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Epidemiology and Clinical Profile of Patients with Low Serum Vitamin B12 in a Tertiary Care Hospital

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ABSTRACT

Background: Vitamin B12 deficiency is a common clinical condition that presents with different clinical profiles most common being macrocytic anemia. In this study we aimed to analyse the relationship between serum Vitamin B12 level with demography and clinical presentations.

Methods: Analysis of patients with low Serum B 12 levels admitted at the tertiary referral centre S.R Patil Medical College, Hospital and Research Centre Badagandi, Bagalkot, India from October 2023 to October 2025.

Results: Out of 86 patients presenting with low Serum vitamin B12 levels, 44 (37.84%) patients were between 31-60 years & 32 (27.52 %) patients were > 60 years. Middle aged and elderly population are more likely to have low serum B12 levels as a cause for macrocytic anemia. Low serum Vitamin B12 was more common in vegetarians. Men were more in number than women. 68 (58.48 %) presented with fatigue/malaise (symptoms of anemia) and 6 (5.16 %) patients presented with neurological manifestations. Incidental discovery during routine health check-up was seen in 12 patients (10.32 %)

Conclusions: Serum B12 levels can be an important early low-cost investigation to be able to diagnose causation of anemia in the early stages, treat them adequately and prevent neurological complications.

Keywords: Vitamin B12, clinical profile, macrocytic anemia

INTRODUCTION

Many conditions cause macrocytic anemia, B12 deficiency being one of the important causes of megaloblastic anemia in India.[1, 2] There is an increasing prevalence megaloblastic anemia due to numerous lifestyle factors both in urban and rural populations. The vegetarian predominant diet in many areas of the country, practices like excess washing of vegetables and loss of beneficial organisms due to concern about pesticides, lifestyle including excessive alcohol consumption, cooking practice of frying non vegetarian food, prevalence of "occasional meat eaters" etc. contribute to low levels of Vitamin B12 and ensuing deficiency. A number of studies highlight pancytopenia secondary to low serum B12. Megaloblastic anemia occurs classically with low serum Vitamin B12.

The term macrocytosis is used to indicate that the red blood cells are larger than normal and the mean corpuscular volume (MCV) >100 femtoliters.[3] It occurs when there is defective synthesis of the red blood cells, as in vitamin B12 or folic acid deficiency.[3, 4, 5]

Macrocytic anemia is typically classified as megaloblastic and non- megaloblastic. Vitamin B12 deficiency commonly leads to megaloblastic macrocytic anemia. Alcohol abuse is a common cause of non-megaloblastic macrocytic anemia.[6]

MATERIALS & METHODS

Out of 234 patients admitted with anemia we conducted a retrospective analysis study on the 105 adult patients with macrocytic anemia on peripheral smear study in the wards of S.R Patil Medical College, Hospital and Research Centre Badagandi, Bagalkot, India from October 2023 to October 2025. 4 patients went DAMA (discharge against medical advice). There were no deaths. Inclusion criteria were hospitalized patients above the age of 18 years with peripheral smear showing macrocytic anemia.

Detailed clinical history and physical examination was done. Demographic characteristics of age, sex, body mass index (BMI), food preferences and comorbid diseases were recorded. Hematological investigations in form of complete hemogram, peripheral smear study, S.B12 level on admission was done. Renal and liver function tests, Serum Lactate dehydrogenase, Serum homocysteine, and radiological investigations in the form of chest-ray, ultrasonography of abdomen, and electrocardiogram were done. Bone marrow aspiration, thyroid function tests, and serum ferritin level were done case-to case basis.

Statistical Analysis

Statistical analysis was done and percentage was calculated.

RESULT

Out of total 105 patients with macrocytic anemia included in study, 86 patients had B12 deficiency and 19 patients had macrocytic anemia due to other causes. Low serum B12 is a major causative factor for macrocytic anemia (Table 1).

Table 1. Serum B12 level Correlation

	No of patients	Percentage
Macrocytic anemia	105	100 %
Low serum B12 levels	86	90.3 %
Normal B12 levels	19	19.95 %

The patients having low serum B12 levels were further analysed on age profile: 18-30 years, 31-60 years and >60 years. 10 (8.6 %) patients were between 18-30 years of age, 44 (37.84%) patients were between 31-60 years & 32 (27.52 %) patients were > 60 years. Middle aged and elderly population are more likely to have low serum B12 levels as a cause for macrocytic anemia. (Table 2)

Table 2. Age Distribution

	No of patients	Percentage
Low Serum B12 levels	86	100 %
18-30 years	10	8.6 %
31-60 years	44	37.84 %
>60 years	32	27.52 %

In our study 59 men and 27 women had Low serum B12 levels which suggests that B12 deficiency is more common in males than in females (Table 3)

Table 3. Sex Distribution

Sex	Men	Women	Total
Low serum B12 levels	59	27	86
Normal serum B12 levels	14	5	19

Out of the 86 patients with low serum vitamin B12, 58 (49.88 %) patients were vegetarian and 28 (24.08 %) patients followed a mixed diet. B12 deficiency is more common in vegetarians (Table 4).

