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Assessment of Vitamin B12 Deficiency and Associated Factors in Patients Attending Tertiary Care Hospital of Southern Rajasthan

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ABSTRACT

Introduction: Vitamin B12 deficiency is gaining increasing importance as a public health issue as subclinical deficiency is reported to exist in India in more than 30% of adults and children. Thus the present study was done to find the burden of vitamin B12 deficiency in the symptomatic patients in the tertiary care centre and to analyze its association with demographic profile, dietary habits and severity of presenting symptoms.

Method: A 3 months long cross-sectional study was done in 235 symptomatic patients who were biochemically tested for serum Vitamin B12 levels.

Results: Almost 25.1% patients with symptoms were found deficient in Vitamin B12 at the study centre. Deficiency is higher in males i.e. 29.6%. Higher deficiency levels were found in urban population i.e. 30.6% and vegetarians (27.7%). Maximum deficiency was seen in females when they presented with late neurological deficit like dementia or seizures (42.8%).

Conclusion: Approximately 1/4th of the symptomatic population was found Vitamin B12 deficient suggesting the clinical deficiency showing the tip of the iceberg. Study findings suggest public health issue, thus further community based studies are required to evaluate it in India with large sample size and compelling IEC activities regarding dietary habits and early reporting of the symptoms and prompt treatment.

Keywords: Serum Vitamin B12, subclinical deficiency, neurological deficits, Dietary habits

INTRODUCTION

Vitamin B12 Deficiency is gaining increasing importance as a public health issue as subclinical deficiency is reported to exist in India in more than 30 percent in adults and children.[1] And estimated to affect 10%-15% of people over the age of 60.[2] Vitamin B 12 cooperates with folate in the synthesis of DNA, so deficiency of either leads to megaloblastosis. It also has a role in the synthesis of fatty acid in the myelin. Thus its deficiency is associated with pernicious anemia, demyelinating neurological lesions in the spinal cord and infertility (in animal species).[1]

The main dietary sources of vitamin B_{12} are animal products because animals obtain vitamin B_{12} through microbial symbiosis. The subsequent release of vitamin B_{12} from food for absorption into the body is complex and requires intact function of stomach, pancreas, and ileum[2].Vitamin B12 is known to be abundant in liver, kidney, meat, milk, and cheese.[1]

Usually, 2 to 3 mg of vitamin B_{12} reserves are stored in the body primarily in the liver, and our daily requirement of vitamin B_{12} is only about 2 to 3 μg. Thus, even with vegan diets, deficiency generally takes several years to develop.[2]

The laboratory diagnosis is usually based on low serum vitamin B12 levels or elevated serum methylmalonic acid and homocysteine levels.[3] Cut off level for deficiency is 180 pg/ml.

Symptoms can be strange sensations, numbness, or tingling in the hands, legs, or feet, difficulty walking (staggering, balance problems), anemia, a swollen and inflamed tongue, yellowed skin (jaundice), difficulty thinking and reasoning (cognitive difficulties), or memory loss, paranoia or hallucinations, weakness, fatigue.[4] Pregnant women with low or marginal levels of Vit B_{12} are at increased risk of having children with neural tube defects.[5]

The present study was done to find the burden of vitamin B12 deficiency in the symptomatic patients in the tertiary care centre and to analyze its association with demographic profile, dietary habits and severity of presenting symptoms.

METHODOLOGY

A cross sectional hospital based study was conducted in Central Laboratory, RNT Medical College, Udaipur, Rajasthan from September 2015 to November 2015 using a pre designed, pre tested, semi-structured questionnaire enquiring about age, gender, area of residence, dietary habits and symptoms . A sample size of 233 was calculated keeping the prevalence rate of deficiency of Vitamin B12 in India as 30%[1]; Confidence Interval of study 95% and Allowable error as 20% which was rounded off to 235 for the study purpose. All the symptomatic subjects referred from Medicine OPD for Serum Vitamin B12 level on Mondays and Thursdays OPD days; after giving consent, with age > 16 years and all the subjects who were getting tested for the first time were included in our study and rest all were excluded. Those patients who satisfied our inclusion criteria were subjected to Serum Vitamin B12 level testing by Chemiluminescence analysis test in the central laboratory. The cut-off level of deficiency was considered to be 180pg/ml as followed by the central lab in RNTMC, Udaipur. The collected data was entered and analyzed with MS Excel version 10, appropriate tables and graphs were generated using MS power point and standard tests were applied to find statistical associations.

