

International Journal of Scientific Research and Reviews

Prevalence and Clinical Spectrum of Vitamin B-12 Deficiency in a Cohort of Patient Presenting with Neurological Disorders in Tertiary Care Hospital of Rajasthan.

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ABSTRACT

Vitamin B-12 is an important nutrient that the body uses to serve as a cofactor in many main cell reactions. Cobalamin, in combination with folate, is necessary for DNA synthesis in cells that undergo rapid turnover, such as haematopoietic and enteric lining cells. Quantitative research approach will be adopted in current research study, Non experimental descriptive research design will be used in this study. Research study for this study was Neurological OPD and hospitalize patient in Mahatma Gandhi Hospital, Jaipur. Sample size will be calculated with appropriate statistical method after pilot study and purposive sampling technique. 400 sample use for this study. Prevalence of neurological disorder due to vitamin B-12 deficiency was 13.75% of participant were have mild deficiency of neurological disorder due to vitamin B-12 Deficiency, 66.75% of participant were have moderate deficiency of neurological disorder due to vitamin B-12 Deficiency and 19.50% of participant were have severe deficiency of neurological disorder due to vitamin B-12 Deficiency. These findings caution against identification of patient suffering from vitamin B-12 deficiencies.

KEYWORDS: Prevalence, Clinical Spectrum, Vitamin B-12 Deficiency, Neurological Disorders, Tertiary Care.

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INTRODUCTION:

Vitamin B-12 is an important nutrient that the body uses to serve as a cofactor in many main cell reactions. Cobalamin, in combination with folate, is necessary for DNA synthesis in cells that undergo rapid turnover, such as haematopoietic and enteric lining cells. Increased homocysteine, reduced methionine, and impaired tetrahydrofolate formation are the physiological effects of either of the above nutrient's deficiency. These changes eventually result in the typical neurological and haematological symptoms, as well as some conditions such as vascular thromboses, which can occur even though there is no overt vitamin B-12 deficiency.¹

The only dietary source of vitamin B-12 is animal products. Vitamin B-12 deficiency is a well-known risk factor for vegetarians. Pernicious anemia and malabsorption are two other significant etiological factors to consider. The treatment consists of simply supplementing the body's vitamin supply with extremely satisfying outcomes at minimal cost and risk.²

Vitamin B-12 deficiency is a reversible cause of bone marrow failure and demyelinating nervous system disease, so early detection and treatment are important. Microorganisms produce vitamin B-12 (cobalamin), which is used in trace quantities mainly in animal-based foods. Intrinsic factor, which is produced by gastric parietal cells, and the "cubam receptor" in the distal ileum are responsible for uptake in the gastrointestinal tract. Even though many patients present with mostly neurologic symptoms, the most common cause of serious vitamin B-12 deficiency is a lack of intrinsic factor due to autoimmune atrophic gastritis³, also known as "pernicious anaemia." Vitamin B-12 is needed for the normal functioning of the central nervous system, as well as its production and initial myelination. Demyelination of the cervical and thoracic dorsal and lateral columns of the spinal cord, as well as cranial and peripheral nerve demyelination and brain white matter demyelination⁵. Owing to the loss and swelling of myelin sheaths, pathological examination shows a "spongy degeneration" that can be seen on magnetic resonance imaging. The magnitude of megaloblastic anaemia is inversely associated with the degree of neurologic dysfunction for unknown causes. Glossitis, malabsorption, miscarriage, and thrombosis are some of the less common symptoms of vitamin B-12 deficiency. The marked hyperhomocysteinemia seen in extreme cases of vitamin B-12 deficiency has been linked to thrombosis; patients can also experience hyperpigmentation, which resolves with treatment.³

