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COMPARATIVE STUDY OF NT-PRO BNP AND SERUM HOMOCYSTEINE IN PATIENTS WITH HYPERTENSION: A PILOT CASE-CONTROL STUDY

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ABSTRACT:
Background: Hypertension causes cardiovascular morbidity by inducing vascular dysfunction and pressure load on the heart. Homocysteine (HCY) plays a role in hypertension and cardiovascular risk, whereas N-terminal pro- B-type natriuretic peptide (NT-pro BNP) mirrors myocardial wall stress.
Objective: To estimate NT-pro BNP and serum homocysteine levels in patients with essential hypertension and compare them with normotensive controls.
Methods: A hospital-based pilot case-control study was carried out to estimate NT-pro BNP and serum homocysteine levels in patients with essential hypertension and to compare them with normotensive controls. The sample size comprised of 50 hypertensive cases and 50 age and sex matched normotensive controls selected from Rohilkhand medical college and hospital, Bareilly, UP. NT-pro BNP was estimated by Quidel Triage Meter Pro and serum homocysteine by Beckman Coulter 480. The comparison between the groups was done by independent-samples t test.
Results: this study observed that, NT-pro BNP and serum Homocysteine level were higher in hypertensive subject as compared to control group.
Conclusion: Hypertensive participants had higher NT-proBNP and homocysteine concentrations and they have higher risk for heart failure and renal disease.

KEYWORDS: Hypertension, NT-pro BNP, homocysteine, cardiovascular risk.

INTRODUCTION

Hypertension is a major modifiable cardiovascular risk factor that may lead to hypertension-mediated organ damage, involving the heart, kidneys, brain, and vessels[1] . A contemporary European guideline recommends a risk-based evaluation of organ damage in individuals with increased blood pressure and hypertension[2] . Hypertension is an emerging public-health problem in Uttar Pradesh, India. Population-based data suggest that approximately 19.9% of adults in the state have hypertension, with men (21.8%) more affected than women (18.3%)[3] .
NT-proBNP is an inactive cleavage product that is released along with B-type natriuretic peptide in response to increased myocardial wall stress[4] . Its concentration is influenced by age, sex, renal function, obesity, atrial arrhythmias, and overt cardiac disease and must be considered when interpreting results[5] . Although principally used in heart-failure assessment, elevated NT-proBNP can indicate subclinical cardiac stress in hypertensive individuals[6] .
In the present article, the researchers have examined the associations of homocysteine with blood pressure and incident hypertension[1] . The researchers have noted that elevated homocysteine is associated with endothelial dysfunction, increased oxidative stress, vascular remodeling, hypertension, and stroke risk. Reviews have reported an overall positive association between plasma homocysteine level and blood pressure or incident hypertension[7] . Moreover, recent population-based evidence has also shown an association between higher total homocysteine and elevated NT-proBNP and suggested a potential relationship between vascular-metabolic risk and myocardial stress[4,7–9] .
However, local evidence analyzing both biomarkers simultaneously in hypertensive patients and normotensive individuals is limited. Thus, the pilot study was conducted to establish preliminary data for an extensive analytical study.

Aim and Objectives

Aim:
To compare NT-pro BNP and homocysteine levels in between hypertensive and normotensive subjects.
Objectives:
- To estimate NT-pro BNP and serum homocysteine levels in patients with essential hypertension and control group.
- To estimate blood pressure levels in patients with essential hypertension and control group.

