Correlation Between Mean Corpuscular Volume, Vitamin B12 And Haemoglobin Level In Patients With Neurological Disorders.

Gautam Kumar Bunker, Tarun Kumar Ralot, Manoj Kumar Arya

1Assistant Professor, Department of Medicine, 2Associate Professor, Deptt. of Neurology,
3Assistant Professor, Deptt. of Respiratory Disease and Tuberculosis,
R.N.T. Medical College, Udaipur, Rajasthan

ABSTRACT

Objectives: vitamin B12 is a micronutrient essential for neuro-cognitive, haemopoietic and cardiovascular function. This study was planned to find out the correlation between vitamin B12 deficiency and its haematological effect like haemoglobin and MCV.

Material and Methods: In this cross sectional study, 100 patients presented in the department of Neurology and Internal Medicine R.N.T. Medical College, Udaipur from 1st January 2015 to 30th June 2016, with neurological disorders and in whom vitamin B12 was diagnosed were analyzed. After detail history and careful examination, blood was sent for CBC and vitamin B12 level. Routine investigations too were done in the study subjects. Information had then filled in the predesigned proforma for analysis. Results: there were 37 male and 63 female and the male to female ration was 1: 1.7. Maximum numbers of the patient were under 50 year of age. Out of 100 vitamin B12 deficient patients, only 10% patients had MCV above 100fl. In this study 54 (54%) patients were anaemic out of these 39 (72.22%), 13 (24.07%) and 2 (3.70%) were mild, moderate and sever anaemic. Conclusion: there was no correlation between vitamin B12 and MCV level in the study subjects. In patients with neurological disorders, vitamin B12 deficiency should be suspected irrespective of their MCV and haemoglobin level.

Key Words: Vitamin B12, haemopoietic, megaloblastic anaemia, MCV

Corresponding Author: Dr. Tarun Kumar Ralot, Associate Professor, Deptt. of Neurology, R.N.T. Medical College, Udaipur. Mail: drtarun98@gmail.com

INTRODUCTION

Vitamin B12 deficiency has been a well known health problem. However, now there is evidence that the disease is more common than was previously believed.1 Vitamin B12 deficiency affect many systems, chiefly haematological and neurological. The haematological manifestation includes megaloblastic anaemia means a group of disorders characterized by one or more peripheral cytopenias, oval macrocytosis (defined as mean corpuscular volume above 100fl), iron overload, erythroid hyperplasia.2 The neurological features includes vertigo, sensory neuropathy, stroke, cervical myelopathy, subacute combined degeneration of the cord, migraine, parasthesias, dementia, giddiness and nystagmus, anxiety neurosis, transient ischaemic attack, and acute confusional state.3 Vitamin B-12 or cobalamin (Cbl) is required for the methylation of myelin, neurotransmitters, and membrane phospholipids and is essential for the integrity of the central and peripheral nervous systems.4 Neurological and psychiatric symptoms may be seen in patients without related anemia or...
macrocytosis, with B12 concentrations in the previously defined range of low-normal. Erythrocyte indices have been used in the initial evaluation of anemic patients; high Mean corpuscular volume (MCV) value is a traditional criterion for folate and vitamin B12 deficiencies. There is no large study of the prevalence of B12 deficiency among patients with normocytosis or microcytosis. Our study was aimed to find out any correlation between MCV, haemoglobin level and vitamin B12 deficiency in this region.

AIMS AND OBJECTIVES

To study the correlation between vitamin B12 deficiencies, mean corpuscular volume and haemoglobin level in patients suffering from neurological symptoms.

MATERIAL AND METHOD

Study design: Single center cross sectional study. Study subjects: 100 confirmed vitamin B12 deficient patients who have attended the Department of Neurology and Internal Medicine of Maharana Bhupal, Govt. Hospital, Udaipur. Study period: from 1st January 2015 to 30th June 2016. Consent: An informed and written consent was taken prior to the study. The patients, who have attended the outpatient department of Neurology and Internal Medicine with neurological disorders, were the study population. Those who were sick were admitted in either of department. Their clinical history, personal history, past history of any disease or surgery and physical as well as systemic examination was performed carefully to rule out any underlying cause of their illness. Blood was drawn using universal precaution for routine investigations. Three ml of blood in EDTA vial was drawn after overnight fasting to determine vitamin B12 level. Serum vitamin B12 level (normal range 200-900 pg/ml) were estimated by Roche Elecsys modular Cobas e 411 using electro-chemiluminescence immuno assay (Manheim Germany) using commercially available kits from Roche. The vitamin B12 deficiency was defined at a concentration below < 200 pg/ml. Work up for another cause of anaemia was done where haemoglobin was low. Two ml blood was drawn in EDTA vial for complete blood count to see haemoglobin level and MCV. The reports were collected on the same day. All the information then filled in predesigned proforma for analyses. Anaemia in the study population was considered using WHO guideline. Macrocytosis was labelled when MCV was >100fl.

Inclusion criteria

- Patients with neurological manifestations in whom Vit. B12 deficiency was found.

Exclusion criteria

- Patients who have neurological symptoms but had isolated iron deficiency anaemia, chronic blood loss, i.e. haemorrhoids, gastric ulcer and acute blood loss.
- Patients with neurological symptoms who were not willing to be a part of this study.

