IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PREVALANCE OF VITAMIN B12 DEFICIENCY AND ITS CORRELATION TO THE HEMATOLOGICAL PARAMETERS IN GUJARAT CITY

Dr.Jignasa Mansuriya,Parul B Padhiyar, Nikita Panchal, Shreya Macwan

B.N. Patel Institute of paramedical and Science,Anand / Sp University

Abstract:

Vitamin B12 deficiency is a serious health problem that can result in megaloblastic anemia, pernicious anemia, inhibition of cell division, and neurological disorders.

Objective: Our study aims to identify the correlation between the deficiency of vitamin B12 and the hematological parameters, also the prevalence of vitamin B12 deficiency among vegetarian and non-vegetarian people of the city of Gujarat state.

Method: Retrospective study undertaken among age varied from 18 to 60 years patients in Gujarat. 100 patients were studied and analyzed. Clinical features, hematological and serological parameters were noted.

Result: We have evaluated the clinical picture, hematology indices of 100 patients with reduced vitamin B12 level. In this study secondary data on age, sex, referring unit, religion and dietary history of these patients were obtained from the medical laboratory Gujarat, India. We found the gender is significantly associated with hemoglobin. Vegetarian females have lower hemoglobin level than vegetarian males. Vitamin B12 deficiency is mainly mild to moderate (100 pg/ml-210 pg/ml). Severe B12 deficiency (100 pg/ml) is more involved in the younger age group (<50 years) than the older group (> 50 years).

Conclusion: In our study, we concluded that the vegetarians have lower serum vitamin B12 levels compared to non-vegetarians. In present study total 100 patients were included and among them 48% were males and 52% were females. In which 28% males and 32% females were Vitamin B_{12} deficient. So, it is concluded that prevalence of vitamin B_{12} deficiency was higher in females as compared to male.

KEYWORDS: Vitamin B12, cobalamin, deficiency, Megaloblastic anemia, Pernicious anemia

Introduction:

The body uses Vitamin B12, a necessary nutrient, as a cofactor in some crucial cell-level functions. A water-soluble vitamin called Cobalamin, it can be found in foods including dairy, eggs, and red meat. A glycoprotein called intrinsic factor is created by parietal cells in the stomach and is essential for Vitamin B12 absorption in the terminal ileum. B12 is absorbed and then used as a cofactor by enzymes that produce myelin, fatty acids,

and DNA. As a result, hematologic and neurologic problems may develop from a Vitamin B12 shortage. Vitamin B12 is over-stored in the liver, but when it cannot be absorbed for an extended length of time (due to inadequate food, malabsorption, or a lack of intrinsic factor), hepatic stores are depleted, and shortage results.

1.Megaloblastic anemia (MA):

MA refers to a diverse category of anemias characterized by the presence of giant red blood cell precursors known as megaloblasts in the bone marrow. Nuclear division is prevented by this condition's poor DNA synthesis, which is the cause of it. The most frequent cause of megaloblastic anemia is hypovitaminosis, particularly a deficiency in folate and Vitamin B12 (cobalamin), which are essential for DNA synthesis. A type of anemia known as megaloblastic anemia is characterized by big red blood cells and a decline in their quantity. When the body has less red blood cells than usual, anemias, which are blood diseases, develop. Megaloblastic anemia is typically brought on by an acquired folic acid or Vitamin B12 deficiency.

2.Pernicious Anemia (PA):

By having autoantibodies against an intrinsic factor secreted by the stomach and gastric parietal cells as well as by the common coexistence of other autoimmune conditions in these patients, the mechanism that results in gastric atrophy and PA is autoimmune in character. Recent epidemiological studies confirm the existence of autoimmune gastritis and PA across all continents [1],[2], and suggest that they are likely underdiagnosed [3],[4], given that most patients with microcytic or macrocytic anemia receive treatment with iron, folates, and cobalamin without conducting a more thorough investigation into the cause of their anemia; a biopsy of the gastric mucosa is frequently skipped; and even when a biopsy is taken.

