

# Study on sociodemographic variables associated with Vitamin B12 deficiency in symptomatic patients attending fever outpatient department, Civil Hospital, Ahmedabad

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## ABSTRACT

**Background:** B12 deficiency is extremely common in India. Deficiency has varied manifestations and causes a range of disorders such as anemia, gastrointestinal, and neuropsychiatric manifestation and affects all age groups. **Objectives:** The aim of the study is to assess the clinical and sociodemographic variables associated with Vitamin B12 deficiency among symptomatic patients and to correlate the symptoms with serum level of Vitamin B12 deficiency. **Materials and Methods:** A cross-sectional observational study carried out among 97 patients attending fever outpatient department at civil hospital, Ahmedabad. Patients were interviewed with pretested questionnaire and were subjected for biochemical estimation of Vitamin B12, mean corpuscular volume, and hemoglobin. **Results:** Median age of attendees was 25 years (range: 13–64). Three out of eight symptoms were weakness (96.9%), tingling and numbness in hand and feet (60.8%), and fatigue (57.7%). All the patients who were tested on the basis of symptoms were found to be having Vitamin B12 insufficiency (<300 pg/ml). 46.3% were having severe deficiency (<150 pg/ml). Out of severely Vitamin B12 deficient patient, 47.8% were having any type of anemia. Study did not find any significant association ( $P < 0.05$ ) between gender, diet, water supply, and level of Vitamin B12, whereas there was a significant association between religion and severity of Vitamin B12 deficiency ( $\chi^2 = 6.09$ ,  $P < 0.05$ ). **Conclusion:** All the patients need to be clinically screened for symptoms of B12 deficiency, and even the mild symptomatic patients should be treated to prevent the severe form of deficiency or neuropsychiatric manifestations. This will also reduce the unnecessary burden on laboratory.

**KEY WORDS:** Vitamin B12; Deficiency; Age; Religion


## INTRODUCTION

Vitamin B12 is water-soluble vitamin, which is present in some foods naturally, added to some food items, and it is available as a prescription supplement in oral and injectable forms. Mineral “cobalt” is present in all the different

forms of Vitamin B12, and therefore, these compounds with Vitamin B12 functions are called as “cobalamins.” In our metabolism, two chemical forms of Vitamin B12, i.e., methylcobalamin and 5-deoxyadenosylcobalamin are active. Functions of Vitamin B12 in the human body include neurological development, synthesis of genetic material, i.e., DNA and maturation of red blood cells and other activity such as working as a cofactor for certain enzymes such as L-methylmalonyl-CoA mutase and methionine synthase.<sup>[1]</sup>

The assessment of Vitamin B12 status is done by serum Vitamin B12 levels. For adults, values <170–250 pg/mL (120–180 pmol/L) are considered Vitamin B12 deficiency.

<sup>[1]</sup> People with Vitamin B12 deficiency show various

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symptoms which are often ignored, and chronic deficiency leads to neurological impairment and anemia. Therefore, prompt treatment is warranted if deficiency is found in serum Vitamin B12 levels.<sup>[2]</sup>

Neurological problems due to deficiency of Vitamin B12 include paresthesia, memory loss, ataxia, vision problem, and peripheral neuropathy. Another major effect of Vitamin B12 deficiency is due to immature red blood cells leading to megaloblastic anemia. There is a type of megaloblastic anemia called pernicious anemia caused by autoimmune mechanism; in this type of anemia, intrinsic factor (IF) of castle is destroyed by autoimmunity which is essential in the absorption of Vitamin B12 and this also increases the risk of development of stomach cancer. Vitamin B12 deficiency in the antenatal period is responsible for the neural tube defect in fetus. The deficiency also causes temporary infertility which is rare and usually improves by treating with Vitamin B12.<sup>[3]</sup>

Among the causes of Vitamin B12 deficiency, autoimmune pernicious anemia is the most common cause. Some other common causes include ileal resection, gastrectomy, pancreatic insufficiency, and malabsorption syndromes. Some less common causes include the use of drugs such as biguanides, antacids, aminoglycoside antibiotics, colchicine, and rarely malabsorption due to gastrointestinal overgrowth of bacterial and parasitic infestation. Pure nutritional deficiency is rare and usually occurs only in strict vegans.<sup>[4]</sup>

In case of specific populations, deficiency proportion is highest among pregnant women which is often associated with folate deficiency leading to developmental defects in fetus. Deficiency rates are reported to be higher in vegans than vegetarians. Among vegetarians, higher deficiency rates are seen in people vegetarian since birth compared to people who became vegetarian later in life.<sup>[5]</sup>

Early recognition of symptoms and prompt treatment has shown beneficial effect in case of serious neurological symptoms. Other than paresthesia and optic atrophy, rest all neurological symptoms are reversible if treated early.<sup>[6]</sup>

B12 deficiency is extremely common. There are many reasons for this and are related to diet, lifestyle, social, and cultural issues. In spite of being a common disorder, its recognition is delayed or missed because the manifestations are diverse in nature, affecting all the organs and systems, and is often subclinical. To add to the confusion, laboratory estimations are notoriously unreliable even from the best of centers and doctors tend to rely on laboratory estimate of B12 levels.

