International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Evaluation of Clinical and Hematological Profile of Megaloblastic Anemia In Tertiary Care Hospital

Dr. Heny S. Pedhadiya[1] , Dr. Gauravi Dhruva[2], Dr. Deepa Jethvani[3]

[1]Senior resident, P.D.U. Medical College, Rajkot
[2]Professor and Head, P.D.U. Medical College, Rajkot
[3]Associate Professor, P.D.U. Medical College, Rajkot

OPEN ACCESS

Corresponding Author:

Dr. Heny S. Pedhadiya
Senior resident, P.D.U. Medical College, Rajkot

Received: 22-01-2026
Accepted: 04-02-2026
Available online: 16-03-2026

ABSTRACT

Background: Megaloblastic anemia is a common and potentially reversible cause of anemia, particularly in developing countries like India. It results from impaired DNA synthesis, most commonly due to vitamin B12 and folate deficiency, leading to characteristic hematological and clinical manifestations.
Aim: To evaluate the clinical and hematological profile of patients diagnosed with megaloblastic anemia in a tertiary care hospital.
Material and Methods: This observational, descriptive, cross-sectional study was conducted on 100 patients with hemoglobin levels <10 g/dL and peripheral blood smear findings suggestive of megaloblastic anemia at P.D.U. Medical College, Rajkot, over a period of three months (August 2025 to October 2025). Clinical details including age, gender, socioeconomic status, symptoms, and dietary habits were recorded. Severity of anemia was assessed using complete blood count parameters. Patients with chronic diseases such as renal disease, malignancy, tuberculosis, and liver disease were excluded.
Results: The highest incidence of megaloblastic anemia was observed in the 11–30 years age group (49%). A slight female preponderance (56%) was noted. Most patients belonged to the lower socioeconomic class (61%). Generalized weakness (92%) and pallor (88%) were the most common presenting features, followed by dyspnea (54%) and giddiness (46%). Neurological manifestations were observed in 26% of cases. A majority of patients (68%) were vegetarians. According to WHO criteria, moderate anemia was the most common severity pattern (48%), followed by mild (29%) and severe anemia (23%).
Conclusion: Megaloblastic anemia remains a common and treatable condition in tertiary care settings, predominantly affecting young individuals from lower socioeconomic backgrounds. Vitamin B12 deficiency, particularly among vegetarians, appears to be a major contributing factor. Early recognition based on clinical and hematological parameters and timely vitamin supplementation are essential to prevent complications and improve patient outcomes.

Keywords*: Megaloblastic anemia, Vitamin B12 deficiency, Macrocytic anemia, Clinical profile, Hematological profile, Socioeconomic status.*

INTRODUCTION

Anemia remains a major global public health problem, adversely affecting health, social well- being, and economic development in both developing and developed countries.(1) Megaloblastic anemia is a common form of anemia in developing nations such as India.(2) The first clinical description of pernicious anemia, a known cause of megaloblastic anemia, was provided by Thomas Addison in 1849.

Megaloblastic anemia results from impaired DNA synthesis leading to defective maturation of hematopoietic cells. Vitamin B12 (cobalamin) and folic acid are essential for DNA biosynthesis, and their deficiency constitutes the most common cause of this condition.[3] Impaired DNA synthesis leads to nuclear–cytoplasmic asynchrony in erythroid precursors, resulting in characteristic hematological features such as macro-ovalocytes, hypersegmented neutrophils, and frequently pancytopenia.[1] Macrocytosis is often detected incidentally on automated cell counters, and evaluation of clinical, biochemical, and hematological parameters helps establish the diagnosis.[4] In India, the high prevalence of vegetarian dietary practices contributes significantly to vitamin B12 deficiency.[3] Megaloblastic anemia is a reversible cause of neurodevelopmental and neurological impairment if diagnosed and treated early.[5]

AIM:

To evaluate the clinical and hematological profile of patients diagnosed with megaloblastic anemia in a tertiary care hospital.

