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AN ASSESSMENT OF VITAMIN B12 DEFICIENCY IN MEDICAL PROFESSIONALS"

Medical Science

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ABSTRACT

Vitamin B12 Deficiency is becoming a public health issue as it exists in more than 30% in adults and children in India. Although the classic hematologic expression of vitamin B12 deficiency is a megaloblastic anemia, upto 28% of affected patients may have a normal hemoglobin level, and 17% may have a normal MCV. Doctors connect the health services to society and their health status would improve the public health. Thus the present study was done to find the prevalence of Vitamin B12 deficiency in doctors and to assess its correlates like age, gender, diet, exercise and sleeping habits, working hours. It was a cross-sectional population survey of the medical professionals conducted in the Government medical college of Udaipur with a sample size of 90, calculated by epiinfo6. Simple random sampling was done to select the departments to include the doctors. 72.3% doctors were found deficient in Serum Vitamin B12 levels, with 25.5% severely deficient. The association of Vitamin B12 deficiency was found to be statistically significant with dietary pattern.

KEYWORDS

Vitamin B12 Deficiency, Megaloblastic Anemia, Medical professionals

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] In 1994, the Framingham Heart Study reported the prevalence of vitamin B_{12} deficiency, as defined by a serum vitamin B_{12} level less than 200 pg per mL and elevated levels of serum homocysteine, methylmalonic acid, or both, to be 12 percent. However, most deficient patients did not have hematologic manifestations, and neurologic manifestations were not assessed.[2] Vitamin B-12 is important for DNA synthesis, regenerating methionine for protein synthesis and methylation, and preventing homocysteine accumulation.[3] Vegetarians are at risk of vitamin B_{12} deficiency as are other groups with low intakes of animal foods or those with restrictive dietary patterns. Malabsorption of vitamin B_{12} is most commonly seen in the elderly, secondary to gastric achlorhydria.[4]

(Methylmalonic acid) MMA is considered to be the specific indicator of cobalamin metabolism, and (homocysteine) tHcy is raised in vitamin B_{12} deficiency.[4] The Recommended Dietary Intake (RDI) by ICMR (2010) for normal adult is 1 mcg/day.[1] Clinical Manifestations include a wide spectrum of signs and symptoms like hyperpigmentation, vitiligo, glossitis, jaundice, anemia (macrocytic, megaloblastic), thrombocytopenia, cognitive impairment, gait abnormalities, irritability, paresthesias, tingling, peripheral neuropathy, weakness etc. Although the classic hematologic expression of vitamin B_{12} deficiency is a megaloblastic macrocytic anemia, up to 28 percent of affected patients may have a normal hemoglobin level, and up to 17 percent may have a normal mean corpuscular volume.[2]

Thus having known the various implications and consequences of Vitamin B12 deficiency, we felt a need to address this silent issue in public health. So, a study to find out the prevalence of Vitamin B12 deficiency in doctors was done.

MATERIALS AND METHODS

The present study was a cross-sectional population survey of the medical professionals conducted in the Government medical college of Udaipur. The sample size was calculated by using *Epi info 6* for population survey with a population size of 225(doctors working in the medical college, expected frequency as 30% (ref : Park's textbook of Preventive and Social Medicine), worst acceptable limit of 40% and at confidence level of 99%, a minimum sample size required was 86. Keeping the drop-outs in the mind, the sample size taken was 90. We noted down the names of all the departments on chits and randomly drew the chits to approach the departments. All the doctors willing to participate and giving the written consent were included in the study. A semistructured closed-ended questionnaire was subjected to each of the participant enquiring about the age, gender, dietary pattern, exercise and sleeping habits and working hours. Serum Vitamin B12 levels of the respondents were done in the Central Laboratory, RNT Medical College, Udaipur by the **Chemiluminescence analysis test** with normal range of 183-999 pg/ml. Serum Vitamin B12 levels <183 pg/ml were considered deficient. An arbitrary range of deficiencies was made in order to classify the respondent viz., <50 pg/ml, 50-100 pg/ml, 100-183 pg/ml and >183 pg/ml. The Serum Vitamin B12 essay is conducted under Rajasthan Medical Relief Society (RMRS) with a reasonable charge of Rs 120. Data were entered and analyzed by using Micro soft excel version 2011, Epiinfo 6 and Statistical Package for social science ver.21 (SPSS.21). The standard tests were used to find the statistically significant association. A p-value less than 0.05 was considered statistical significant.