The present study is aimed to assess the clinical and sociodemographic variables associated with Vitamin B12 deficiency among symptomatic patients and to correlate symptoms with serum Vitamin B12 level.

**MATERIALS AND METHODS**

A cross-sectional study was done in fever outpatient department (OPD) of civil hospital, Asarwa, Ahmedabad. All the symptomatic patients attending fever OPD during period of September 2017–November 2017 were interviewed with pretested structured questionnaire, and those who were found positive for three symptoms out of eight, i.e., weakness, fatigue, tingling and numbness in hands and feet, soreness in mouth, poor memory and depressive symptoms, constipation, weight loss, and loss of appetite were subjected for biochemical estimation of Vitamin B12, mean corpuscular volume (MCV), and hemoglobin. Analysis was done using Microsoft Excel 2007 and Chi-square test. Ethical permission was taken. Informed consent was taken from patient after explaining about the study.

**RESULTS**

Table 1 shows sociodemographic distribution of patients attending the fever OPD. Out of total 97 patients, 70 were females (72%) and 27 (28%) were males. Median age of attendees was 25 years (range: 13–64).

Figure 1 shows complaints of symptoms among OPD attendees. It was found that most patients complaining of weakness (96.9%), tingling and numbness in hands and feet (60.8%), and fatigue (57.7%).

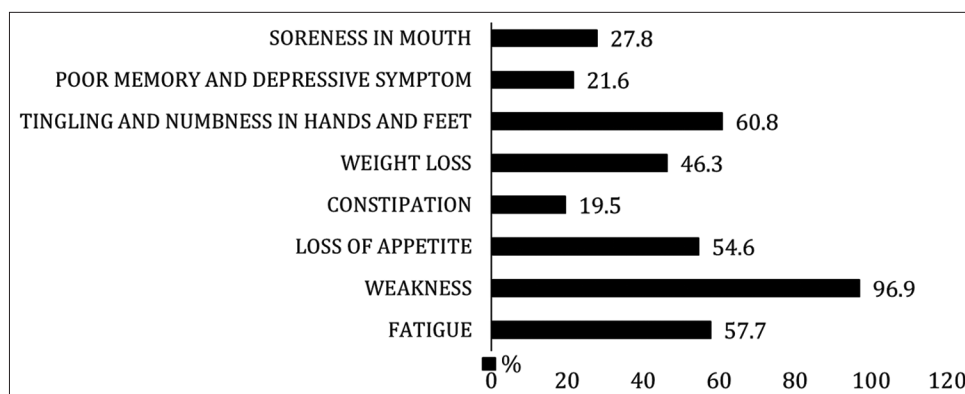
**Table 1:** Sociodemographic distribution of patients

Parameters	Frequency (n=97)	Percentage
Age (years)		
13–20	33	34
21–40	55	56
41–60	8	8.2
>60	1	1
Gender		
Female	70	72.1
Male	27	27.8
Diet		
Vegetarian	62	63.9
Mixed	35	36.0
Drinking water source		
Bore well	9	9.2
Municipal supply	84	86.5
RO	4	4.1
Socioeconomic status (modified B.G. Prasad) n=97		
I	3	3.0
II	7	7.5
III	26	26.8
IV	36	38.1
V	25	25.7

**Table 2:** Relation between sociodemographic variables and Vitamin B12 deficiency

Diet	Vitamin B12 deficiency present	Vitamin B12 deficiency absent	$\chi^2$ value	P-value
Vegetarian	53	09	1.076	>0.05
Mixed diet	27	08		
Male	24	03	1.065	>0.05
Female	56	14		
Hindu	68	10	6.09	<0.05
Muslim	12	07		
Hb deficiency present	35	05	1.65	>0.05
Hb deficiency absent	44	13		
Bore well	11	02	0.047	>0.05
Municipality	69	15		