MATERIALS AND METHODS

The sample size comprised of 50 hypertensive cases and 50 age and gender matched normotensive controls selected from Rohilkhand medical college and hospital, Bareilly, U.P. Both gender male and female were included in this study and the

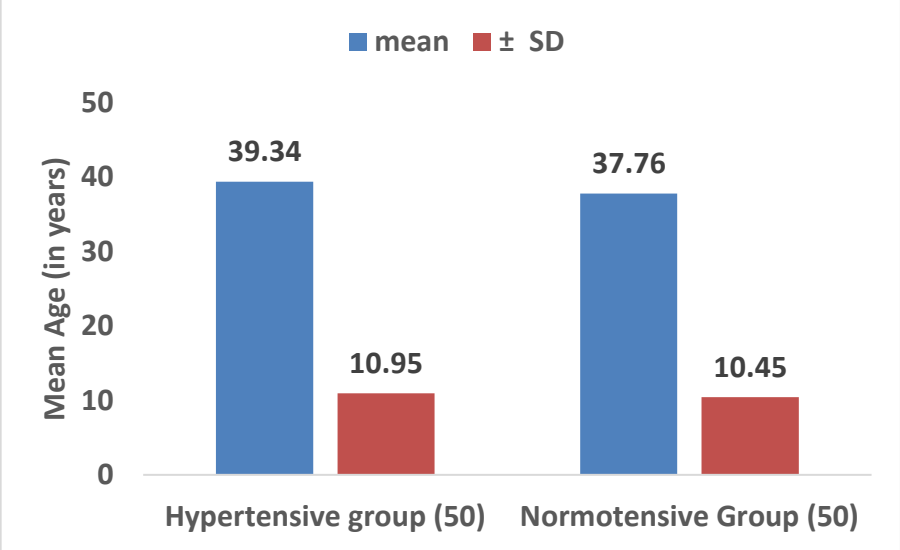
age of participants were 30 to 60 years. 5 ml of blood sample were collected from the patients who fulfilled the inclusion and exclusion criteria. Patient with high Blood pressure were include in this study and patients with co-morbidities like Diabetes mellitus, thyroid dysfunction, heart disease, renal disease and liver disease were excluded from the study. Systolic Blood pressure was measured with help of digital sphygmomanometer to identify hypertensive patient. The NT-pro BNP was estimated by Quidel Triage Meter Pro and serum homocysteine by Beckman Coulter 480. All the collected data were entered in MS Excell sheet and calculate the mean value, standard deviation and independent-samples t-test with the help of SPSS software.

RESULTS

Age, Systolic blood pressure, NT-proBNP and Homocysteine were analyzed for this pilot study. In this study, the average age of hypertensive subject's was 39.34 ± 10.95 years and normotensive subjects was 37.76 ± 10.45 years, which found statistically not significant (p-value 0.24) (see Table 1). The mean value of systolic blood pressure of hypertensive patient was 141.92 ± 9.88 mmHg and normotensive subjects was 109.56 ± 7.23 mmHg, which found statistically significant (t-test value-18.50, p-value <0.01). The mean value of NT-proBNP of hypertensive patient was 129.38 ± 1.02 mmHg and normotensive subjects was 19.23 ± 4.36 mmHg, which found statistically significant (t-test value-172.19, p-value <0.01). The mean value of homocysteine of hypertensive patient was 17.50 ± 0.97 mmHg and normotensive subjects was 4.12 ± 1.15 mmHg, which found statistically significant (t-test value-62.35, p-value <0.01) (see Table 2).

Table-1: Comparison of Age in between Hypertensive and Normotensive Group

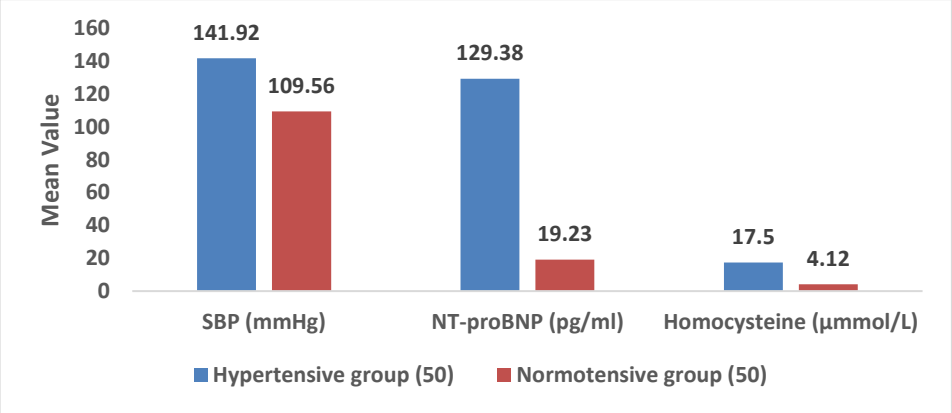
Variable	Hypertensive group (50)		Normotensive Group (50)		t-test	p-value
	Mean	**± SD**	**Mean**	**± SD**		
Age (years)	39.34	10.95	37.76	10.45	0.73	0.24