RESULTS

In our study, maximum respondents belonged to the age group of 26-35 yrs followed by 16-25 yrs. 61.2% respondents were females and 38.8% were males. (Table 1 and 2) Out of all the respondents included in our study, 25.1% of the respondents were found Vitamin B12 deficient. Deficiency was higher in males i.e. 29.6% than in females i.e. 22.2%, but the difference was not statistically significant, p=0.19 (Table 2)

Table 1: Distribution of data according to the different age-groups

Age (yrs)	Total	Deficient Subjects	Percentage
16-25	45	8	17.7
26-35	49	23	46.9
36-45	38	8	21.0
46-55	27	0	0.0
56-65	42	16	38.1
66-75	34	4	11.7
Total	235	59	25.1

Table 2: Distribution of data according to the different Age-groups and Gender

Age Group(yrs)	Males		Females		Chisquare value	P value
	Total (%)	Deficient (%)	Total (%)	Deficient (%)		
16-25	11(100)	0(0.0)	34(100)	8(23.5)	Yates correction 1.74	0.186
26-35	19(100)	15(78.9)	30(100)	8(26.6)	12.77	0.00
36-45	19(100)	8(42.1)	19(100)	0(0.0)	Yates correction 7.76	0.005
46-55	8(100)	0(0.0)	19(100)	0(0.0)	Not compared	
56-65	15(100)	4(26.6)	27(100)	12(44.4)	1.29	0.255
66-75	19(100)	0(0.0)	15(100)	4(26.6)	Yates correction 3.46	0.062
Total	91(100)	27(29.6)	144(100)	32(22.2)	1.65	0.19

(Figures in parenthesis indicate percentages)

Table 3: Distribution of data according to the Area of Residence and Gender

Area	Males		Females		X^2	P valve
	Total	Deficient	Total	Deficient		
Rural	45(100)	8(17.7)	53(100)	9(16.9)	0.01	0.91
Urban	46(100)	19(41.3)	91(100)	23(25.27)	3.69	0.05
	X^2= 6.03, p=0.014		X^2=1.33, p=0.248			
Total	91(100)	27(29.6)	144(100)	32(22.2)		

(Figures in parenthesis indicate percentages)

Table 4(a): Distribution of the data according to the Dietary habits and Gender

Diet	Males		Females	
	Total	Deficient	Total	Deficient
Veg	68(100)	23(33.8)	98(100)	23(23.4)
Non Veg	11(100)	0(0.0)	8(100)	0(0.0)
Mixed Indian	12(100)	4(33.3)	38(100)	9(23.6)
Total	91(100)	27(29.6)	144(100)	32(22.2)

(Figures in parenthesis indicate percentages)

Table 4(b): Distribution of the data according to the Dietary habits

	Total subjects	Deficient subjects
Veg	166	46 (27.7)
Non veg	19	0 (0.0)
Mixed Indian	50	13 (26.0)
Total	235	59 (25.1)

(Figures in parenthesis indicate percentages)
16.7% of exp value <5, X^2=6.99, df=2, p=0.03

Maximum deficiency cases seen in age group 26-35 years (46.9%) followed by 56-65 years (38.1%). (Table 1) On further segregating the data gender-wise, maximum deficient were the males in 26-35 yrs age group (78.9%) followed by females in 56-65 yrs age group (44.4%). Though the difference of Vitamin B12 deficiency levels between males and females was not statistically significant at all the age groups except that of 26-45 yrs where the males were found to be more deficient than females with a highly statistically significant difference, p=0.00. (Table 2) Taking the area of residence and gender together into consideration, the deficiency was observed much higher in urban males than urban females with a significant difference and p value of 0.05, but not in rural males and females. Also the deficiency was more in urban males as compared to rural males with a significant statistical difference, p value=0.014 but not so for rural and urban females. (Table 3) Comparing the dietary habit, it was observed that there was a statistically significant difference in the Vitamin B12 deficiency levels amongst the subjects taking veg, mixed Indian and non veg diet, p value=0.03 as not even a single case was seen deficient in the population with majorly non-vegetarian diet. This difference was more evident in males (p=0.005) than females (0.041). (Table 4 a and b) On distributing the data according to symptoms with which subjects presented and their gender, we see that maximum deficiency was seen in females presenting with late neurological deficit like dementia or seizures (42.8%) as compared to their male counterparts but the difference was not statistically significant (p=0.405) followed by males (42.3%) presenting with early neurological deficit like tingling and loss of sensation with a significant statistical difference than female counterparts(p=0.007). (Table 5)

Table 5: Distribution of data according to Symptoms with which the subjects present and their Gender

