



A STUDY ON PREVALENCE OF VITAMIN B12 DEFICIENCY AMONG HYPERTENSIVE PATIENTS AND ITS RISK FACTOR

General Medicine

Dr. Srimy Modi* Third Year Post Graduate, General Medicine, MGM Medical College And Hospital, Navi Mumbai. *Corresponding Author

Dr Ratan Choudhary Senior Resident, General Medicine, MGM Medical College And Hospital, Navi Mumbai.

Dr. Vandana Dandekar Professor And Head Of Unit General Medicine, MGM Medical College And Hospital, Navi Mumbai.

ABSTRACT

Background: Hypertension is chronic diseases of global concern. The role of vitamin B12 in controlling blood pressure has been debated with varying results among the existing research. Hence, the present study aims to identify the burden of vitamin B12 among hypertensive patients assess its risk factors. **Material And Method:** A cross-sectional study was conducted among 100 hypertensive patients visiting the OPD of a tertiary care hospital. Structured questionnaire was used to collect detailed history, clinical examination and laboratory investigations. Vitamin B12 values less than 211 pg/ml was considered to be deficiency of the vitamin. **Results:** The mean age of the study participants was 40.5 ± 4.8 years, with 62% being females. We found 37% (95% CI: 27.5 – 47.2) of the hypertensive patients to have vitamin B12 deficiency. The grade and duration of hypertension was not associated with vitamin b12 deficiency while vegetarian diet, smoking and drinking alcohol was found to be statistically associated with vitamin B 12 deficiency ($p < 0.05$). **Conclusion:** A high prevalence of vitamin B12 deficiency was seen among hypertensive patients which was associated with diet, smoking and alcohol but not the grade and duration of hypertension. Improving dietary habits and quitting smoking and alcohol should be emphasized to all hypertensive patients.

KEYWORDS

Vitamin B12, Hypertension, Folate, Homocysteine

INTRODUCTION

Hypertension is a serious public health issue of global concern which is influenced by both hereditary and environmental factors. The risk of stroke, heart disease, kidney failure, disability, and mortality are increased in the presence of hypertension. Managing and treating the complications of hypertension among the low- and middle-income nations is a huge challenge since there is disproportionately huge number of cases with inadequate health systems. Therefore, its crucial for investigating underlying factor attributing to rise in blood pressure and develop targeted intervention. In this regard, the beneficial effect of vitamin B on lowering blood pressure or incident hypertension has been extensively studied [1].

However, there has been debate regarding the role of B vitamins in the development of cardiovascular disease, as some large prospective trials have failed to find a significant association between the two. [2] A recent meta-analysis of clinical trial data suggested that recurrent stroke is not significantly reduced by B-vitamin supplementation, while the incidence of new ischemic stroke was reduced. This suggests the possibility that B-vitamin treatment may be more effective in individuals without established vascular disease.

A prior study found an inverse relationship between blood pressure and vitamin B12 in relation to heme metabolism. [3] However, there is paucity of research in this aspect. Moreover, these vitamins are critical for the metabolism of methionine and are important nutritional factors that influence plasma Hcy levels, with limited data to support this theory. The only source of vitamin B12, is animal sources and its products. Most of the vegetarian in India do not consume any animal products except for milk and milk products. The present study was done to assess the prevalence of vitamin B12 deficiency among hypertensive patients and to assess factors associated with it.

MATERIAL AND METHODS

Study Design And Setting

This was an observational study conducted among hypertensive patients visiting the OPD and in-patients admitted in the Department of Medicine, MGM Medical Hospital, Kamothe, Navi Mumbai during the period March 2021 to September 2023

Sample Size And Sampling Method

Sample size was calculated using the formula $n = (Z^2 PQ)/E^2$, where P is the prevalence of hypertension from a previous study which was 29%, $Q = 100\% - P$, $Z = 1.96$ for 95% Of Confidence Interval and E is margin of error = 10%. Rounding off to nearest tens place the final sample was calculated to be 100. Consecutive sampling of all patients with

hypertension was done during the study period till the desired sample size was achieved. Inclusion criteria: Patients aged between 18 and 60 years and known to be a hypertensive (with or without medication) for at least 6 months. Exclusion criteria: Patients receiving B12 supplements, known case of diabetes, having malabsorption syndrome like intrinsic factor deficiency like pernicious anaemia and those not giving consent.