Graph Chart-1: Comparison of Age in between Hypertensive and Normotensive Group

Table-2: Comparison of SBP, NT-proBNP and HCY in between Hypertensive and Normotensive Group

	Hypertensive group		Normotensive Group		t-test	p-value
	Mean	**± SD**	**Mean**	**± SD**		
SBP (mmHg)	141.92	9.88	109.56	7.23	18.50	<0.01
NT-proBNP (pg/ml)	129.38	1.02	19.23	4.36	172.19	<0.01
Homocysteine (µmmol/L)	17.50	0.97	4.12	1.15	62.35	<0.01



Graph Chart-2: Comparison of SBP, NT-proBNP and HCY in between Hypertensive and Normotensive Group

DISCUSSION

In the current pilot study, no significant intergroup difference in mean age ($p = 0.24$) was found, with hypertensive subjects (39.34±10.95 years) being only slightly older than normotensive patients (37.76 ± 10.45 years). Thus, the two groups were age-matched and comparable in terms of this parameter, which could act as a confounder. However, the systolic blood pressure (SBP) was significantly higher in hypertensive (141.92 ± 9.88 mmHg) than in normotensive subjects (109.56 ± 7.23 mmHg; $p < 0.01$), which suggests effective grouping in terms of blood-pressure status. Indeed, increased SBP is a major symptom of hypertension[8] .

The mean level of NT-proBNP among hypertensive subjects was significantly higher (129.38 ± 1.02 pg/mL) than among normotensive subjects (19.23 ± 4.36 pg/mL; $p < 0.01$). A similar result was obtained by Hildebrandt et al. who found that NT-proBNP in hypertensive patients with left ventricular hypertrophy was approximately eight-fold higher than in healthy controls and was associated with left ventricular dimensions and prognosis[10] . Another study conducted by Roselló-Lletí et al. also reported increased NT-proBNP levels in patients with hypertension and abnormal left ventricular geometry as compared to controls which suggests that NT-proBNP may be an indicator of hypertension-associated remodeling[11] . Therefore, increased NT-proBNP levels found in our study might indicate myocardial wall stress, pressure overload, or hypertensive heart disease which require further evaluation by echocardiography to determine left ventricular hypertrophy or diastolic dysfunction[12] .

Serum homocysteine levels were also found to be significantly higher among hypertensive subjects (17.50 ± 0.97 µmol/L) compared to normotensive subjects (4.12 ± 1.15 µmol/L; $p < 0.01$). This is a finding similar to the one made by Tessari et al., who also found that hypertensive subjects had a higher level of plasma homocysteine than normotensive subjects (13.6 ± 1.1 vs. 10.3 ± 0.6 µmol/L; $p < 0.04$)[13] . A likely explanation for the phenomenon is that homocysteine metabolism is impaired due to diminished trans-sulfuration, endothelial dysfunction, increased oxidative stress, and reduced nitric-oxide availability, which leads to increased vascular resistance and higher blood pressure[1] .

CONCLUSION

The clinical value of NT-proBNP and homocysteine as potential adjunct biomarkers for assessing cardiovascular stress and vascular risk in hypertensive patients are examined in this pilot study. Such results should be considered as preliminary and hypothesis-generating and further extensive prospective study incorporating rigorous control of renal function, nutritional status, medication exposure, and hypertension-mediated organ damage is required prior to any clinical application.

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