Symptom	Males		Females		Chisquare value	df	P value
	Total (%)	Deficient (%)	Total (%)	Deficient (%)			
Generalized symptoms	61(100)	16(26.2)	114(100)	27(23.7)	0.14	1	0.709
Early neurological deficit	26(100)	11(42.3)	23(100)	2(8.6)	7.07	1	0.007
Late neurological manifestation	4(100)	0(0.0)	7(100)	3(42.8)	0.69*	1	0.405
Total	91(100)	27(29.6)	144(100)	32(22.2)			

* Yates Correction

DISCUSSION

The present study conducted in the Central Laboratory, RNT Medical College for a duration of 3 months included 235 subjects in which 61.2% respondents were females and 38.8% were males. Contrary to our study, 41% males and 59% females were included in the study by Vijaysingh Parmar et al in Gujarat.[4]

Out of all the respondents included in our study, 25.1% of the respondents were found Vitamin B12 deficient. Similarly, Pawlek R et al did a systemic analysis and found that the deficiency in adults and elderly individuals ranges between 0-86.5%.[6] Contrary to our study, higher prevalence of Vitamin B12 deficiency was observed in study by Jagjit singh chahal et al i.e 53.6%.[7] And also higher prevalence of Vitamin B12 deficiency was observed in a study by Chittaranjan S. Yajnik et al where 81% of the urban middle class had low Vitamin B12 level.[8]

Deficiency was higher in males i.e. 29.6% than in females i.e. 22.2%, but the difference was not statistically significant, p=0.19. As compared to our study in general population by Vijaysingh Parmar et al in Gujarat, 44% of males had low serum vitamin B12 level while in female, 45% had low serum vitamin B12 level and thus similarly, gender did not appear to contribute towards the B12 deficiency in their study(p>0.05).[4] Contrary to our study, male participants were observed to possess higher serum vitamin B12 than that in their female counter parts which showed significant inter-group variability ($P < 0.05$) in a study by Jagjit singh chahal.[7]

Maximum deficiency cases seen in age group 26-35 years (46.9%) followed by 56-65 years (38.1%). Our

data was comparable to an article by Pawlek R et al in Nutrition Reviews Journal of Oxford University where he observed the deficiency rates of 11-90% Vitamin B12 deficiency in elderlies.[6] In a similar study, Clarke R et al in USA in 2003 found 10% and 20% prevalence of Vitamin B12 deficiency among person aged 65-74 yrs and >=75 yrs respectively.[9] In a different study done in general population by Vijaysingh et al, Vitamin B12 level in subjects having age group less than 30 was 31.5%, between 30 year to 60 year was 39.3% and in ages more than 60 year, it was 62.5% and thus elderly patients (>60 years) appeared to have increased risk of Vitamin B12 deficiency($p < 0.05$).[4]

Taking the area of residence and gender together into consideration, the deficiency was observed much higher in urban males than urban females with a significant difference and p value of 0.05, but not in rural males and females. Also the deficiency was more in urban males as compared to rural males with a significant statistical difference, p value=0.014. In the study done by Yajnik et al in Pune, similar to our study median plasma vitamin B12 concentration was found lowest in the urban middleclass. Using150 pmol/L as threshold, 68% rural residents and 81% urban middle-class residents were found Vitamin B12 deficient.[8]

Comparing the dietary habit, it was observed that there was a statistically significant difference in the Vitamin B12 deficiency levels amongst the subjects taking veg, mixed Indian and non veg diet, p value=0.03 as not even a single case was seen deficient in the population with majorly non-vegetarian diet. This difference was more evident in males (p=0.005) than females (0.041). Similar to our study, higher proportion of def was seen in Vegans and vegetarians than non veg in study Pawlek R et al.[10] Similarly, Chittaranjan S. Yajnik et al found that Vegetarians had 4.4 times higher risk of Vitamin B12 deficiency. Vitamin B12 deficiency observed in 70.9% of vegetarians vs 50% of non-vegetarians.[8] Similarly higher proportion of Vitamin B12 deficiency was observed in Vegetarians (24%) vs 9% in Non-vegetarians in a study by Gammon CS et al 2011.[11] Contrary to our finding, only 33% of Vitamin B12 deficient were vegetarians in a study by Sanket K Mahajan et al in Maharashtra in 2015.[12]