Data collection tool and procedure

Information was collected through a pre-tested and structured proforma for each patient. Qualifying patients underwent detailed history, clinical examination and laboratory investigations. The purpose of study was explained to the patients in simple terms and informed consent was obtained prior to recruiting them in the study. The following laboratory investigation was done: Complete blood count, peripheral smear for cell type, reticulocyte count and Vitamin B12 levels. Vitamin B12 values less than 211 pg/ml was considered to be deficiency of the vitamin.

Statistical Analysis

The data was entry done in MS-Excel and analyzed using SPSS-version 25. Quantitative variables were expressed in mean value \pm standard deviation (SD), while qualitative variables were expressed as frequency and proportion. Chi-square test was used to infer association between two variables and a p value of < 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted only after obtaining approval from ethics committee. Voluntary written consent was obtained from the patient. All information obtained from patients were kept confidential and were only used for scientific reasons and no personal identity was revealed at any point in time.

RESULTS

The mean age of the study participants was 40.5 ± 4.8 years, with 62% being females and the rest male. Most of the patients i.e. 69% were either obese or overweight. The mean duration of hypertension in was 7.3 ± 3.8 years. We found 37% (95% CI: 27.5 – 47.2) of the hypertensive patients to have vitamin B12 deficiency. The presence of vitamin B12 deficiency was not associated with the grade of hypertension ($p = 0.08$). (Table 1)

The association between vitamin B12 deficiency with dietary pattern, smoking, alcohol and duration of hypertension was found to be

statistically significant ($p < 0.05$). (Table2)

Table 1: Mean Vitamin B12 Values Of Patients Based On Their Hypertensive Status (n=100)

Hypertensive status	Vitamin B12 deficiency		Chi-square test (P-value)
	Absent	Present	
Controlled HT (n=26)	14 (22.2%)	12 (32.4%)	6.73 (0.08)
Pre-HT (n=32)	26 (41.3%)	6 (16.2%)	
Stage I HT (n=24)	13 (20.6%)	11 (29.7%)	
Stage II HT (n=18)	10 (15.8%)	8 (21.6%)	
Total	63 (100%)	37 (100%)	

Table 2: Factors associated with vitamin B12 deficiency

Variables	Vitamin B12 deficiency		Chi-square test (P-value)
	Absent (n=63)	Present (n=37)	
Age			3.76 (0.05)
18-30 (n=11)	4 (6.3%)	7 (18.9%)	
31-45 (n=89)	59 (93.7%)	30 (81.1%)	
Sex			0.00 (0.97)
Male (n=38)	24 (38.0%)	14 (37.8%)	
Female (n=62)	39 (62.0%)	23 (62.2%)	
BMI			2.41 (0.12)
Normal (n=31)	23 (36.5%)	8 (21.6%)	
Obese/overweight (n=69)	40 (63.5%)	29 (78.4%)	
Diet			12.09 (0.000*)
Vegetarian (n=40)	17 (26.9%)	23 (62.1%)	
Non-vegetarian (n=60)	46 (73.1%)	14 (37.9%)	
Smoking			9.07 (0.002*)
Present (n=26)	10 (15.8%)	16 (43.2%)	
Absent (n=74)	53 (84.2%)	21 (56.8%)	
Alcohol			27.06 (0.000*)
Present (n=21)	3 (4.7%)	18 (48.6%)	
Absent (n=79)	60 (95.2%)	19 (51.4%)	
Duration of hypertension			0.03 (0.85)
<5 years (n=26)	16 (25.4%)	10 (27.0%)	
≥5 years (n=74)	47 (74.6%)	27 (73.0%)	

DISCUSSION

In the present study the prevalence of vitamin B12 deficiency among hypertensive patients was 37% (95% CI: 27.5 – 47.2). A study by Liu et. al. [4] found a very higher high proportion of B12 deficiency i.e. 98.5%. There are very limited studies on the burden of vitamin B12 deficiency among hypertensive with a wide variation in prevalence, hence the need for further research among different population`.

We found no association between the grade and duration of hypertension with the occurrence of vitamin B12 deficiency. Scazzone et. al. [5] in their study compared the serum levels of Vitamin B12, folate and homocysteine among 116 hypertensive cases and 81 healthy controls. In this study hypertensive patients had lower folate and elevated homocysteine level which was statistically significant but not vitamin B12 which supports our study findings.

