BRAIN NATRIURETIC PEPTIDE, SYSTOLIC AND DIASTOLIC BLOOD PRESSURES

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Background: Hypertension is an increasingly important medical and public health issue. Because of life time risk of hypertension Joint National Committee-7 introduced a new term "Pre-hypertension" for those with systolic blood pressure 120–139 mmHg and diastolic blood pressure 80–89 mmHg. Individuals prone to the development of hypertension often have a hyperdynamic circulation antedating the onset of hypertension by several years. Brain Natriuretic Peptide is a new promising cardiovascular risk marker due to its association with high blood pressure via its key role in salt and water homeostasis and hence blood pressure. This study was designed to find out the levels of plasma Brain Natriuretic Peptide in normotensive, pre-hypertensive and newly diagnosed hypertensive and to observe its association with increasing values of blood pressure. **Methods**: This was an cross-sectional study conducted in the Department of Physiology Basic Medical Sciences Institute, Jinnah Post Graduate Medical Centre, Karachi. Study included 85 adult males, aged between 20–60 years, non- smokers, non- diabetic and having no other chronic illness. Systolic blood pressure and diastolic blood pressure values were measured and divided into three groups on the basis of normotensive to hypertensive as stated by Joint National Committee -7. Brain Natriuretic Peptide was assayed by AxSym technology. **Results**: Brain Natriuretic Peptide developed a positive and statistically significant correlation with both systolic and diastolic blood pressures and was also found out to be significantly raised in pre-hypertensive group. **Conclusions**: his study concluded that Brain Natriuretic Peptide is positively related with increasing values of both variables i.e. systolic as well as diastolic blood pressures. It also concluded out Brain Natriuretic Peptide to be significantly elevated in pre-hypertensive stage which may remain increased in sustained hypertension.

Keywords: Brain Natriuretic Peptide, Pre hypertensive, systolic blood pressure, diastolic blood pressure.

INTRODUCTION

Hypertension is an increasingly important medical and public health issue. Data from observational studies involving more than one million individuals have indicated that death from both ischemic heart disease and stroke increases progressively and linearly from blood pressure (BP) levels as low as 115 mmHg systolic and 75 mmHg diastolic upwards.[1]

For every 20 mmHg systolic or 10mmHg diastolic increase in blood pressure there is doubling of mortality from both ischemic heart disease and stroke.[2]

Investigators have reported that individuals prone to the development of high blood pressure often have a hyperdynamic circulation antedating the onset of hypertension by several years.[3] Brain Natriuretic Peptide (BNP) is a new promising cardiovascular risk marker[4] that has been associated with high blood pressure.[5] Experimental studies suggest that induction of BNP gene expression is one of the earliest responses to haemodynamic pressure overload and occurs before development of left ventricular hypertrophy.[6] BNP-dependent decrease in blood pressure results in part from a reduction in cardiac preload and partly afterload.[7] So we speculate that increased plasma BNP levels may antedate or be closely related to subsequent rise in blood pressure. However there is limited information about the role of BNP in subjects without overt cardiovascular disease and blood pressure. This study is designed to search out any existing relationship between plasma BNP levels and blood pressure values.

MATERIAL AND METHODS

This study was carried out during February till October 2007 at Basic Medical Sciences Institute JPMC, Karachi. This study included a total of 85 apparently healthy males ranging between the ages of 20 to 60 years. The selected subjects had no history of diabetes, any hypertensive complication or any other chronic systemic illness. Exclusion was made on the basis of history and lab findings (TLC and CRP levels). Hypertensive subject was defined as a person having diastolic blood pressure (DBP) ≥90 mmHg or systolic blood pressure (SBP) ≥140 mmHg as stated by JNC-7. All selected hypertensive were the newly diagnosed who had not started the treatment yet. Mercury sphygmomanometer was used for blood pressure measurements between 8–10 AM to avoid diurnal variations. Average of 3 blood pressure readings were considered. Blood samples were collected between 8–10 AM after a fast of 12–14 hours and separation was done within one and half

hour. Plasma was preserved at -20 °C till analysis. BNP was determined by AxSYM technology based on microparticle enzyme immunoassay (MEIA) provided by Abbot Diagnostic Laboratories having kit Ref. No. 8G82-20ABBL001/R4. Systolic and Diastolic blood pressure values were divided into three groups as normotensive (<120/<80 mmHg),pre-hypertensive (120–139/80–89 mmHg) and hypertensive (≥140/≥90 mmHg) as stated by JNC-7.[2] Data was analysed using SPSS 10.0 for descriptive and inferential statistics.

RESULTS

In this study BNP value increased from a value of 10.99 to 27.06 pg/ml with the increasing values of SBP from <120 to ≥140 mmHg. It showed a positive and statistically significant correlation between SBP and BNP (p<0.044, r=0.25) as shown in Table-1.

