiae or easy bruisability.(Table 1).

Approximately 52%, have shown the presence of hyper segmented neutrophils, 46% of the population have macrocytosis, 44% of individuals have Macrovalocytosis, 26% of the subjects exhibited a dimorphic picture(Table 2).

About 78% of cases observed have hypercellularity, 16% of cases showed hypocellular bone marrow aspiration. Only 6% of cases exhibited normocellular bone marrow aspiration.

In our study, 84% of individuals suffer from megaloblastic anemia, while the remaining 16% are diagnosed with aplastic anemia.(Table 4)

Age distribution among patients with Megaloblastic Anemia (MA) and Aplastic Anemia (AA)

Table 1: Clinical features in Pancytopenia

Clinical features	No. of patients	Percentage(%)
Pallor	50	100
Easy fatiguability	50	100
Glossitis	14	28
Shortness of breath	13	26
Knuckles Pigmentation	12	24
Icterus	9	18
Pedal Edema	6	12
CNS symptoms	5	10
Angular cheilitis	6	12
Bleeding	5	10
Easy petechiae/ bruisability	4	8

Table 2: General blood picture (GBP) in Pancytopenia

GBP	No. of patients	Percentage(%)
Hypersegmented neutrophils	26	52
Macrocytosis	23	46
Macroovaocytosis	22	44
Dimorphic Picture	13	26

Table 3: Bone marrow Aspiration in Pancytopenia

Bone marrow Aspiration	No. of patients	Percentage (%)
Hypercellularity	39	78
Normocellular	3	6
Hypocellular	8	16
Dimorphic Picture	50	100

Table 4: Etiology of Pancytopenia

Etiology of Pancytopenia	No. of patients	Percentage (%)
Megaloblastic anaemia	42	84
Aplastic Anaemia	8	16
Total	50	100

reveals a notable prevalence of AA in younger individuals. Specifically, 38.9% of patients aged 18-25 years were diagnosed with AA, while 61.1% had MA (p = 0.010), indicating a significant association of AA with younger age groups. Rohira, N., Meenai, F. J., *et al.* (2019) 64% cases were observed in the age group of 11-30 years. Present study showed slight male preponderance with male to female ratio being 1.3:1 which was comparable to the studies conducted by Manzoor *et al* (2014), Biradar *et al* (2016) and Sahay *et al* (2018)[3,4,5,6].

Approximately 100% of the patients have pallor, and another 100% have easy fatiguability. About 28% of patients have glossitis, 26% have dyspnea, 24% have pigmentation on the knuckles, 18% have icterus, 12% have both angular chelitis and pedal edema. About 10% have neurological symptoms such as irritability and sensory deficits of impaired vibration sensation and joint position sense. These subjects underwent nerve conduction studies and 3 cases was of demyelinating peripheral neuropathy. Most subjects with Vitamin B12 deficiency reported subjective improvement in their symptoms of irritability and peripheral neuropathy. There was complete or partial recovery in sensory neuropathic complaints at 3 months after injectable vitamin B12 therapy in subjects with cobalamine deficiency with normal NCS in 2 cases, when test was repeated after 3 months. Another 10% have bleeding. Around 8% have petechiae or easy bruisability. This was comparable to the study conducted by Raina, Javia Singh *et al* (2020), Manzoor *et al* (2014) which showed that progressive pallor was the most common clinical feature and it was found in almost every case followed by generalized weakness, and dyspnea[7].

Around 84% of people experience megaloblastic anemia, while the other 16% are identified as having aplastic anemia in the present study .Bahal N *et al* (2016) showed similar results with megaloblastic anaemia(37%) as most common cause while Shetty, Varun *et al* (2023) identified aplastic anaemia(40%) as most common cause .Those differences in the etiology of pancytopenia are due to differences in population characteristics such as age, nutritional status and socioeconomic parameters[8,9].

In our study ,parameters between Megaloblastic Anemia and Aplastic Anemia. Hemoglobin (Hb) levels were significantly higher in Megaloblastic Anemia, with a mean of 5.23±1.52 g/dL compared to 3.40±1.17 g/dL in Aplastic Anemia (p=0.002).Absolute Neutrophil Count (ANC) was significantly higher in Megaloblastic Anemia (1.61±0.70 × 10^9 cells/L) compared to Aplastic Anemia (0.88±0.62 × 10^9 cells/L), with a notable difference (p=0.009). Platelet counts were also significantly higher in Megaloblastic Anemia, at 80.90±33.28 × 10^9 cells/L, versus 47.05±17.93 × 10^9 cells/L in Aplastic Anemia (p=0.008) Santra, Gouranga *et al* (2010) similar to our study the mean Hb was 5.90±1.90g/dl, mean ANC was 705±530/mm^3, mean platelets count was 45.20±38.60/mm3, mean Hb in Aplastic anaemia was lower 4.70±2.40g/dl. Approximately 52%, have shown the presence of hyper segmented neutrophils. About 46% of the population have macrocytosis. About 44% of individuals have Macrovalocytosis. In this study, it was found that about

26% of the subjects exhibited a dimorphic picture. The study by Patel *et al* (2018) was in contrast to our study as the observed predominant blood picture was normocytic normochromic (38.5%) followed by dimorphic (32.7%), macrocytic (17.3%) and microcytichypochromic (5.8%)[10,11].

Approximately 30% of the participants have serum ferritin levels a below 12ng/ml indicating iron deficiency. Combined iron deficiency and VitB12 deficiency found in 28% of patients. This study found that a staggering 84% of participants have a serum vitamin B12 level below 200pg/ml. Majority of the cases, 80%, have levels of serum folate higher than 5ng/ml. Combined Vitamin b12 deficiency and folic acid deficiency found in 6% of patients.

This present study found that approximately 38% of individuals showed an increase in their levels of lactate dehydrogenase (LDH).74%, have normal indirect bilirubin levels, rest 26%, were found to have higher indirect bilirubin levels but icterus seen in 18% cases.

Around 78% of the observed cases displayed an increase in cell count in bone marrow. Around 16% of the cases displayed a decrease in cell count in bone marrow aspiration. A small percentage (6%) of cases showed a normal level of cellularity in aspiration. Similar to our study Javia Singh Raina *et al* (2020) the maximum number of patients i.e. 48 (81.35%) showed hypercellularity in Bone Marrow.

It was observed that there was a significant increase in the levels of Haemoglobin, TLC, ANC, Platelets, MCH and reticulocyte count on follow up visit. This indicates that the treatment for vitamin B12 deficiency was effective in improving these hematological parameters.

CONCLUSION

There are various causes for pancytopenia. However, there is a lack of information on pancytopenia in the adult population of India, which led to this research. In India and other developing countries, individuals still face vitamin deficiencies that result in anemia and pancytopenia. Early detection and treatment can easily prevent these conditions. Vegetarian diets are more prone to have vitamin B12 deficiency.

Treatment for vitamin B12 deficiency was shown to improve hematological parameters. These findings emphasize the importance of monitoring vitamin B12 levels and providing appropriate treatment for deficiency in order to prevent and improve anemia. Further research may also be needed to explore other potential factors that contribute to anemia development.

Limitations: There are certain limitations to this study that must be acknowledged.

- Study only conducted in one region of India
- Other potential etiology not taken into account
- Further research needed to confirm findings and explore other causes

Recommendations: Recommendations for the present study.

- Use large and diverse sample size.
- Use standardized diagnostic criteria.
- Conduct thorough medical history and physical examination.
- Carry out longitudinal studies.

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