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Original Research Article

Brain natriuretic peptide: new surrogate marker for adequacy of anti-hypertensive treatment

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ABSTRACT

Background: High blood pressure (hypertension) is one of the preventable causes of premature morbidity and mortality. The objective of this study was to assess the difference in mean BNP level at baseline and 3months after start of treatment among newly diagnosed hypertensive cases up to 35 years.
Methods: Study was carried out on fifty newly diagnosed hypertensive patients over a period of three months satisfying inclusion criteria. Pre and post treatment BNP level were measured and analysed.
Results: 39 (78%) cases out of 50 cases have high BNP in which 5 (10%) cases are in <30 year age group and 34 (68%) cases are in <30 year age group, High BNP level are significant in both age group with p value <0.01. 10 (20%) cases of age <30 year have normal BNP after antihypertensive treatment and 40 (80%) cases of age <30 year out of which 31 (62%) have normal BNP level and 9 (18%) cases have abnormal BNP level after antihypertensive treatment. Mean BNP level in pre antihypertensive treatment is (143.92±25.19) and post treatment is (117.26±11.20), And Mean change in BNP level pre and post treatment is (26.66±20.75) with p value <0.001which is statistically highly significant.
Conclusions: Out of many risk factors for raised BNP level, hypertension is also one of the most prevalent factors for raised BNP level. Positive correlation was found between Blood pressure and BNP level reduction after antihypertensive treatment which is highly significant. Thus Potential clinical application of BNP can be expanded, regarding monitoring the adequacy of treatment. By which we can prevent or delay the progression of disease (hypertension).

Keywords: BNP, Hypertension

INTRODUCTION

High blood pressure (hypertension) is one of the preventable cause of premature morbidity and mortality.[1] Approximately 7.6 million deaths (13-15% of total) and 92 million disability adjusted life years worldwide were attributable of high BP.[2] Hypertension is epidemic worldwide; nevertheless, only a minority of subjects with the condition receive effective treatment. The World Health Organization (WHO) cites a "second wave" epidemic of cardiovascular disease related to hypertension and other factors in developing countries.[3] Although the national health and nutrition examination survey II and III showed a progressive increase in patient's awareness (73%), treatment (55%), and satisfactory control (29%) of hypertensive up to 19914, in most patients the BP is not sufficiently controlled. Since 1991, there has been a plateau, at most modest improvement, in treatment and control rates of hypertension.[5-7] There is a need for markers to see the adequacy of anti-hypertensive treatment. BNP level estimation may be one of the markers. BNP hormone

secreted by ventricular cardiomyocytes in response to pressure overload in the left ventricular hypertrophy in patient with hypertension. Thus, BNP is used during antihypertensive treatment in order to assess hypertensive cardiac damage and risk stratification. Previous studies have demonstrated that antihypertensive treatment lowers plasma BNP levels; therefore, BNP estimation may be used as a marker of blood pressure control.[8,9] Brain natriuretic peptide (BNP) is a member of natriuretic peptide family. The highest concentrations of BNP were measured in the heart, where it acts as a cardiac hormone. Physiological actions of BNP are vasodilation, natriuresis, diuresis, inhibition of the aldosteron synthesis and lipolysis. However, given the great ventricular mass which is 70% of the total content, all cardiac BNP and its mRNA derives from the ventricles. Therefore, it is hypothesized that there may be an association between BNP and systemic hypertension during the pre and post treatment phase of patients with hypertension and BNP level estimation can be used as surrogate marker to look for the adequacy of antihypertensive treatment.[10]

METHODS

The study was an observation descriptive study carried out from June 2014 to June 2015 at Sawai Man Singh Medical College and hospital, Jaipur (Rajasthan). Fifty Patients of newly Diagnosed Young hypertensive (25-35 years) without any target organ damage taken as case after excluding the patients of hypertension age more than 35 years, concomitant renal failure, coronary artery disease, heart failure and secondary hypertension. Classification of hypertension accessed by using JNC-VIII criteria. Detailed history was taken including risk factor, then patients examined for fundus, ECG, and blood sample were taken for routine investigation including CBC, RFT, LFT, LIPID PROFILE, BNP. For BNP 5cc blood from antecubital vein taken and transferred to plain vacutainers. The samples were sent to laboratory within 3 hours of collection and analyzed using the ELFA (enzyme linked fluorescence Assay method) by Vidas (automated immunoassay analyzer). Pretreatment BNP estimation was done. Antihypertensive treatment was given to control the BP. Patients followed up every month to observe the adequacy of antihypertensive treatment. After three months, again blood sample was taken for BNP estimation. The statistical analyses of data done by using SPSS 20 software, t-statistic (paired test) were used for test of significance. The qualitative data were analyses by using x^2 test (chi square).

RESULTS

In this table cases are divided in to two groups according to age, One is <30 year and another group is <30 year. Total 10 (20%) cases comes in group <30 year out of which 9 (8%) are male and 1 (2%) are female. And 40 (80%) cases comes in group <30 year out of which 25 (50%) are male and 15 (30%) are female. Mean age of male cases is (32.38±2.24) and mean ages of female cases are (33.25±1.71).

Table 1: Distribution according to age and sex of subjects.

Age group (in years)	Sex		Total
	Male	Female	
< 30	9 (18.00)	1 (2.00)	10 (20.00)
≥ 30	25 (50.00)	15 (30.00)	40 (80.00)
Total	**34 (68.00)**	**16 (32.00)**	**50 (100.00)**

Mean age±Sd (Male) =32.38±2.24 Mean age±Sd (Female) = 33.25±1.71.

