

DISTRIBUTION OF VITAMIN B12 LEVEL ACCORDING TO SOCIO-DEMOGRAPHIC CHARACTERISTICS IN PATIENTS OF DHIRAJ GENERAL HOSPITAL, PIPARIYA, GUJARAT

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ABSTRACT

Background: Vitamin B12 is a biologically active corrinoid, a group of cobalt containing compounds with macrocyclic pyrrol rings. Vitamin B12 deficiency is characterized by megaloblastic anemia, fatigue, weakness, constipation, loss of appetite, and weight loss. Neurological changes, such as numbness and tingling in the hands and feet, can also occur.

Materials and Methods: Records of the patients who tested for vitamin B12 during April 2011 to September 2011 were analyzed. Secondary data on vitamin B12 level, age, sex, referring unit, religion and dietary history of these patients were obtain from hospital records.

Results: Gender did not appear to contribute towards the B12 deficiency according to our study. Vegetarian dietary habit was found to be a substantial risk factor for B12 deficiency

Key Words: Vitamin B12, Lactovegetarians, Fluorometric enzyme immuno assay

INTRODUCTION

Vitamin B12 is a biologically active corrinoid, a group of cobalt containing compounds with macrocyclic pyrrol rings.¹ Vitamin B12 deficiency is characterized by megaloblastic anemia, fatigue, weakness, constipation, loss of appetite, and weight loss. Neurological changes, such as numbness and tingling in the hands and feet, can also occur.² The neurological symptoms of vitamin B12 deficiency can occur without anemia, so early diagnosis and intervention is important to avoid irreversible damage.³

Vitamin B12, apart from causing neuropsychiatric symptoms, leads to hyperhomocysteinemia and methylmalonic acidemia which can have serious health implications. Low serum vitamin B12 levels have low sensitivity and specificity in terms of tissue deficiency.³ Homocysteine and methylmalonic acid estimations are adjunct and aid in diagnosis of B12 deficiency but still serum vitamin B12 measurement is the extensively applied standard method by practical purposes.

It is known that more vegetarians or elderly people suffer from vitamin B₁₂ deficiency compared to omnivores or younger adults. Because natural sources of vitamin B₁₂ in human diets have known to be restricted to animal-origin food, it has been believed that those people with low animal food diets are more susceptible to cobalamin deficiency.⁴

MATERIALS AND METHODS

This is a cross-sectional study, conducted at the department of Biochemistry of Smt. Bhikhiben K. Shah Medical Institute & Research Center of Sumandeep Vidyapeeth University in Pipariya of Waghodia taluka in Vadodara district, Gujarat, India. Pipariya is a village situated 13 kms from Vadodara city in Gujarat. Dhiraj general hospital is hospital attached with this medical college at Pipariya. Records of the patients who tested for vitamin B12 during April 2011 to September 2011 were analyzed. Permission from institutional ethical committee of the hospital was obtained for the study. Secondary data on vitamin B12 level, age, sex, referring

unit, religion and dietary history of these patients were obtain from hospital records.

Only those who consumed meat or fish were considered as non-vegetarians. Lactovegetarians as well as lacto-ovo vegetarians were grouped under vegetarians. As per the protocol of our laboratory, blood sample for vitamin B12 was drawn after an overnight fasting. Serum vitamin B12 levels (normal range 211- 946 pg/ml) were estimated by AIA 360 using fluometric enzyme immuno assay using commercially available ST AIA Pack B12 kits. The biochemical vitamin B12 deficiency was defined at a concentration below <211 pg/ml^{5,6} whereas at levels 350 pg/ml it was taken as borderline deficiency.⁷ Chi square test was applied to find association between B12 values of different age, sex and diet groups. Calculations were done using by Microsoft excel and SPSS software, version 12.0 for Windows.

RESULTS

During the period of 6 months, from April 2011 to September 2011, total 100 patients screened for serum vitamin B12 levels in the hospital and these all were enrolled in this study. Out of the total 100 patients, there were 48 men (48%) and 52 women (52%). Table

1 depicts serum B12 levels and percentage of men and women studied. Mean levels of B12 in 100 subjects were observed to be 536.8. Mean value for male is 453.2 and for woman is 414.8. If 211pg/ml was taken as cut off for deficiency state, total 38 out of 100 subjects (38%) turned out to be B12 deficient. In this group, 18 (18%) were men with mean levels of 170 pg/ml and 20 (20%) were women with mean of 161.6 pg/ml and no significant difference was observed between these two vitamin B12 deficient groups (p=0.006). It was observed that 70/100 (70%) subjects had B12 levels less than 350 pg/ml. Using this cut off value, 33 males (33%) and 37 females (37%) were included in the category of vitamin B12 deficient. There was no significant difference in the levels between males and females (170 vs. 161.6 respectively).