Vitamin B-12 deficiency may have negative consequences for the central nervous system. Symptoms of paresthesias Changes in emotional state Depression, mania, irritability, anxiety, delusions,

and lability are also symptoms of "Megaloblastic Madness." Nervous mechanism autonomic Hypotension due to posture Incontinence is the inability to control one's bladder. Incapacity Nervous system of the periphery Cutaneous sensory impairment Hyporeflexia is a condition in which the body's reflexes Symmetrical flaw Paresthesias are a form of numbness.⁴

The aetiology of vitamin B-12 deficiency has an effect on the disease's epidemiology. According to several studies, B-12 deficiency affects between 1% to 2% of patients with anaemia in the general population. According to other research, B-12 deficiency is to blame for 18% to 20% of patients with clinical macrocytosis (defined as an MCV > 100). Vitamin B-12 deficiency is more common in the elderly, regardless of the cause. As a consequence, with pernicious anaemia, people of Northern European ancestry are more prone to suffer from B-12 deficiency. Pernicious anaemia is less common in citizens of African descent than those from other regions of Europe.^{5,6}

In north India, 47 percent of the population suffers from vitamin B-12 deficiency. Vitamin B-12 levels are higher in diabetics than in the general population, but deficiency is still normal. In the Indian population, vitamin B-12 deficiency is normal.⁷

Vitamin B-12 is an important nutrient obtained mostly from non-vegetarian foods. The Indian population is more susceptible to vitamin B-12 deficiency due to their largely vegetarian diet. In India, however, there is a paucity of data on vitamin B-12 status in the general population and diabetics. More evidence from around the world may spark a well-informed discussion about food fortification and replacement strategies. By analysing the incidence of vitamin B-12 deficiency in the general population of a Haryana tier 3 district, this study fills a void in the literature.⁸

NEED OF THE STUDY

In order to determine the prevalence of Vitamin B-12 deficiency in north India, a retrospective analysis was performed. Electronic medical reports were used to gather data in Jind, Haryana. The study enrolled a total of 11913 participants. This search yielded 378 people with diabetes, 92 people with prediabetes, and 285 people who went to the endocrine OPD for causes other than diabetes or prediabetes. Vitamin B-12 deficiency was seen in 37.76 percent of pre-diabetics (n = 92), 31.23 percent of people with endocrine disorders other than diabetes and pre-diabetes (n = 285), and 18.25 percent of diabetics (n = 378). Vitamin B-12 levels in Tier 3 community residents were slightly lower than those in metropolitan areas who visited an endocrine clinic. When contrasted to people with other endocrine

conditions, people with diabetes had slightly higher vitamin B-12 levels.⁷

Another research was carried out to determine the prevalence of Vitamin B-12 Deficiency in Khyber Pakhtunkhwa patients. A total of 209 diabetic patients with type 2 diabetes were chosen for the analysis. People over the age of 45 who had been taking metformin for at least three months were included in the study. B-12 deficiency is characterised as a serum B-12 level of less than 150 pg/ml. According to the report, laboratory testing revealed that 29.66 percent of diabetic patients have B-12 deficiency. B-12 levels were statistically lower in metformin patients ($P = 0.01$). Vitamin B-12 deficiency was shown to be slightly higher in smokers than in non-smokers ($p=0.001$). Vitamin B-12 deficiency was also smaller in multivitamin consumers relative to nonusers($p=0.05$).⁹

The neurological effects of vitamin B-12 deficiency in the paediatric population were investigated in a retrospective review. The research was carried out at a Turkish university hospital. In the analysis, a total of 38 samples were collected. Twenty of the 38 patients were male and 18 were female, with ages ranging from nine months to seventeen years. There were no agricultural products in the diets of either of the patients. B-12 deficiency was diagnosed when serum B-12 concentrations were less than 200 pg/mL. Vitamin B-12, folic acid levels, entire blood count, haemoglobin and hematocrit, and mean corpuscular volume were all tested in the lab (MCV). The research involved patients with neurological problems, a serum B-12 level of less than 200 pg/mL, and average folic acid levels. During the analysis, none of the patients were on any medications, and none of them had signs of parasitic or duodenal ulcer disease. Syncope ($n=6$), dizziness ($n=4$), hypotonia ($n=9$), failure to sit or move without assistance, or gait ataxia ($n=2$), convulsion ($n=4$), hand tremor ($n=1$), tingling feelings and paresthesia ($n=3$), visual blurring ($n=1$), weakness and attention difficulties ($n=8$) were among the neurological results discovered throughout the research. A statistically important disparity was discovered between the age classes. Hypotonia (group 2) has a slightly lower age than syncope and dizziness (group 1) and tingling-paresthesia, nausea, difficulties focusing, and headache (group 3) ($p<0.05$). The average serum B-12 amount in the patients was 137.18 mg/dL.¹⁰