On distributing the data according to symptoms with which subjects presented and their gender, we see that maximum deficiency was seen in females presenting with late neurological deficit like dementia or seizures (42.8%) as compared to their male counterparts but the difference was not statistically significant (p=0.405) followed by males (42.3%) presenting with early neurological deficit like tingling and loss of sensation with a significant statistical difference than female counterparts(p=0.007). According to a study conducted by Dr Chetan Anil Bhole et al in the similar setting of Udaipur, neurological complains like paresthesia, ataxia, decreased vision, psychiatric and cognitive impairment were observed in 68 (54.4%) patients among them paresthesia were present in three-fifth (60.29%) patients. Also majority of patients (78.9%) had constitutional symptoms like weakness, fatigue, anorexia, weight loss while gastrointestinal symptoms were present in 53.33% patients. Among the non-neurological signs majority of patient's i.e.112 (89.47%) patients had general symptoms like pallor or hyper pigmentation of palm.[13]

The results of our study lead us to many points to ponder about such as why the deficiency is more in the males than females and why the population from the urban area is affected more! Furthermore, as the study was conducted in the hospital setting, it lacks the projection on the larger population of the community and thus there is further scope of community based researches with larger sample size and compelling IEC activities regarding dietary habits and early reporting of the symptoms and prompt treatment.

CONCLUSION

From our study, it was concluded that almost 1/4th of the respondents were Vitamin B12 deficient. Males especially from the age-group 26-35 yrs were the maximum amongst the deficient ones, suggesting the emergence of the condition in the younger age-group. It was also concluded that Vitamin B12 was more prevalent in urban residents than rural ones which could be probably attributed to their lifestyles differences and makes a good point for further research. Vitamin B12 deficiency was observed amongst the subjects taking vegetarian and mixed Indian diet than non-vegetarian diet. On distributing the data according to symptoms with which subjects presented and their gender, we see that maximum subjects presented with the generalised symptoms followed by early neurological deficits. Also the maximum percentage of Vitamin B12 deficiency was seen in subjects with late neurological symptoms. Males presenting with early neurological deficit like tingling and loss of sensation with a significant statistical difference than female counterparts.

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REFERENCES

1. K Park. Park's Textbook of Preventive and Social Medicine, 23rd ed. Jabalpur: Bhanot Publishers; 2015. p 650
2. Baik HW, Russell RM. Vitamin B12 deficiency in the elderly. Annu Rev Nutr. 1999;19:357-77.
3. CW Wong. Vitamin B_{12} deficiency in the elderly: is it worth screening? Hong Kong ***Med*** J 2015 Apr;21(**2**):155–64
4. Vismay Naik, Parul Bhatt. Vitamin B12 Deficiency: A Clinical Review. International Journal of Basic and Applied Medical Sciences 2014; Vol. 4 (3) September-December: pp.66-73
5. Patrick J. Skerrett. Vitamin B12 deficiency can be sneaky, harmful. Harvard Health Publications; Posted January 10, 2013, 10:03 am
6. Pawlak R, Lester SE, Babatunde T. The prevalence of cobalamin deficiency among vegetarians assessed by serum vitamin B12: a review of literature. Eur J Clin Nutr. 2014 May;68(5):541-8.
7. Jagjit Singh Chahal, Sunil Kumar Raina, KK Sharma, et al. How common is Vitamin B12 deficiency - A report on deficiency among healthy adults from a medical college in rural area of North-West India. International journal of Nutrition, Pharmacology and Neurological diseases. 2014; Volume 4; Issue 4; 241-245
8. Chittaranjan S Yajnik, Deshpande SS, Lubree HG, et al. Vitamin B12 deficiency and hyperhomocysteinemia in rural and urban Indians. The Journal of the Association of Physicians of India. October 2006; 54:775-82
9. Clarke R, Refsum H, Birks J, et al. Screening for vitamin B-12 and folate deficiency in older persons. Am J Clin Nutr. 2003 May;77(5):1241-7.
10. Pawlak R, Parrott SJ, Raj S, et al. How prevalent is vitamin B(12) deficiency among vegetarians?. Nutr Rev. 2013 Feb;71(2):110-7.
11. Gammon CS, von Hurst PR, Coad J, et al. Vegetarianism, vitamin B12 status, and insulin resistance in a group of predominantly overweight/obese South Asian women. Nutrition. 2012 Jan; 28(1):20-4.
12. Sanket K. Mahajan and Swati C. Aundhakar. A Study of the Prevalence of Serum Vitamin B12 and Folic Acid Deficiency in Western Maharashtra. J Family Med Prim Care. 2015 Jan-Mar; 4(1): 64–68.
13. Chetan Anil Bhole, Tarun Kumar Ralot, R L Meena. A Study of Correlation between Vitamin B12 Deficiency and Its Clinical, Haematological and Electrophysiological Parameters. International Journal of Medical Science and Education 2014 Oct-Dec; 1(4):187.