

ASSOCIATION BETWEEN PLASMA LEVELS OF VITAMIN B12 AND HYPERTENSION

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ABSTRACT

Background: Hypertension is an important community health concern all over the world, which is influenced by both genetic and environmental factors. Epidemiological studies have discovered that numerous environmental factors are linked with hypertension, such as sodium intake, obesity, physical inactivity, and alcohol consumption. **Methods:** The present cross-sectional prospective study was conducted at the department of Biochemistry of our tertiary care hospital. The study duration was of six months between April 2019 and March 2020. The patients were grouped into two groups 75 patients in hypertension and 75 normotensive persons based on sphygmomanometer readings. **Results:** The age of the subjects in the study group ranged from 20 to 50 years. The mean and standard deviation for the age of the Cases and control individuals were 27.81 ± 6.1 and 26.92 ± 5.6 respectively; there was no significant difference among the cases and controls with reference to the age. The significant difference is there in BMI, WHR, B12 level, (Mean and SD) between cases and control. **Conclusion:** In our study, blood levels of B12 is a conjunct parameter with Homocysteine to predict risk for CVD, the relationship between elevated vitamin B12 and CVD is causal and probably due to multiple, potentially synergistic, pathogenetic mechanisms. Measurement of blood vitamin B12 is recommended for risk assessment in CVD patients.

Keyword: Postoperative analgesia patient-controlled epidural analgesia patient-controlled intravenous analgesia.



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INTRODUCTION

Hypertension is an important community health concern all over the world¹, which is influenced by both genetic and environmental factors.² Epidemiological studies have discovered that numerous environmental factors are linked with hypertension, such as sodium intake, obesity, physical inactivity, and alcohol consumption.^{3,4} A well understanding of adjustable risk factors for hypertension is beneficial for timely discovery and prevention of hypertension, which contributes to reducing this disease and its related problems.

Hyperhomocysteinemia is known as a well-known risk factor for cardiovascular disease (CVD) and

stroke.^{5,6} Interestingly, an earlier study recommended that vitamin B₁₂ as related to Homocysteine metabolism is also inversely connected with blood pressure.⁷ However, limited studies have inspected the association with these nutrients. It is also of notice to observe the hypothesis that folate and vitamin B₁₂ are independently associated with the risk of hypertension in a general population. The indication for this hypothesis is weak, although these vitamins are essential in the metabolism of methionine and are major nutritional determinants of plasma homocysteine levels.⁸ Also, the association of Homocysteine with hypertension may be reliant on

folate and/or vitamin B₁₂. Hence, to ponder these nutrients involved in Homocysteine metabolism in addition to Homocysteine itself should be important.

Thus, this study has been planned to observe the relation of plasma levels of vitamin B₁₂, and hypertension, after regulating for various confounding factors, in a cross-sectional study showed among a general Indian population.

MATERIAL & METHODS

The present cross-sectional prospective study was conducted at the Department of Biochemistry of our tertiary care hospital. The study duration was of six months between April 2019 and March 2020. A sample size of 75 for case and controls was calculated at a 95% confidence interval at 11.3% acceptable margin of error by epi info software version 7.2. Volunteering individuals with hypertension without medication and aged between 20-60 years of both male & female genders, attended to the OPD of the hospital were enrolled for the study. Patients below 20 and above 60years, Patients with medications, pregnant women, and patients with any Terminal Illness (Cancer, HIV, etc) were excluded. Clearance from Institutional Ethics Committee was taken before the start of the study. Written informed consent was taken from each study participant. Clinical examination and detailed history including family and dilatory history were recorded and fasting serum vitamin B₁₂, Waist

circumference, Waist-Hip ratio & BMI were also recorded

The patients were grouped into two groups 75 patients in hypertension and 75 normotensive persons based on sphygmomanometer readings. Sample collection: After overnight fasting for 8 – 12 hrs, approx. 3ml blood sample for B₁₂ in the red top plane tube. Samples will be centrifuged at 3000 rpm for 10 min for serum separation. Vitamin B₁₂ was estimated by the ECLIA method. Data analysis was carried out using SPSS v22. Qualitative data were expressed as a percentage (%) and Pearson's chi-square test was used to find out statistical differences between the study groups. If the expected cell count was < 5 in more than 20% of the cells then Fisher's exact test was used. All tests were done at an alpha (level significance) of 5%; which means a significant association was present if the p-value was less than 0.05.