Cross-sectional research was conducted in the laboratory district of Anand, Gujraat, to estimate the prevalence of B-12 deficiency. In total, 100 samples were used in the research. The results revealed that 45 percent of the participants were male and 55 percent were female. According to their eating habits, 81% were vegetarians and 19% were non-vegetarians. In a study of 100 patients with vitamin B-12 deficiency, 4% had a strong MCV (>100 fL). Just 19 percent had a poor MCV (76 fL) and 77% had

usual MCV values (76 - 100 fL). In addition, 73 percent of the participants in this sample had mild to moderate vit. B-12 deficiency (> 100 pg/ml), while 27 percent had extreme vit. B-12 deficiency (100pg/ml). Females are more prevalent (16%) than males among those with severe Vit. B-12 deficiency (less than 100 pg/ml) among vegetarians and non-vegetarians (11 percent). Many that have more than or equivalent to 100 pg/ml of vitamin B-12 Females have a higher dominance rate (39%) than males (34 percent). There is a statistically significant discrepancy in sex between the two vitamin B-12 deficient classes (p.001).¹¹

The analysis comprises a survey of 120 pregnant people. According to the findings, 15% of the mothers had a low socioeconomic status (SES) and 35% of the mothers had a lower middle-class SES. The most common clinical manifestation was fatigue (25%) accompanied by pallor (24.8%), breathlessness (20.8%), and fainting (20.8%). (20.8 percent). (19.2% of the total). The most common risk factor for B-12 deficiency was consanguinity (25percent), followed by the usage of RO water (13.3percent). The most important former maternal and neonatal risk factors/outcomes were previous one or two abortions (32.5%), low birth weight (15.8%), short height (11.67%), and previous LSCS (9 percent). Anemia and B-12 deficiency were observed in 55 percent and 17.5 percent of the population, respectively. Just 11.67 percent of people with anaemia have a B-12 deficit, which could be treated with vitamin B-12 supplements. Thirteen of the 52 people who had a haemoglobin drop of more than 1% were treated as well as the other 52 women who had repeat haemoglobin in 1 or 2 months. The other 39 individuals who had low B-12 levels received no care.¹²

Vitamin B-12 is a water-soluble micronutrient, which helps in the formation of red blood cells and is also essential for the normal functioning of the nervous system and brain. Along with folic acid, Vitamin B-12 is needed for fatty and amino acid metabolisms and DNA synthesis and also plays a significant role in the conversion of homocysteine to methionine, which is required for the synthesis of neurotransmitters and phospholipids. It is naturally produced by microbial synthesis, and the main dietary sources are of animal origin. Other important sources are fermented foods and uncooked plant-based food contaminated with B-12 producing bacteria or algae. Vitamin B-12 deficiency can result from malabsorption, intestinal disorders, and low levels of binding proteins and the use of medications such as proton-pump inhibitors and metformin. People consuming vegetarian diet are at a higher risk. Other common causes are low socioeconomic status and social and religious reasons for nonconsumption of meat. Several studies highlight South Asian ethnicity as a risk factor. India has the highest prevalence of

Vitamin B-12 deficiency, ranging from 47% to 71% in adults.¹³

Objective

1. To determine the prevalence of vitamin B-12 deficiency among patients presenting with neurological disorders.
2. To identify the clinical spectrum of vitamin B-12 deficiency in a cohort of patients presenting with neurological disorders.
3. To find out the association between Vitamin B-12 deficiency and demographic variables patients presenting with neurological disorders.
4. To find out the association between vitamin B-12 deficiency and clinical spectrum patients presenting with neurological disorders.