OBJECTIVES:

1. To study the demographic profile (age and gender distribution) of patients diagnosed with megaloblastic anemia.
2. To evaluate the clinical presentation, including symptoms and physical findings, in patients with megaloblastic anemia.
3. To assess the socioeconomic and dietary factors associated with megaloblastic anemia.
4. To analyze the hematological parameters and severity of anemia in affected patients.
5. To determine the overall clinical–hematological profile of megaloblastic anemia in a tertiary care hospital setting.

MATERIAL AND METHODS

This was an observational, descriptive, cross-sectional study conducted in the Department of Pathology at P.D.U. Medical College and Hospital, Rajkot, over a period of three months from August 2025 to October 2025. The study included 100 patients who presented with hemoglobin levels less than 10g/dL and peripheral blood smear findings suggestive of megaloblastic anemia.

All eligible patients meeting the inclusion criteria during the study period were enrolled. Detailed case records were reviewed and analyzed to obtain demographic and clinical information, including age, gender, socioeconomic status, dietary habits (vegetarian or mixed diet), presenting symptoms, and clinical signs. Particular attention was given to symptoms such as generalized weakness, fatigue, pallor, dyspnea on exertion, giddiness, loss of appetite, neurological symptoms, icterus, and hepatosplenomegaly.

Peripheral blood smear examination was carried out in all cases to identify morphological features consistent with megaloblastic anemia, such as macro-ovalocytes, anisopoikilocytosis, and hypersegmented neutrophils. The severity of anemia was classified based on hemoglobin levels.

Patients suffering from chronic disease like renal disease, cancer, tuberculosis, liver disease etc., will be excluded from the study to avoid confounding factors.

The collected data were compiled and analyzed to assess the clinical and hematological profile of patients diagnosed with megaloblastic anemia.

RESULTS

The highest incidence of megaloblastic anemia in the present study was observed in the age group of 11–30 years, accounting for 49% of the total cases (Table 1).

Table-1: Distribution of cases of megaloblastic anemia according to age (n=100)

Age Group (years)	Total no. of cases (%)
<=10	11
11-20	26
21-30	23
31-40	21
41-50	10
>50	09
Total	100

A slight female preponderance was observed in the present study, with females constituting 56% of the 100 patients diagnosed with megaloblastic anemia (Table 2).

Table-2: Distribution of cases of megaloblastic anemia according to gender (n=100)	
Gender	**Total no. of cases (%)**
Female	56
Male	44
Total	100

Megaloblastic anemia was more commonly observed among patients belonging to the lower socioeconomic status, accounting for 61% of the cases in the present study (Table 3).

Table-3: Distribution of cases of megaloblastic anemia according to socioeconomic status (n=100)	
Socioeconomic status	**Total no. of cases (%)**
Lower	61
Middle	31
Upper	08
Total	100

In the present study comprising 100 cases of megaloblastic anemia, generalized weakness (92%) and pallor (88%) were the most common presenting features. These were followed by dyspnea (54%) and giddiness (46%). Neurological manifestations (26%), icterus (18%), and hepatosplenomegaly (12%) were observed less frequently (Table 4).

Table-4: Distribution of cases of megaloblastic anemia according to symptoms and signs (n=100)	
Symptoms and signs	**Total no. of cases (%)**
Generalized weakness / fatigue	92
Pallor	88
Dyspnea on exertion	54
Giddiness	46
Loss of appetite	32
Neurological symptoms	26
Icterus	18
Hepatosplenomegaly	12

Among the 100 cases of megaloblastic anemia, the majority of patients (68%) were vegetarians, while 32% were non-vegetarians, suggesting a higher prevalence of the condition among individuals adhering to a vegetarian diet (Table 5).

Table-5: Distribution of cases of megaloblastic anemia according to dietary habit (n=100)	
Dietary habit	**Total no. of cases (%)**
Vegetarian	68
Non-vegetarian	32
Total	100

According to the World Health Organization (WHO) guidelines, anemia is classified based on hemoglobin (Hb) levels as mild anemia when Hb is slightly below the normal reference range, moderate anemia when Hb is between 7–10g/dL, and severe anemia when Hb is less than 7g/dL. In the present study of 100 cases of megaloblastic anemia, moderate anemia was the most common category, observed in 48% of patients (Table 6).