Other socio-demographic factors such as age, sex and BMI were not associated with B12 deficiency. Tamura et. al. [6] in their study included 2079 samples, among which 734 individual i.e 35.3% had hypertension. They found the plasma vitamin B12 to be significantly associated among hypertensive female (p for trends=0.027) but not males.

Intake of vegetarian diet, smoking and alcohol was found to be significantly associated with vitamin B12 deficiency. A cross-sectional study by Liu et. al. [4] comprising over 2000 study participants, investigated the association between hypertension and three vitamin B i.e. B12, B6 and folate. The prevalence of hypertension in this study population was 26.4% with 98.5%, 20.5% and 43.9% having Vitamin B12, B6 and folate deficiency respectively. They found increased intake of folate alone to be associated with reduced risk of hypertension among both sexes while folate along with B6 intake had an odds ratio 0.53 (95%CI:0.29-0.89) for hypertension only among females but not for male. This association was absent for B12.

Himmerich et. al. [7] evaluated the use of serum vitamin B12 level as a marker for alcohol intake and found significant positive correlation

between the hepatic enzyme i.e. gamma-glutamyl transferase ($r=0.58$), alanine ($r=0.43$) and aspartate ($r=0.47$) amino transferase, glutamate dehydrogenase ($r=0.43$) and B12 values ($p < 0.001$). The study supports the findings that alcohol intake decreases serum vitamin B12 probably by inhibiting its absorption from diet.

Piyathilake et. al. [8] studied the effect of smoking on vitamin B12 by comparing the vitamin level among smokers and non-smokers. They found significant lower concentration of B12 among smokers than their counterparts. Research suggest that tobacco can increase in cyanide level that disrupts the absorption and metabolism of vitamin B 12.

CONCLUSION

The present study has found a high prevalence of vitamin B12 deficiency among hypertensive patients but there was no association with the grade nor the duration of hypertension. We found statistically significant association between those on vegetarian diet, taking alcohol and smoking to have vitamin B12 deficiency. There is a need for further studies among larger sample to evaluate the association between hypertension and serum B12.

REFERENCES

- Forman JP, Rimm EB, Stampfer MJ, Curhan GC. Folate intake and the risk of incident hypertension among US women. *JAMA*. 2005 Jan 19;293(3):320-9. doi: 10.1001/jama.293.3.320.
- Bonaa KH, Njolstad I, Ueland PM, Schirmer H, Tverdal A, Steigen T, et al. Homocysteine lowering and cardiovascular events after acute myocardial infarction. *N Engl J Med*. 2006 Apr 13;354(15):1578-88. doi: 10.1056/NEJMoa055227. Epub 2006 Mar 12.
- Tamai Y, Wada K, Tsuji M, Nakamura K, Sahashi Y, Watanabe K, et al. Dietary intake of vitamin B12 and folic acid is associated with lower blood pressure in Japanese preschool children. *Am J Hypertens*. 2011 Nov;24(11):1215-21. doi: 10.1038/ajh.2011.133. Epub 2011 Aug 4.
- Liu R, Mi B, Zhao Y, Li Q, Yan H, Dang S. Effect of B vitamins from diet on hypertension. *Archives of medical research*. 2017 Feb 1;48(2):187-94.
- Scazzone C, Bono A, Tornese F, Arseno R, Schillaci R, Butera D, Cottone S. Correlation between low folate levels and hyperhomocysteinemia, but not with vitamin B12 in hypertensive patients. *Annals of Clinical & Laboratory Science*. 2014 Jun 20;44(3):286-90.
- Tamura T, Kuriyama N, Koyama T, Ozaki E, Matsui D, Kadomatsu Y, Tsukamoto M, Kubo Y, Okada R, Hishida A, Sasakabe T. Association between plasma levels of homocysteine, folate, and vitamin B12, and dietary folate intake and hypertension in a cross-sectional study. *Scientific reports*. 2020 Oct 28;10(1):18499.
- Himmerich H, Anghelescu I, Klawe C, Szedegi A. Vitamin B12 and hepatic enzyme serum levels correlate in male alcohol-dependent patients. *Alcohol and Alcoholism*. 2001 Jan 1;36(1):26-8.
- Piyathilake CJ, Macaluso M, Hine RJ, Richards EW, Krumdieck CL. Local and systemic effects of cigarette smoking on folate and vitamin B-12. *The American journal of clinical nutrition*. 1994 Oct 1;60(4):559-66.