Table 4. Dietary Patterns

Diet	Low Serum Vitamin B12	Percentage
Vegetarian	58	49.88 %
Mixed	28	24.08 %

Out of 86 patients of macrocytic anemia secondary to low serum B12, 68 (58.48 %) presented with fatigue/malaise (symptoms of anemia) and 6 (5.16 %) patients presented with neurological manifestations. Incidental discovery during routine health check-up was seen in 12 patients (10.32 %).

Table 5. Symptomatology

Symptoms	Low Serum Vitamin B12	Percentage
Symptoms of Anemia	68	58.48 %
Neurological symptoms	6	5.16 %
Jaundice	0	-
Routine check-up	12	10.32 %

DISCUSSION

We aimed to analyse the clinical profile of patients who presented with macrocytic anemia. Out of total 105 patients with macrocytic anemia included in study, 86 patients had B12 deficiency and 19 patients had macrocytic anemia due to other causes.

Similar was seen in Refsum et al. who reported that ≈75% of a selected urban population from India (Pune, Maharashtra State) had metabolic evidence (hyperhomocysteinemia and methylmalonic acidemia) consistent with cobalamin deficiency that can only partly be explained by a vegetarian diet. This was further confirmed by study Antony AC. [1,2,4] 10 (8.6 %) patients were between 18-30 years of age, 44 (37.84%) patients were between 31-60 years & 32 (27.52 %) patients were > 60 years.

Middle aged and elderly population are more susceptible to low serum B12 levels as a cause for macrocytic anemia.[3]

This finding is consistent with multiple studies wherein Dali-Youcef N et al found likewise Cobalamin (vitamin B12) deficiency being especially seen in the elderly (>65 years of age), but unfortunately not recognized due to subtle clinical presentations; although they can be potentially important, from a neuropsychiatric and hematological view. [5]

Beaudry-Richard C et al., demonstrated lower serum vitamin B12 and holotranscobalamin levels as associated with subclinical structural brain changes and slower cognitive processing speeds in older adults. [6]

Chan JCW et al in their study saw the median age of their 52 patients was 73.5 years. Clarke R et al reported vitamin B12 deficiency increasing with age, 1 in 20 in ages 65-74 years to 1 in 10 or even greater in ages 75 years or more. [7,8]

In our study 59 men and 27 women had Low serum B12 levels which suggests that B12 deficiency is more common in males than in females. This was consistent with the studies done by Chan JCW et al whose study had male to female ratio of 1.08:1. Margalit l et al reported deficiency prevalence being higher in men (25.5%) as of compared to women (18.9%; p <0.001). Men were significantly more likely to manifest severe deficiency (adjusted OR 2.26; 95% CI 1.43-3.56). [7,9]

Out of the 86 patients with low serum vitamin B12, 58 (49.88 %) patients were vegetarian and 28 (24.08 %) patients followed a mixed diet. B12 deficiency is

more common in vegetarians. Mehta et al observed that a steak that is an average size for consumption by one person in the United States commonly fed 6–8 persons when made into a stew or curry in the developing world. Thus, non- vegetarians in developing countries seem to have vitamin B-12 levels that is only a shade better than that of lacto-ovo-vegetarians. [10]

68 (58.48 %) presented with fatigue/malaise (symptoms of anemia) and 6 (5.16 %) patients presented with neurological manifestations. Incidental discovery during routine health check-up was seen in 12 patients (10.32 %). This is also seen in Wolffenbuttel BHR et al who reported the symptoms related to vitamin B_{12} deficiency as being diverse and varying between neurologic to psychiatric. Persons with vitamin B_{12} deficiency can have a presentation of classic megaloblastic anemia. [11]

Recent evidence from the Nordic Nutrition Review (2025) suggests that functional biomarkers such as methylmalonic acid and homocysteine should complement serum B12 levels to better define deficiency across all age groups .[12]

CONCLUSION

Serum B12 levels can be an important early low cost investigation to be able to diagnose causation of anemia in the early stages, treat them adequately and prevent neurological complications.

Declaration by Authors

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