RESULTS :

The age of the subjects in the study group ranged from 20 to 50 years. The mean and standard deviation for the age of the Cases and control individuals were 27.81 ± 6.1 and 26.92 ± 5.6 respectively; there was no significant difference among the cases and controls with reference to the age. The above table shows a significant difference is there in BMI, WHR, B₁₂ levels, (Mean and SD) between cases and control.

Table 1 Comparison between hypertensive patients(cases) and controls.

Parameter	Cases		Control	P-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Age	27.81 ± 6.1	26.92 ± 5.6	26.92 ± 5.6	0.350967
BMI	28.52 ± 3.19	23.1 ± 1.66	23.1 ± 1.66	<0.0001
WHR	0.88 ± 0.04	0.77 ± 0.04	0.77 ± 0.04	0.0068**
B ₁₂ (pg/ml)	109.59 ± 26.4	142.47 ± 34.4	142.47 ± 34.4	<0.0001*
Systolic Blood Pressure	145.21 ± 17.9	108.21 ± 8.9	108.21 ± 8.9	<0.0001
Diastolic Blood Pressure	98.51 ± 8.8	82.21 ± 5.2	82.21 ± 5.2	<0.0001
Mean Arterial Pressure	85.2 ± 7.6	75.9 ± 4.8	75.9 ± 4.8	<0.0001
Pulse Pressure	49.8 ± 5.8	38.8 ± 3.4	38.8 ± 3.4	<0.0001
Heart rate	92 ± 8.1	74 ± 9.2	74 ± 9.2	<0.0001

DISCUSSION

The present age- and sex-matched study shows that serum B12 level is lower in hypertensive subjects when compared to the normotensive subjects. The mean serum B12 level in control is 142.47 ± 34.4 while it is 109.59 ± 26.4 in hypertensives. Since $P < 0.05$, there is a significant difference in B12 level between the groups. Hence, it is evident from the results that BP increases the serum B12 level decreases. This negative correlation of serum B12 with systolic and diastolic BP is also statistically significant ($P < 0.0001$) between the groups. Similar to our study Tamai, Y *et al* reported that in essential hypertension, there is a continuous negative correlation of serum B12.⁷ on the contrary Dalery K *et al* did not find a correlation between B12 and hypertension.⁹

The results showed that vitamin B12 deficiency was higher with the hypertensive cases and even homocysteine levels are more, this is confirmed by the previous studies that reported the percentage of vit.B12 deficient was much higher in vegetarians than non-vegetarians.^{10,11,12}

We found that higher dietary consumption of vitamin B12 was coupled with lower systolic and diastolic blood pressure in patients with hypertension, which ultimately lower the risk of cardiovascular diseases. To date, many studies have been conducted to investigate the association between vitamin B12/ folic acid and blood pressure in adults or adolescents. An inverse association between folic acid intake and blood pressure was found in adults and adolescents.¹³⁻¹⁴ In the present study, we found a significant inverse association between vitamin B12 and blood pressure. The lowering effects of vitamin B12 together with folic acid on blood pressure have been reported in an intervention study in adults.¹³

In the present study, even though within normal ranges, the BMI (28.52 ± 3.19 vs. 23.1 ± 1.66 , $P < 0.05$) of hypertensive was significantly higher than the normotensive subjects. The results are similar to the findings of the study conducted by Ohira *et al*. In his study, he found that there exists an inverse relationship between systolic BP and BMI.¹⁵

Lifestyle changes can also help reduce levels and the adoption of healthy behaviors, such as a balanced diet, cessation of smoking, regular exercise, and consumption of only moderate amounts of caffeine and alcohol, all have considerable positive health benefits beyond the prevention of CVD.

CONCLUSION

In our study, we concluded that the hypertensive patients have lower serum vitamin B12 levels, compared to control. The potential interaction between these in relation to blood pressure should also be examined in future studies. Blood levels of B12 are a conjunct parameter with homocysteine to predict risk for CVD, the relationship between elevated vitamin B12 and CVD is causal and probably due to multiple, potentially synergistic, pathogenetic mechanisms. Measurement of blood vitamin B12 is recommended for risk assessment in CVD patients.

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