Table-6: Distribution of cases of megaloblastic anemia according to severity of anemia (n=100)	
Severity of anemia	**Total no. of cases (%)**
Mild	29
Moderate	48
Severe	23
Total	100

DISCUSSION

Megaloblastic anemia is a common yet treatable cause of anemia.[1] It represents a heterogeneous group of disorders

characterized by distinctive hematological abnormalities and overlapping clinical manifestations. The condition is defined by characteristic bone marrow changes involving erythroid, myeloid, and megakaryocytic precursors, leading to ineffective hematopoiesis and macrocytic anemia. It is frequently associated with leukopenia, thrombocytopenia, and various systemic manifestations. Deficiency of folate or cobalamin (vitamin B12) is the principal etiological factor in megaloblastic anemia. These deficiencies are linked to a broad spectrum of hematological and neuropsychiatric manifestations, many of which are potentially reversible with early diagnosis and timely treatment.[3,6,7]

In the present study, the majority of participants belonged to the 11–30 years age group (49%). This finding is comparable to the observations of Sharma et al.[2], who reported peak prevalence in the 16–30 year age group, and Shukla et al.[9], who found most cases in the 20–40 year age range. In contrast, Agrawal et al.[8] documented the highest incidence among older adults aged 46–60 years. These differences may be attributed to variations in demographic distribution, nutritional patterns, lifestyle factors, and the characteristics of the study populations.

A slight female preponderance (56%) was observed in the present study. However, several other studies have reported male predominance, including Singh RK et al.[1] (52% males), Khajuria A et al.[3] (70% males), and Agrawal et al.[8] (58.3% males). Such variations may reflect regional differences in dietary practices, healthcare-seeking behavior, socioeconomic conditions, and socio-cultural influences affecting gender-based nutritional status.

In the present study, the majority of patients with megaloblastic anemia belonged to the lower socioeconomic group (61%), followed by the middle (31%) and upper (8%) socioeconomic classes. These findings are in concordance with studies conducted by Singh et al.[1], Sharma et al.[2], Khajuria et al.[3], Yellinedi et al.[5], Kaur et al.[6] and Agrawal AR et al.[8], all of which reported a higher prevalence of megaloblastic anemia among individuals from lower socioeconomic strata. The increased vulnerability in this group may be attributed to inadequate nutritional intake, limited dietary diversity, poor awareness regarding balanced nutrition, and restricted access to healthcare services.

In the present study, generalized weakness (92%) and pallor (88%) were the most common presenting complaints. These observations are consistent with multiple studies, including those by Singh et al.[1], Sharma et al.[2], Khajuria et al.[3], Yellinedi et al.[5], Kaur et al.[6], Agrawal et al.[8], Shukla et al.[9], Socha et al.[10], and Hariz A et al[11], which similarly identified fatigue, pallor, and generalized weakness as the predominant clinical features. Neurological manifestations were less frequent but clinically significant, particularly in cases associated with vitamin B12 deficiency.[7–9]. Overall, anemia-related symptoms remain the primary mode of presentation in megaloblastic anemia, while systemic features such as hepatosplenomegaly and icterus are observed in a smaller proportion of patients.

In the present study, 68% of patients were vegetarians and 32% were non-vegetarians, suggesting a significant association between a vegetarian diet and megaloblastic anemia. Similar findings were reported by Aher et al.[7], Agrawal et al.[8]and Shukla et al.[9], where vegetarian dietary habits were identified as a common risk factor for vitamin B12 deficiency. In contrast, Kaur et al. observed a predominance of patients consuming a mixed diet without a significant association with vegetarianism, highlighting the influence of regional dietary practices and nutritional variations on disease prevalence.