We also found an increase in the BNP value from 9.90–33.55 pg/ml with the increasing values of DBP from <80 to ≥90 mmHg respectively. A positive and statistically significant correlation was found between DBP and BNP (p<0.024, r=0.23) as shown in Table-2.

Table-1: Values of plasma BNP levels in systolic blood pressure groups

Systolic BP (mmHg)	n	BNP (pg/ml) Mean±SEM	*p*-value	Post HOC test
<120	34	10.99±3.31	0.044*	120–139 vs <120 *p*= 0.044*
120–139	37	29.03±6.75		
≥140	14	27.06±6.00		

*p<0.05, n= Number of subjects.

Table-2: Values of plasma BNP levels in diastolic blood pressure groups

Diastolic BP (mmHg)	n	BNP (pg/ml) Mean±SEM	*p*-value	Post HOC test
< 80	26	9.90±2.93	0.024*	≥90 vs <80 *p*=0.018*
80-89	32	20.74±4.60		
≥ 90	27	33.55±8.58		

*p<0.05 n = Number of subjects.

DISCUSSION

The prevalence of individuals with increased blood pressure is growing and there is no threshold of blood pressure that identifies cardiovascular risks (i.e., risk is linear and doubles for each 20/10 mmHg blood pressure rise). These insights have led a group of hypertension experts to propose a new definition of hypertension as 'A progressive cardiovascular syndrome arising from complex and interrelated aetiologies' which features early markers that are often present before blood pressure elevation is sustained. This revision of the definition of hypertension and the need to assess the blood pressure levels in the context of cardiovascular risks has guided for an earlier detection of at risk patients[8]. Acknowledging the graded and continuous nature of the relations of blood pressure to vascular risk JNC-7 introduced 'PRE-HYPERTENSION' to describe people with SBP between 120–139 and DBP between 80–89 mmHg. Framingham Heart Study (FHS) indicated that BP values in the 130–139/85–89 mmHg range are associated with a more than two fold increase in relative risk from cardiovascular disease compared with the BP levels below 120/80 mmHg. A strategy of estimating cardiovascular risk and adjusting the intensity of BP lowering to the absolute risk of cardiovascular disease is desirable in prehypertensive individuals[9]. With the knowledge of such discussion it is useful to have a bio-marker that can serve as a reliable indicator of the risks attributed to the progression of blood pressure above and beyond other clinical determinants. Plasma BNP was thought to be a candidate bio-marker based on cross-sectional associations with BP measures. Several studies have extended the potential role of BNP measurements to risk stratification of the general population in which long term mortality increases in proportion to BNP concentration both in patients with or without evidence of cardiovascular disease.[10,11] BNP has related itself positively with the pathophysiological conditions characterized by alterations of cardiac function and systemic haemodynamic as hypertension when compared with their controls[7,12] but there is little information about the role of BNP in subjects without overt cardiovascular diseases so the current study was undertaken to compare and confirm the reported increase in plasma BNP levels in hypertensive who yet had not started the treatment and to find out the possibility of an increase in the BNP levels with the progressive increase in blood pressure values.

In our study a positive and significant correlation was observed between BNP and SBP which is in accordance with the findings of Kato *et al*[13] who had a mean age of 56 years and mean SBP value of 127 mmHg while our study had a mean age of 41 years and SBP value of 121 mmHg. Cheung and Brown[12] found the same results but study included the hypertensive only compared with controls. Freitag *et al*[14] in FHS tracked plasma BNP and BP in a group of subjects with mean age of 56 years and found a significant but weak association between elevated baseline BNP levels and an increase in BP category (progression) on follow up of 4 years. In our study having participants of mean age 41years exhibited a progressive increase in BP values along with BNP levels respectively. David Conen *et al*[15] stated statistically a non-significant difference in the baseline values between the patients having mean daytime blood pressure values below 135/85 mmHg and sustained hypertension. In our study BNP values

were also not found out to be markedly different between the prehypertensive and hypertensive groups as shown in Table-1. It gives a clue that BNP levels might rise significantly before the establishment of hypertension which later may remain sustained.

In our study BNP also showed a positive and statistically significant correlation with DBP. These findings are in accordance with Jakubik, *et al*[16] who aimed to find the impact of moderate to severe hypertension on BNP levels when compared with healthy controls while our study proved a gradual rise in BNP levels with a graded increase in DBP values. Pitzalis *et al*[17] found the same relation between diastolic function and BNP including the normotensive subjects only with and without family history of hypertension.

CONCLUSION

Our study concluded that BNP is positively and significantly related with the increasing values of both variables, i.e., systolic as well as diastolic blood pressures. This study also concluded that BNP levels are significantly raised in the prehypertensive stage which may remain increased in the sustained hypertension. So it is suggested that BNP levels should not only be assayed in hypertensive but in prehypertensive preferably to decide all those measures which may prevent or delay the onset of hypertension.

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