VITAMIN B12 (Cyanocobalamin):

Anti-pernicious anemia vitamin is another name for vitamin B12.The empirical formula of Vitamin B12 (cyanocobalamin) is C63H90N14O14PCo. The structure of Vitamin B12 consists of a corrin ring with a central cobalt atom.

The Corrin ring with a cobalt atom in its Centre makes up the structure of Vitamin B12. Water-soluble vitamin called cobalamin, it can be found in foods including dairy, eggs, and red meat. A glycoprotein called intrinsic factor is created by the parietal cells in the stomach and is essential for B12 absorption in the terminal ileum. B12 is absorbed and then used as a cofactor by enzymes that produce myelin, fatty acids, and DNA.

Water-soluble Vitamin B12 can be obtained as a dietary supplement, a prescription drug, and is naturally contained in some foods and added to others. Compounds with vitamin B12 action are collectively referred to as **"coalmines"** since Vitamin B12 comes in a variety of forms and contains the element cobalt. Vitamin B12 is a required for proper red blood cell formation, neurological function, and DNA synthesis. Serum or plasma vitamin B12 levels are commonly used to determine vitamin B12 status. Values below approximately 170-250 picogram/ml (120-180 picogram/ml) for adults indicate a vitamin B12 deficiency.

Intake Requirements:

In the U.S., the National Institutes of Health (NIH) recommend that teens and adults over the age of 14 years should consume 2.4 in ug/d of vitamin B12 a day. Pregnant women should be sure to consume 2.6 in ug/d, and lactating women 2.8 in ug/d.

As an organometallic complex, vitamin B12 is the only known necessary biomolecule with a stable metal-carbon link.

The cobalt can link to:

1. A methyl group – as in methyl cobalamin.
2. A 5'-deoxyadenosine at the 5' position – as in adenosyl cobalamin (coenzyme B12).
3. A cyanide group – as in Vitamin B12 – as supplied from drug companies.

METHOD AND MATERIALS:

Determination of Vitamin B12 in my study was carried on auto analyzer called as MAGLUMI® 800 Chemiluminescence Immunoassay (CLIA) System.

PRINCIPLE:

Competitive chemiluminescence immunoassay:

Use ABEI to label purified Vitamin B12 antigen, use FITC to label Vitamin B12 binding-protein, use an anti-FITC polyclonal antibody to coat magnetic microbeads. The sample (or calibrator/control, if applicable), ABEI Label, FITC Label and magnetic microbeads are mixed thoroughly and incubated at 37°C, forming complexes; after precipitation in a magnetic field, decent the supernatant, and perform a wash cycle. Subsequently, the starter 1+2 is added to initiate a flash chemiluminescent reaction. The light signal is measured by a photomultiplier within 3 seconds as RLU which is proportional to the concentration of Vitamin B12 present in samples.

To ensure proper test performance, strictly adhere to the operating instructions of MAGLUMI® 800 Fully-auto chemiluminescence immunoassay (CLIA) analyzer. Each test parameter is identified via a RFID tag on the Reagent Integral.

PROCEDURE:

To ensure proper test performance, strictly adhere to the operating instructions of **MAGLUMI® 800 Fully-auto chemiluminescence immunoassay (CLIA) analyzer**. Each test parameter is identified via a RFID tag on the Reagent Integral.

Sample, Calibrator Displacing reagent	100 µl +100 µl
Incubation	2 min.
ABEI label FITC label Magnetic microbeads	110 µl +110 µl +20 µl
Incubation	15 min.
Wash cycle	400 µl
Measurement	3s

CALCULATION:

1)Calculation of Results:

The analyzer automatically calculates the FA concentration in each sample by means of a calibration curve which is generated by a 2-point calibration master curve procedure. The results are expressed in pg/ml. For

further information please refer to the operating instructions of MAGLUMI® 800 Fully-auto chemiluminescence immunoassay (CLIA) analyzer.

2)Interpretation of Results:

Based on the 95% confidence interval, the reference value range is: 239-931 pg/ml Vitamin B12 deficiency <239 pg/ml.