Regarding the severity of anemia, moderate anemia (48%) was the most common presentation in the present study, followed by mild (29%) and severe anemia (23%). These findings are comparable to those reported by Singh et al.[1], Sharma et al.[2], Khajuria et al.[3], Yellinedi et al.[5], and Kaur et al.[6], Aher et al.[7], Agrawal et al.[8], Shukla et al.[9] and Socha et al.[10] and Hariz A et al.[11], where moderate anemia predominated and severe anemia constituted a smaller proportion of cases. This pattern may reflect earlier healthcare access and diagnosis before progression to severe anemia in most patients.

CONCLUSION

Megaloblastic anemia remains a common and treatable cause of anemia in tertiary care settings, particularly in developing regions, predominantly affecting young and middle-aged adults due to vitamin B12 and folate deficiencies. Patients typically present with weakness, pallor and fatigue with occasional neurological manifestations in B12 deficiency. Hematological findings such as macrocytic anemia with elevated MCV, hypersegmented neutrophils on peripheral smear, and occasional pancytopenia, along with hypercellular bone marrow showing megaloblastic erythropoiesis, aid in diagnosis. Early identification through clinical evaluation and laboratory assessment followed by timely vitamin supplementation, is essential to prevent complications and improve patient outcomes.

Conflict of Interest: None

REFERENCES

1. Singh RK. Prevalence and Clinico-Hematological Profile of Megaloblastic Anemia in Children Aged 1-14 Years: A Hospital-Based Study. European Journal of Cardiovascular Medicine. 2025 Sep 11;15:343-7.

2. Sharma AK, Jain HK, Mishra A. To Evaluate Clinical Spectrum of Megaloblastic Anemia in A Tertiary Care Hospital Central India. International journal of health sciences. 2022;6(S9):1598-604.
3. Khajuria A, Das R. Prevalence of megaloblasticanaemia and its causative factors in a tertiary care centre at Western India. Santosh University Journal of Health Sciences. 2022 Jul 1;8(2):141-4.
4. Kannan A, Tilak V, Rai M, Gupta V. Evaluation of clinical, biochemical and hematological parameters in macrocytic anemia. Int J Res Med Sci. 2016 Jul;4(7):2670-8.
5. Yellinedi S, Karanam S, Gowdar G. Clinico-hematologic profile of megaloblastic anemia in children. Int J ContempPediatr. 2016 Jan;3(1):28-30.
6. Kaur N, Nair V, Sharma S, Dudeja P, Puri P. A descriptive study of clinico- hematological profile of megaloblastic anemia in a tertiary care hospital. medical journal armed forces india. 2018 Oct 1;74(4):365-70.
7. Aher A, Navghare P, Zawar S. Study of clinical and haematological profile of Vitamin B12 deficiency and to check response to Vitamin B12 therapy. Vidarbha Journal of Internal Medicine. 2024 Jul 10;33(2):73-6.
8. Agrawal AR, Mair N, Mehta RS, Chakrapani AS, Gupta K, Srivastav Y, Mittal G. Clinical and hematological characteristics of vitamin B12 deficiency and evaluation of the therapeutic response to vitamin B12 supplementation. Cureus. 2024 Dec 27;16(12):e76468. doi: 10.7759/cureus.76468.
9. Shukla A, Sinha S, Verma SP, Rungta S, Ali W, Tripathi AK, Raghuveer P, Datta G, Saha A, Middinti A, Maurya RK. Study of Clinical and Laboratory Profile Of Vitamin B12 Deficiency in Tertiary Health Care Centre in North India. Indian Journal of Hematology and Blood Transfusion. 2025 Nov 21:1-8.
10. Socha D, DeSouza SI, Flagg A, Sekeres M, Rogers HJ. Severe megaloblastic anemia: Vitamin deficiency and other causes. Cleve Clin J Med. 2020;87(3):153 164. doi:10.3949/ccjm.87a.19072.
11. Hariz A, Bhattacharya PT. Megaloblastic anemia. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.