In this table total 11 (22%) cases out of 50 cases have normal BNP in which 5 (10%) cases are in <30 year age group and 6 (12%) cases are in <30 year age group, and 39 (78%) cases out of 50 cases have high BNP in which 5 (10%) cases are in <30 year age group and 34 (68%) cases are in <30 year age group, High BNP level were observed in both age group at the time of diagnosis of hypertension, which is statistically significant (p value <0.01).

Table 2: Distribution of pretreatment BNP according to age of study subjects.

Age group (in years)	BNP		Total
	Normal	High	
< 30	5 (10.00)	5 (10.00)	10 (20.00)
≥ 30	6 (12.00)	34 (68.00)	40 (80.00)
Total	**11 (22.00)**	**39 (78.00)**	**50 (100.00)**

x2 = 5.711; d.f. =1; P < .01 Sig.

In this table 10 cases of age <30 year out of total 50 cases have normal BNP after antihypertensive treatment and out of the 40 cases of age <30 year 31 have normal BNP level and 9 cases have abnormal BNP level after antihypertensive treatment.

Table 3: Distribution of post treatment BNP according to age of study subjects.

Age group (in years)	BNP		Total
	Normal	High	
< 30	10 (20.00)	0 (0.00)	10 (20.00)
≥ 30	31 (62.00)	9 (18.00)	40 (80.00)
Total	**41 (82.00)**	**9 (18.00)**	**50 (100.00)**

Table 4: Mean ± Sd of pre and post Treatment BNP of study subjects.

	BNP		Mean change±Sd	P value	Sig.
	Pre	Post			
Mean± Sd	143.92 ±25.19	117.2 ±11.20	26.66±20. 75	<0.001	HS

In this table Mean of BNP level in pre antihypertensive treatment is (143.92±25.19) and post treatment is

(117.26±11.20), And Mean change in BNP level pre and post treatment is (26.66±20.75) with p value <0.001which is statistically highly significant.

Table 5: Mean ± Sd of pre and post treatment MAP (Mean Arterial Pressure) of study subjects.

	MAP (Mean±Sd)		Mean change ±Sd	P-value	Sig.
	Pre	Post			
Mean ± Sd	114.30± 6.31	96.42± 6.25	17.88± 21.85	<0.001	HS

In this table Mean MAP pre and post treatment is (114.30±6.31) and (96.42±6.25) respectively and Mean change in Mean arterial pressure (MAP) is (17.88±21.85) with p value <0.001 which is statistically highly significant.

Table 6: Correlation between Pre MAP and Post BNP of study subject.

Correlation	r-value	P-value	Significance
MAP versus BNP	+ 0.724	< .001	HS

In the present study above table shows that the correlation of MAP level with BNP was highly statistically significant (r = +0.724, p = <0.001).

DISCUSSION

The mean age of cases is 32.38±2.24 for male and 33.25±1.71 is for female. Maximum number of cases 40/50 (80%) in this study are in age group <30 year. Our studies suggest that with increasing age blood pressure also rise and similar results were found in.[11] In our study pretreatment BNP level found higher in 39 (78%) cases, in which 5 (10%) cases in group <30 year and 34 (68%) in group <30 year. Our study suggest that BNP level raises as with increasing age, similar result were found by Margaret M Redfield et al12 study and Suzuki M et al.[13] In our study after giving antihypertensive treatment for 3 month BNP level are reduced in 41 (82%) cases out of 50 cases in which 10 (20%) cases in age <30 year and 31 (62%) cases in <30 year which is significantly reduced in both group. In age group of <30 years, 100% pt. have normalization of BNP after adequate antihypertensive treatment but in age group >30 years around 80% had normalization of BNP with adequate treatment. This study is supported by Meno H et al study.[14] This study showed that after achieving target BP, 63% of elderly pt. >65 years have reduction in BNP level. In our study, mean of pretreatment BNP level were(143.92±) and post treatment BNP level is (117.26±11.20) and mean change in BNP level after antihypertensive treatment is (26.66±20.75) with p value <0.001 whis is highly significant, our study is supported by Meno H et al, in this study mean±sd plasma BNP level decreased significantly from (46.0±83.0 pg/ml) to (40.8±68.0 pg/ml) with p value <0.05, Andreadis EA et al also had similar observation, 64.7% of the participants who had achieved BP control showed decreased BNP levels in contrast to those with poor BP control (median change -14.5 versus -1.3 and median range from -34.4 to -4.4 versus -9.6 to 10.9, respectively, p<0.001).[14,15]

In this study mean change in pre and post treatment BNP level in age <30 year is (23.80±19.34) with p value <0.001 and in age group <30 year is (27.37±21.02) with p value 0.001, in both age group reduction of BNP level after antihypertensive treatment is highly significant. There is no difference observe in reduction of BNP level according to age. So correlation of BNP level with age was statistically non-significant (r = +0.146, p = >0.05), WEI HU et al study support our study and Margaret M Redfield et al study12 also have similar result with our study, the association of BNP remained similar across all age group p value (>0.90).[16]

In this study mean change in MAP pre and post treatment is (17.88±21.85) with p value <0.001 which is highly significant. Similar observation was found in Zeynep Cakir et al study20, and a positive and statistically significant correlation in between MAP and BNP level is found in our study (r = +0.724, p<0.001). Same results were found in Cakir Z et al study in which they found a positive correlation between MAP and BNP level (r = +0.33, p<0.05).[17]

CONCLUSION

Our study concludes that high BNP level was found in newly diagnosed hypertensive patients, reduction in BNP level is associated with adequacy of antihypertensive medication, so periodic BNP level estimation can be used as new surrogate marker to look for the adequacy of antihypertensive medication.

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