RESULT:

Table 1: Gender distribution of patients with Vitamin B12 Deficiency:

Gender	No. of patients	Percentage %
Male	28	46.6%
Female	32	53.3%
Total	60	100%

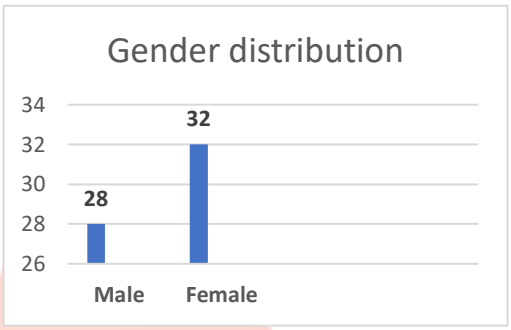


Table 2: Distribution of patients based on Vitamin B_{12} deficiency:

Condition	Male	Female	Total
Normal Vitamin B_{12}(239-931 pg/ml)	18 (50%)	18 (50%)	36 (100%)
Vitamin B_{12} deficiency (<239 pg/ml)	28 (46.6%)	32 (53.3%)	60 (100%)
>1000 pg/ml Vitamin B_{12} level	3 (75%)	1 (25%)	4 (100%)
Total	49 (49%)	51 (51%)	100 (100%)

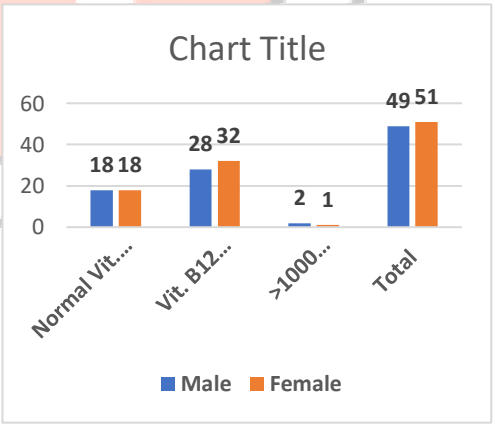
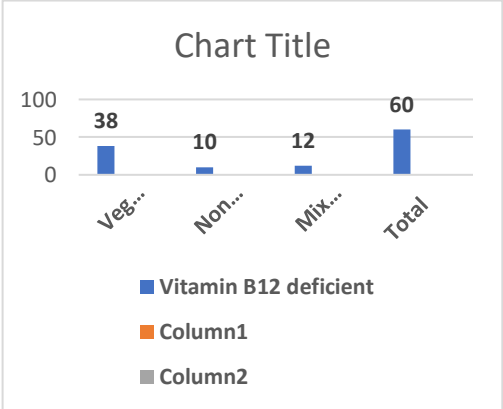


Table 3: Serum Vitamin B_{12} distribution according to diet:

Diet	Vitamin B12 Deficient	Percentage %
Vegetarians	38	63.3
Non vegetarians	10	10
Mixed Diet	12	20
Total	60	100



CONCLUSION:

- In present study total 100 patients were included and among them 48% were males and 52% were females.
- In which 28% males and 32% females were Vitamin B_{12} deficient. So, it is concluded that prevalence of vitamin B_{12} deficiency was higher in females as compared to male.
- The highest number of Vitamin B_{12} Deficiency (17%) were seen in >60 years of age group followed by 11% in 50 to 60 years age group. Further followed by 25% in adults (30 to 50 years) and 10% in young and 3% in children. So, it is concluded that Vitamin B_{12} deficiency was higher in -60 years of age group.
- In my study out of 100 patients, there were 50% vegetarians, 15% were non-Vegetarians and 35% were mixed diet population. Out of 60 Vitamin B_{12} deficient patients 63.3% were vegetarians, 16.6% were non vegetarians and 20% were having mixed diet. So, it is concluded that prevalence of Vitamin B_{12} Deficiency was higher in Vegetarians as compared to Non-Vegetarians and Mixed diet population.

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