RESULTS

During this period, 100 confirmed Vitamin B12 deficient patients with their haemoglobin and MCV level were analyzed. In this study there were 37 (37%) male and 63 (63%) female and the male to female ratio was 1:1.7 (Graph-1). 65 (65%) patients were under 50 years and remaining patients were above 50 years (Graph-2). A maximum number of the patients 80 (80%) were normocytic (80-100 fl) whereas, 10 (10%) patients had an MCV level above 100 fl (macrocytosis). Interestingly, 10 (10%) patients had MCV below 80fl (microcytotic) (Graph-3). In this study, 54 (54%) patients were found anaemic and out of these, 39 (72.22%) patients were mild anaemic, 13 (24.07%)
Sex wise distribution of study population were moderate anaemic whereas 2 (3.70%) were severely anaemic (Graph-4).

Among 100 patients with vitamin B12 deficiency, 38 (38%), 31 (31%) and 31 (31%) had vitamin B12 level below 100 pg/ml, 100-150 pg/ml and > 150-200 pg /ml respectively. Those with vitamin B12 level < 100 pg/ml, 2, 32 and 4 patients had an MCV level < 80fl, 80-100fl and > 100fl respectively. Likewise, out of 31 patients with vitamin B12 level between 100-150 pg/ml, 5, 24, 2 patients had an MCV level < 80 fl, 80-100fl and > 100 fl respectively. The patients with vitamin B12 level between 150-200 pg/ml, 3 patients had MCV below 80 fl, 26 had MCV between 80-100fl and 2 had MCV above 100fl. (Graph-5)

Distribution of patients haemoglobin level in anaemic patients with vit b12 deficiency

Level of mcv in vitamin b12 deficiencies in patients with neurological disorder serves as a cofactor for methionine synthesis by transfer of methyl group to homocysteine, which is an atherogenic and a potential endothelial toxin. This conversion of homocysteine to methionine forms demethylated tetrahydrofolate (THF), which is required for DNA
synthesis. Further metabolism of methionine to S-Adenosyl methionine (SAM) is essential for myelin synthesis and maintenance of neuronal integrity as well as neurotransmitter regulation. Vitamin B12 deficiency (Normal values are 200-900 picograms per milliliter) is not uncommon because of diverse religions, ethnic, and socioeconomic heterogeneity of the people influencing their dietary habits and with the high prevalence of *Helicobacter pylori* infections, use of oral contraceptive pills, diabetic medications like metformin, presence of intestinal parasites especially *Diphyllobothrium latum* (fish tapeworm), and chronic alcoholism. But it is often under recognized due to the lack of classical symptomatic presentation and most of the symptoms are vague neurological. The population of the Indian subcontinent is >1 billion, most of whom consume a diet low in Cobalamin. Isolated reports suggest that Cobalamin deficiency in India is common; however, this problem has received little attention. The national strategies for improving micronutrient intake do not include Cobalamin. Erythrocyte Indices have been used in initial evaluation of anaemia patients, High MCV values are traditional criteria for B12 and folate deficiency. Wheeler et al. suggested that vitamin B12 should be determined in anaemia patients when MCV > 100 fL. In our study there was no statistical significant relation between MCV level and Vitamin B12 deficiency. In our study, 80(80%) patients with Vitamin B12 deficiency with neurological symptoms had MCV between 80-100fL. MCV of 10 (10%) patients was below 80fL and only 10 (10%) patients had MCV above 100fL and were labelled as macrocytosis. Similar finding were also reported by Rohit, et al. In their study, out of 868 patients with Vitamin B12 deficiency, 10.36% had high MCV level. Thompson et al. reported that 82% of patients with low B12 levels seen at Bellevue Hospital, New York, had MCV values below 95 fL; they suggested that further evaluation of the suspected B12 deficiency should not be deterred by a normal MCV value which is one of the important observation in our study. One study from Vancouver AIDS conference (1996) suggested that MCV does not always get high even if vitamin B12 is low, so a normal value does not necessarily means that B12 levels is normal, which correlates with our findings. Though the literature is replete with data on raising MCV in megaloblastic anaemia, some recent papers also showed that this may not always be true. This could be because of concomitant iron deficiency, thalassaemia carrier status or anaemia of chronic disease, all of which are not uncommon in India. The low vitamin B12 level causes only neurological symptoms without haematological changes, are more common nowadays, which may be because of some genetic factors or the other environmental factors still not known. Low haemoglobin level in this study was present in a little more than half patient, which was almost similar to the study by Akash et al. this may be because of diverse religions, ethnic and socioeconomic heterogeneity of the people influencing their dietary habits. John Lindenbaum et al. found anaemia in 72% patients among 141 consecutive patients with neuropsychiatric abnormalities due to cobalamin deficiency. Anemia was absent in 18.5% (13/70) patients in the study by Carmel, et al. The haemoglobin level in patients with vitamin B12 deficiency was variable in different studies published in the literature, so a normal haemoglobin level does exclude vitamin B12 deficiency.

**CONCLUSION**

With this we conclude that there is
no correlation between MCV, haemoglobin and Vitamin B12 deficiency in patients with neurological symptoms. MCV should not be the only criteria for ordering Vitamin B12 for patients with neurological symptoms under evaluation. Estimation of vitamin B12 levels in all the patients is mandatory for the proper diagnosis and treatment to avoid irreversible squally of such eminently treatable disorder.

Limitations: Our study was based on serum B12 results, which alone, without other biochemical markers such as homocysteine, methylenic acid might not be an accurate measure of B12 deficiency. The sample size was another limitation of the study.

Source of Funding: Nil. 

Conflicts of Interest: Nil.

References:
15. Refsum H, Yajnik CS, Gadkari M. Hyper-