OBSERVATIONS AND RESULTS

Amongst the respondents, 47.7% were males and 52.2% were females. The maximum respondents fell under the age-group of 25-35 yrs (44.4%) followed by 35-45 yrs (28.8%). Only 10% belonged to age group >55 yrs. The mean age of males was 39.76 +/- 10.25 yrs and that of females was 38.93 +/- 10.15 yrs. (Table 1)

TABLE 1: Distribution of respondents according to age and gender

S. No.	Age Groups	Males	Females	Total
1	25-35	19(44.2%)	21(44.7%)	40(44.4%)
2	35-45	14(32.5%)	12(25.5%)	26(28.8%)
3	45-55	4(9.3%)	11(23.4%)	15(16.6%)
4	>55	6(13.9%)	3(6.38%)	9(10%)
5	Total	43(47.7%)	47(52.2%)	90(100%)

Majority of respondents followed vegetarian dietary pattern (61.1%) followed by mixed diet (34.4%) and only 4.4% followed non vegetarian diet. The tendency of following mixed and non-veg diet was more in males (46.5%) than in females (31.9%). 65.5% of respondents worked for 6 hours or lesser, of these 33.8% were males and 66.1% were females. Only 10% respondents worked for more than 10 hours of which 77.7% were males and 22.2% were females. Out of the total, maximum work out for less than 30 minutes (65.5%), more tendency towards sedentary life. The sedentary life style was seen more in females (78.7%) than males (51.2%) as they exercise for less than 30 minutes. Also the majority of respondents had sleeping hours of 6-8 hrs i.e. 57.7%. Only 27.7% (25) of the total 90 respondents were above the cut off mark of 183 pg/ml. Rest 72.2% (65) were deficient in Vitamin B12 levels. Moreover 25.5% of the total respondents were below the level of 50 pg/ml, which were undetectable by the machine. (Table 2)

TABLE 2: Classification of respondents according to their Vitamin B12 level

S. No.	Serum Vitamin B12	Total respondents with percentage
1	>183	25(27.7%)
2	100-183	30(33.3%)
3	50-100	12(13.3%)
4	<50	23(25.5%)
5	Total	90(100%)

Out of the total 43 males, 74.4% males and out of 47 females, 70.2% females were Vitamin B12 deficient. Amongst both the affected males and females, maximum fell under the age group of 35-45 yrs (88.8% for males and 84.6% for females) followed by 25-35 yrs (73.3% for males and 75% for females). (Table 3)

TABLE 3: Classification of Respondents According To Their Vitamin B12 level, gender and age-group

S.No.	B12 levels	Male					Female					Total
		25-35	35-45	45-55	>55	Total	25-35	35-45	45-55	>55	Total	
1	>183	4	2	3	2	11(25.5%)	5	1	6	2	14(29.7%)	25(27.7%)
2	100-183	6	6	0	2	14(32.5%)	7	5	4	0	16(34.04%)	30(33.3%)
3	50-100	1	4	1	0	6(13.9%)	3	3	0	0	6(12.7%)	12(13.3%)
4	<50	4	6	0	2	12(27.9%)	5	3	2	1	11(23.4%)	23(25.5%)
5	Total	15	18	4	6	43(100%)	20	12	12	3	47(100%)	90(100%)

Vitamin B12 deficiency is observed at later age in males than females. Mean age of the males having <50 is higher i.e. 39.25 yrs with SD 10.3 yrs as compared to females where mean age is 38 yrs ± 10.2 yrs.

Amongst the males, deficiency was more in Vegetarian diet followed by mixed diet while amongst the females, deficiency was more in mixed diet pattern. Deficiency was minimum with non-vegetarian diet in both the genders. Amongst all the respondents with Vitamin B12 levels <50 pg/ml, vegetarians were maximum (65.2%) followed by mixed diet pattern (34.8%). Not a single respondent with non-vegetarian dietary pattern had severe Vitamin B12 deficiency. Amongst the 65 respondents who were Vitamin B12 deficient, maximum proportion were following the vegetarian dietary pattern more than non-veg and mixed. The difference came out to be statistically significant. (X2 = 66.05; df=5; p value= 0.00) (Chart-1)