MATERIAL & METHODS:

Research Approach: Quantitative research approach will be adopted in current research study.

Research Design: Non experimental descriptive research design will be used in this study.

Research Setting: Mahatma Gandhi Hospital, Jaipur

Population: All patients who was visited at and hospitalized in Mahatma Gandhi Hospital, Jaipur.

Samples: Neurological OPD and hospitalized Patients in Mahatma Gandhi hospital, Jaipur and fulfilling inclusion criteria.

Sampling Technique: Sample size will be calculated with appropriate statistical method after pilot study and purposive sampling technique

Sample Size: 400 patients were used for this study.

Data Collection Method: Pre designed self-structured demographic profile, Personal profile, Check list of vitamins B-12 deficiency, Assessment of neurological disorders during physical and neurological examination, Lab investigation of Patient, Interview Observation technique. Bio-physical methods.

RESULT:

Table: 1 severity of vitamin B-12 deficiency

vitamin B 12 deficiency based on clinical features	n=815	in%
No deficiency	415	50.92%
Mild deficiency	179	21.96%
Moderate deficiency	148	18.16%
Severe deficiency	73	8.96%

Above table 1 depict that Total 815 subjects were investigated, out of this 415 were not vitamin B-12 deficient, 400 subjects were vitamin B-12 deficiency, so proportion of vitamin B-12 deficiency is 49.08% ($400/815 \times 100 = 49.08\%$). In the 400 vitamin B-12 deficient subjects, 21.96% were mild deficient, 18.16% were moderate deficient and 8.96% were severe deficient of vitamin B-12 deficiency.

Table:2 Clinical features of vitamin B-12 deficiency

Vitamin B-12 Deficiency based on clinical features	n=40	in%
Do you Suffer from fatigue or weakness?	276	69.00
Do you have a swollen or sore tongue?	197	49.25%
Do you experience tingling or numbness (similar to pins and needles) sensation in your hands and feet?	133	33.25%
Do you have difficulty concentrating or a poor memory?	264	66.00%
Do you suffer from low mood or depression?	271	67.75%
Is your skin usually pale?	254	63.50%
Is your skin inside your mouth pale?	271	67.75%
Do you experience dizziness or light-headedness?	260	65.00%
Have you experience unexplained weight loss?	270	67.50%
Do you have cold hands and/or feet?	223	55.75%
Do you experience difficulty sleeping or have unrestorative sleep (wake from sleep feeling unrested)?	272	68.00%
Do you suffer from shortness of breath with minimal exertion?	263	65.75%
Do you experience difficulty walking?	271	67.75%
Do you regularly drink alcohol?	272	68.00%
Are you a strict vegetarian or vegan?	268	67.00%
Do you experience frequent or daily headaches?	273	68.25%
Do you celiac disease, Crones Disease, inflammatory bowel disease, or have you ever had gastritis bypass or other stomach or intestinal surgery?	228	57.00%
Do you have knuckles?	224	56.00%

Above table 2 shows clinical features of vitamin B-12 deficiency majority of patient admitted in the Mahatma Gandhi Hospital, Jaipur.

Table 3 Severity of neurological disorder due to vitamin B-12 deficiency

Neurological disorders	n - 400	In %
Mild deficiency	55	13.75%
Moderate deficiency	267	66.75%
Severe deficiency	78	19.50%

Above tables 3 depict that 13.75% of participant were have mild deficiency of neurological disorder due to vitamin B-12 Deficiency, 66.75% of participant were have moderate deficiency of neurological disorder due to vitamin B 12 Deficiency and 19.50% of participant were have severe deficiency of neurological disorder due to vitamin B 12 Deficiency.