Table 1: Vitamin B12 levels in total subjects according to sex

Sex	<211 pg/ml	<350 pg/ml	Total
Male	18	33	48
Female	20	37	52
Total	38	70	100

Table 2: Distribution of Vitamin B12 level according to socio-demographic characteristics

Particulars	Vitamin B12 levels (pg/ml)			χ ²	p value
	<211 (%)	>211 (%)	Total (n=100)		
Age	>50 years	20 (50.0)	20 (50.0)	4.07	0.05
	<50 years	18 (30.0)	42 (70.0)		
Gender	Male	18 (37.5)	30 (62.5)	0.01	0.006
	Female	20 (38.5)	32 (61.5)		
Dietary Pattern	Vegetarian	29 (46.8)	33 (53.2)	5.33	0.02
	Non-vegetarian	9 (23.7)	29 (76.3)		

Gender did not appeared to contribute towards the B12 deficiency according to our study (Chi square value=0.012, table value=3.84, p= 0.069). Average age of subjects in our study was 42 years (range 25 to 65 years). Forty subjects out of a total of 100 screened were more than 50 years of age (40%). B12 was less than 211pg/ml in 20/40 (50%) as compare to 18/60 (30%) in <50 years of age group. Age >50 years appeared to increase the risk for vitamin B12 deficiency (chi square value=4.07, table value=3.84, p= 0.04) (table 2).

A total of 100, out of which 62 (62%) were vegetarians and 38 (38%) were non vegetarians. Among the vegetarian group, 29 out of 62 (46.8%) had vitamin B12 level less than 211 pg/ml where as only 9 of 38 non vegetarians (23.7%) had B12 deficiency (table2). Vegetarian dietary habit was found to be a substantial risk factor for B12 deficiency (Chi square value=5.33, table value=3.84, p= 0.02) in our population.

DISCUSSION

Deficiency of vitamin B12 is very common because of inadequate dietary intake and/or malabsorption. The deficiency state has a very wide presentation and can cause or exacerbate neuropsychiatric and other vague symptoms. In early stage vitamin B12 deficiency might present with subtle and slight cognitive impairments. Hence early recognition becomes crucial for preventing irreversible damage.

Present study depicted that 38% of the total subjects (38 out of 100) had vitamin B12 deficiency (levels <211pg/ml). It was observed that when cut off value was raised to 350 pg/ml, 70% population was found to be vitamin B12 deficient. Although varying data have come into picture regarding prevalence, our finding is in consistence with a study where 47% of the Asian Indians had B12 deficiency confirming the high prevalence of this magnitude in Indians.⁸ Though this study by Gupta et al was carried out in south Indians residing in Canada⁸, prevalence was quite similar to our study indicating that there are other factors beyond vegetarian diet that may possibly be responsible for this deficiency.

Over years various groups have proposed higher values as cut off for the deficiency state. Lindenbaum et al observed that many individuals presented with deficiency symptoms at serum vitamin B12 levels as high as 350 pg/ml.⁹ B12 deficiency was observed in 18% men and 20% women in the present study suggesting that risk of developing B12 deficiency is not affected by gender. This is similar to a study conducted on South Asian patients.⁸ In the present study a total of 40 subjects were found to be more than 50 years of age and out of that 20 (50%) were found to be B12 deficient (B12 <211 pg/ml) and 31 were observed to have serum vitamin B12 levels less than 350 pg/ml (70%). The prevalence rate observed in elderly population was higher than the total population. However it was much higher than that observed in Finnish elderly population.¹⁰ This can be explained by occurrence of higher prevalence of vitamin B12 in Indians probably due to the dietary habits. According to our data 52.6% of the subjects diagnosed to be B12 deficient were >60 years. However the age seemed to offer a substantial risk for developing B12 deficiency in Indians. This could be attributed to dietary limitations due to vegetarian dietary habits and lower socio economic status.

By dietary data history it could be assessed that vegetarian dietetic practice offered considerable risk for developing B12 deficiency, rate being 46.8% at 211 pg/ml cut off level. This is in consistence with several studies.^{11, 12}

There are few limitations in our study. First, since we have analyzed only the vitamin B12 levels of our population, the subjects having sub clinical deficiency (elevated homocysteine and methylmalonic acid with normal B12 levels) might have been missed out. Secondly, since it is a hospital based study, the population visiting the tertiary hospital cannot be considered representative of the west Indians. A number of large population based studies are required to validate our study findings in a broader perspective. Despite these limitations, prevalence observed in the present study was found to be highly significant and consistent with several other studies addressing the problem of vitamin B12 deficiency. However large population based studies may provide a better outlook about the magnitude of this problem.

CONCLUSION

Role of vitamins in maintenance of health has received tremendous attention in recent times. Vitamin B12 deficiency is not just a laboratory finding but a clinically relevant issue which

needs to be explored. Elderly people and vegetarians are at substantial risk to develop B12 deficiency. The magnitude of the prevalence of B12 deficiency estimated in our population strengthens the argument that B12 deficiency is more prevalent in Indians. Hence there is a need to include screening of vitamin B12 in routine clinical set up. Despite the plausible biochemical mechanism, further studies, based on laboratory findings along with clinical features will aid in understanding this irrefutable important subject.

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