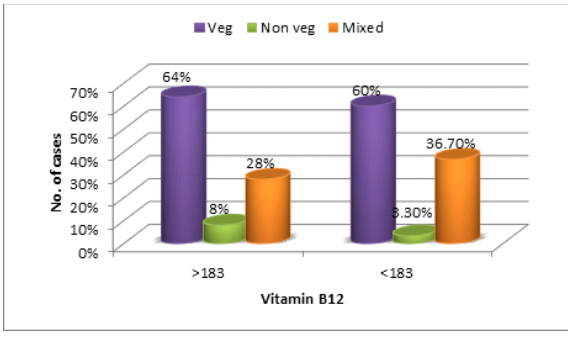

Chart-1: Association of Vitamin B12 with dietary pattern

Severe deficiency appeared in males and females who were working for 6 hours or less. As the working hours increased, their vitamin B12 level seemed to increase. The mean working hours were highest for the respondents at the level of 100-183 pg/ml, i.e. 8.23 hrs. And the working hours of males were more than females at all the levels of vitamin B12. Higher proportion of males (81.25%) and females (76.92%) exercising less than 30 min had Vitamin B12 deficiency as compared males (70.2%) and females (62%) exercising more than 30 min. The overall mean duration of exercise was lower in the Vitamin B12 deficient respondents, with a minimum exercise minutes at 50-100 pg/ml. Males had more mean duration of exercise than females at all the levels of Vitamin B12. Maximum respondents were taking a sleep of 6-8 hours duration. The Vitamin B12 deficiency was higher in females with the sleeping hours <= 6 and >8 but it was higher for males when their duration of sleep was 6-8 hours. The Vitamin B12 levels are decreasing with decreasing mean duration of sleep for both males and females.

DISCUSSION

The present study done in RNT medical college, Udaipur, Rajasthan was aimed at assessing the prevalence of Vitamin B12 deficiency in the medical professionals of the government medical college of Udaipur and its correlates. Amongst the respondents in our study, 47.7% were males and 52.2% were females. The ages of subject completing our study was between 25-60 with a mean of 39.05 yrs. Similar to our study, Ala Qatatsheh et al[5] from Jordan conducted a study on subjects of 18-80 yrs with a mean of 34 yrs. Jagjit Singh Chahal[6] in Punjab conducted a study on subjects between 18-56 yrs, divided in two groups having mean age of 39.06 +- 8.51 yrs in group I (26-56 yrs) and 20.82 +/- 2.93 in group II (18-25 yrs) which included employees and medical students. Contrary to our study, the age range was between 0-96 years and the mean age of patients was found to be 17.65±7.49 in the study by Vijaysingh Parmar et al[7]. The mean age of males was 39.76 +/- 10.25 yrs and that of females was 38.93 +/- 10.15 yrs.

In our study, 72.2% respondents were found to be deficient in Vitamin B12 levels.. Similarly, Pawlek R et al[8] did a systemic analysis and found that the deficiency in adults and elderly individuals ranges between 0-86.5%. Contrary to our study, lower prevalence of Vitamin B12 deficiency was observed in study by Jagal singh chahal et al[6] i.e 53.6%. Whereas higher prevalence of Vitamin B12 deficiency was observed in a study by Chittaranjan S. Yajnik[9] et al where 81% of the urban middle class had low Vitamin B12 level. In our study, borderline Vitamin B12 deficiency occurred in 33.3%. Patrick J Skerrett[10] in an article wrote that as per The National Health and Nutrition examination survey, the borderline deficiency is present in upto 20% of adults which is lower than our study. Moreover 25.5% of the total respondents were severely deficient (below the level of 50 pg/ml) as per our analyser. In comparison to our study, a lower proportion of respondents were found severely deficient 16.3% in a study by Jagjit singh chahal et al[6]. The national health and nutrition exam survey has also estimated a lower prevalence of seriously low Vitamin b12 levels i.e. 3.2% in adults over the age of 50 yrs. Both males and females were almost equally affected at all the levels of Vitamin B12 except at <50 pg/ml where males were more deficient. But the difference in males and females at all the levels of Vitamin B12 was not statistically significant. Very similar to our study in general population by Vijaysingh parmar et al[7] in Gujarat, 44% of males had low serum vitamin B12 level while in female, 45% had low serum vitamin B12 level and gender did not appear to contribute towards the B12 deficiency in their study(p>0.05). 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[6].