Hb: Hemoglobin



**Figure 1:** Complaints of symptoms among patients attending outpatient department

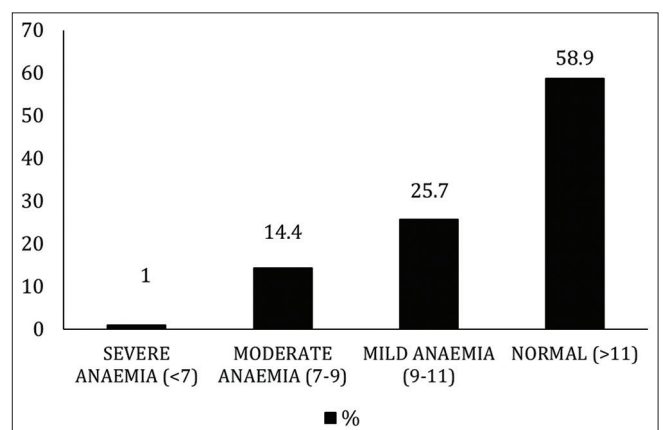
Figure 2 shows hemoglobin level in patients with Vitamin B12 deficiency. All the patients who were tested on the basis of symptom were found to be having Vitamin B12 insufficiency (<300 pg/ml) as per laboratory reports. Out of severely Vitamin B12 deficient patient, 47.8% were having any type of anemia.

Table 2 shows relation between sociodemographic variables and Vitamin B12 deficiency. Study did not find any significant association ( $P > 0.05$ ) between gender, diet, water supply, and level of Vitamin B12, whereas there was a significant association between religion and severity of Vitamin B12 deficiency ( $\chi^2 = 6.09, P < 0.05$ ).

**DISCUSSION**

Vitamin B12 deficiency is frequently underdiagnosed and undertreated condition due to vague symptoms which leads to chronic deficiency and irreversible neurological impairments. Therefore, clinical assessment and serology both are very important for diagnosis.<sup>[2]</sup>

This study shows that the median age of attendees was 25 years, and the number of males was not enough to make any gender-based conclusion whereas in some studies done on south Asians risk appeared to be similar for male and female.<sup>[7]</sup> Majority of the patients were vegetarian (63.9%),



**Figure 2:** Hemoglobin level in patients with Vitamin B12 deficiency patients

the deficiency even among patients who were non-vegetarian, it was found that they ate meat only occasionally. They were using municipality water supply (86.5%) and belong to lower socioeconomic class (63.8%). However, our study did not find any significant association ( $P > 0.05$ ) between gender, diet, water supply, and Vitamin B12 deficiency. There was a significant association between religion and severity of Vitamin B12 deficiency ( $\chi^2 = 6.09, P < 0.05$ ) which may be due to difference in cultural practices. Similar study done in Toronto found Vitamin B12 deficiency even among non-vegetarians.<sup>[7]</sup> Most common symptoms were weakness,

tingling and numbness in hands and feet, and fatigue which is similar to study conducted in Maharashtra.<sup>[8]</sup> All patients who were tested on the basis of symptoms ( $n = 97$ ) were having Vitamin B12 deficiency of which 46.3% were having severe deficiency (<150 pg/ml), 36% were having deficiency (150–200 pg/ml), whereas 17.7% were having potential undersupply (200–300 pg/ml).<sup>[9]</sup> There is evidence that B12 deficiency might clinically present at a much higher B12 concentration, i.e., in low normal range (500–600 pg/ml). Lindenbaum *et al.* observed that many individuals presented with deficiency symptoms at serum Vitamin B12 levels as high as 350 pg/ml,<sup>[10]</sup> whereas in another group, Van Tiggelen *et al.* recommended levels to be 600 pg/ml.<sup>[11]</sup> Our study shows that 61.8% of patients had normal range of MCV, which tell us that MCV alone is not enough as a diagnostic parameter of Vitamin B12 deficiency. Out of Vitamin B12 deficient patient ( $n = 97$ ), 47.8% were having any type of anemia because of the often coexisting iron deficiency could decrease MCV levels. Similar findings were seen in a study done in Toronto in south Asians.<sup>[7]</sup>

In our study, there were limitations, we did not use any other biochemical markers, for example, methyl-malonic acid or homocysteine; this study was based on serum B12 results and clinical symptoms, which alone, without other biochemical markers might be inaccurate measures of B12 deficiency. Outside our study setting, i.e., tertiary level of health facility, these findings might not be generalized.

Strength for this study as patients were available in fever clinic and agreed to take part in the study, so study was conducted easily.

### Recommendations

On the basis of this study, it is recommended that medical graduate and postgraduate should be trained in such a way to rely on clinical skill to make a clinical judgment rather than laboratory investigation to initiate therapy. Advocate a diet plan to give benefit to the patient. Serum B12 levels <100 pg/ml are reported to have specificity approaching 90% for diagnosing clinically manifested Vitamin B12 deficiency. Hence, patients with low Vitamin B12 level should be further tested for methylmalonic acid and IF antibodies.

### CONCLUSION

Since study observed that majority had severe form of B12 deficiency, all the patients need to be clinically screened for

symptoms of B12 deficiency and even the mild symptomatic patients should be treated to prevent the severe form of deficiency or neuropsychiatric manifestations. This will also reduce the unnecessary burden on laboratory.

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