DISCUSSION:

In order to determine the prevalence of Vitamin B-12 deficiency study conducted to identify the level and prevalence of vitamin B-12 Deficiency in the patients who was visited and admitted at Mahatma Gandhi Hospital, Jaipur. Patient visited the hospital receiving different clinical feature of vitamin B-12. Its needed to do study in further for the effectiveness of the treatment of Vitamin B-12.

CONCLUSION:

It is concluded that the prevalence of Vitamin B-12 deficiency is 6 to 7 percent of patient visited in the Mahatma Gandhi Hospital, Jaipur. Mild Neurological disorder is 13.75%, moderate 66.75% and severe neurological disorder was 22.50% was found along with various clinical features in patient visited Mahatma Gandhi Hospital, Jaipur.

REFERENCES:-

1. O' Leary F, Samman S. Vitamin B-12 in health and disease. *Nutrients*. 2010 Mar;2(3):299-316.
2. National Institutes of Health. Vitamin B-12 fact sheet for health professionals. 2016.
3. Briani C, Dalla Torre C, Citton V, Manara R, Pompanin S, Binotto G, Adami F. Cobalamin deficiency: clinical picture and radiological findings. *Nutrients*. 2013 Nov;5(11):4521-39.
4. Strain JJ. Kaplan & Sadock's pocket handbook of clinical psychiatry. *The Journal of Clinical Psychiatry*. 2002 Oct 1;63(10):952-3.
5. Sharma P, Singh K, Bhatnagar R, Jain R. Assessment of Vitamin B-12 Deficiency and Associated

- Factors in Patients Attending Tertiary Care Hospital of Southern Rajasthan. *National Journal of Community Medicine*. 2018;9(10):740-44.
6. Singh C, Pukhraj G. A prospective, cross sectional open label clinico- epidemiological study of Vitamin B-12 deficiency in adolescent children. *Int J ContempPediatr*. 2018Jul;5(4):1468-73.
 7. Serin HM, Arslan EA. Neurological symptoms of vitamin B-12 deficiency: analysis of pediatric patients. *ActaClinicaCroatica*. 2019 Jun 1;58(2.):295- 301.
 8. Nkeshimana M, Ndayambaje B, Muvunyi CM, Dusabejambo V, Masaisa F. The prevalence of vitamin B-12 , folic acid and iron deficiency in healthy relatives of patients admitted at regional referral hospitals in Rwanda: A cross sectional study. *Rwanda Medical Journal*.2018;75(1):5-11.
 9. Green R, Allen LH, Bjørke-Monsen AL, Brito A, Guéant JL, Miller JW, Molloy AM, Nexo E, Stabler S, Toh BH, Ueland PM. Vitamin B 12 deficiency. *Nature reviews Disease primers*. 2017 Jun29;3(1):1-20.
 10. Wolffenbuttel BH, Wouters HJ, Heiner-Fokkema MR, van der Klauw MM. The many faces of cobalamin (vitamin B-12) deficiency. *Mayo clinic proceedings: innovations, quality & outcomes*. 2019 Jun1;3(2):200-14.
 11. Paudel P, Agrawal JP, Timilsena S, Subedi J. Study of vitamin B-12 status and the consequential clinico-hematological profile in healthy vegetarian population in Nepal. *Journal of Chitwan Medical College*. 2017 May24;7(1):41-6.
 12. Luthra NS, Marcus AH, Hills NK, Christine CW. Vitamin B-12 measurements across neurodegenerative disorders. *Journal of clinical movement disorders*. 2020 Dec;7(1):1-6.
 13. Barney Mohanraj Anithaetal Prevalence of Vitamin B-12 Deficiency and Its Associated Risk Factors among Pregnant Women of Rural South India: A Community-based Cross-sectional Study, *Indian J Community Med*. 2020 Oct-Dec; 45(4): 399–404.
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