Amongst both the affected males and females, maximum fell under the age group of 35-45 yrs(88.8% for males and 84.6% for females) followed by 25-35 yrs(73.3% for males and 75% for females). Whereas amongst the ones below 50 pg/ml, males of age group 35-45 yrs(33.3%) and >55 yrs(33.3%) are equally affected and females of age >55 yrs(33.3%) are more affected than other age groups. Our data was comparable to an article by Pawlek R et al[8] in Nutrition Reviews Journal of Oxford University where he observed the deficiency rates of 11-90% Vitamin B12 deficiency in elderlies. In a similar study, Clarke R et al[11] in USA in 2003 found 10% and 20% prevalence of Vitamin B12 deficiency among person aged 65-74 yrs and >=75 yrs respectively. In a different study done in general population by Vijaysingh et al[5], 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). Even Bernadette N. Ng'eno et al[12] and Manjeshwari et al[13] did tremendous work in children in Nepal in 2017 and 2014 respectively observed Vitamin B12 deficiency in children as 32.1% and 41% respectively. Again in our study, severe Vitamin B12 deficiency is observed at later age in males than females. Mean age of the males having Vitamin B12 levels <50 is higher i.e. 39.25 yrs as compared to females 38.25.

Amongst the 65 respondents who were Vitamin B12 deficient in our study, maximum proportion were following the vegetarian dietary pattern more than non-veg and mixed. The difference came out to be statistically significant. 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[9] 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.

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[14] 2011. Contrary to our finding, only 33% of Vitamin B12 deficienct were vegetarians in a study by Sanket K Mahajan et al[15] in Maharashtra in 2015. Deficiency was minimum with non-vegetarian diet in both the genders. Amongst all the respondents with Vitamin B12 levels <50 pg/ml, vegetarians were maximum(65.2%) followed by mixed diet pattern(34.8%). Not a single respondent with non-vegetarian dietary pattern had Vitamin B12 level <50 pg/ml.

In our study, maximum respondents were working for less than or equal to 6 hours, out of them majority were females. Severe deficiency appeared in males and females who were working for 6 hours or less. As the working hours increased, their vitamin B12 level seemed to increase. Higher proportion of males (81.25%) and females (76.92%) exercising less than 30 min had Vitamin B12 deficiency as compared males (70.2%) and females (62%) exercising more than 30 min. Similar to our study, the prevalence of low levels of vitamin B12 is lower (58%) in those who give history of regular exercise than others in a study by Chaitanya Gulvady[16] in Maharashtra.

SUMMARY AND CONCLUSION

72% of the respondents were Vitamin B12 deficient and out of which 25.5% were severely deficient. Both males and females were almost equally affected. Amongst the 65 respondents who were Vitamin B12 deficient, maximum proportion were following the vegetarian dietary pattern more than non-veg and mixed. The difference came out to be statistically significant. As the working hours increased, the Vitamin B12 level seemed to increase for both males and females. Higher proportion of males and females exercising less than 30 min had Vitamin B12 deficiency. The Vitamin B12 deficiency was higher in females with the sleeping hours ≤ 6 and >8 but it was higher for males when their duration of sleep was 6-8 hours. The Vitamin B12 levels are decreasing with decreasing mean duration of sleep for both males and females. Thus we conclude that Vitamin B12 deficiency has become a silent epidemic with serious consequences and it needs to be addressed as it is affecting all the groups and classes of community equally. There is a significant prevalence of Vitamin B12 deficiency in doctors which could be attributed to their lifestyle. There is a need for sensitization of public and health care community about this health issue and promoting its earliest diagnosis and prompt treatment.

RECOMMENDATIONS

We feel that from the public health perspective, understanding the conditions that predispose to B12 deficiency and implementing the appropriate measures like dietary modifications to prevent such deficiency in populations at risk is recommended. Further large scale studies are needed to determine the prevalence of vitamin B12 deficiency in Indian population in order to prevent long-term effects of mild, subclinical cobalamin deficiency. There is a need to extend this study to action oriented approach where the intervention in the form of treatment modalities should be included. As the investigation is done in the Central Government laboratory, we also feel that an External Quality Assurance of these tests should be done by comparing the results with the repeat test results from an Accredited Private laboratory.

STRENGTHS AND LIMITATIONS

We could collect the data from a wide variation of age group and multiple characteristics could be studied at the same time in our study. But prevalence estimates have been based only on a single occasion investigation of Vitamin B12 levels. Even though the study was done using appropriate sample size estimation, it would have been better if a larger sample was taken to increase the power of the study but this could not be achieved due to time and money constraints.

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