

## Study of Serum Homocystien Level in Patient of Essential Hypertension

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### **ABSTRACT**

**OBJECTIVE-** The present study was carried out to study pattern and association between serum homocysteine level among patients of essential hypertension and compared it with matched controls.

**METHODS-** The Cross Sectional study was conducted in patient with essential hypertension (SBP >140 mmHg and/or DBP >90 mmHG measured on admission without any secondary Cause of raised BP) were included in study. Control group also selected.

**RESULT-** Only of 60 patients hypertension 12(20%) patient had sever hyperhomocysteinemia, 27(45%) patients had intermediate, 19(31.67%) patients had moderate and 2(3.33%) had normal serum homocysteine level with comparison group out of 60 normotensive patients 4(6.67%) patients had intermediate, 15(25%) patients had moderate and 41(68.33%) had normal serum homocysteine level.

**CONCLUSION-** It is observed that serum homocysteine appears to be raised in patients with hypertension; it may be involved in the induction and sustaining of hypertension. This study showed that proportion of hypertension accompanied by hyperhomocysteinemia was very high and patients with hyperhomocysteinemia are more prone to hypertension. So, patients with poor control of blood pressure should search for Hyperhomocysteinemia.

### **I. INTRODUCTION**

India is experiencing an epidemic of non-communicable diseases in the 21<sup>st</sup> century. Hypertension is one of the most common non-communicable diseases prevalent in the adult population. According to National Family Health Survey 4 (NFHS 4) 2015-16, the prevalence of Hypertension (SBP >140 mm/Hg) in India is 13.6% in males and 8.8% in females. The same prevalence in Gujarat is 13% in males and 9.7% in females. Surat being one of the affluent cities in Gujarat reports prevalence of Hypertension as 11.1% in males and 11.5% in females. Hence, it is necessary to identify risk factors and prognostic factors for early diagnosis and prompt treatment of HTN. Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart deaths<sup>1</sup>. The increased level of Homocysteine in plasma, hyperhomocysteinemia, is considered to be an independent risk factor for cardiovascular, cerebrovascular diseases, atherosclerosis and thrombotic disease.<sup>2,3</sup> Numerous nutritional deficiencies (folate, and vitamins B12 and B6 as cofactors of methionine metabolism), genetic variation (methylene tetrahydrofolate reductase), drugs (phenytoin, carbamazepine), or diseases (renal insufficiency) affect Homocysteine metabolism and influence serum Homocysteine levels<sup>4</sup>. In the third national health and nutrition examination survey (NHANES III), persons with the highest level of plasma homocysteine had 2 to 3 fold increased prevalence of hypertension compared to those with the lowest level<sup>5</sup>. In a large epidemiological study (NHANES III) it is suggested that each 5 mmol/L increase in plasma Homocysteine levels was associated with an increase in systolic (SBP) and diastolic blood pressure (DBP) of 0.7 and 0.5 mmHg, respectively, in men, and 1.2 and 0.7 mmHg, respectively, in women<sup>6</sup>. This coexistence of hyperhomocysteinemia and hypertension is described as H-type hypertension<sup>9</sup>. H-type hypertension is associated with arterial stiffness<sup>7</sup>, carotid disease, and cerebro-cardiovascular disease<sup>8</sup>.

### **II. MATERIALS AND METHODS**

This study is carried out in a tertiary care hospital of South Gujarat which caters to the urban population residing in the city. The Medicine IPD (in patient department) was taken as the setting. Patients satisfying the inclusion criteria were invited to participate in the study by explaining to them the details and purpose of our study. Patients were provided with a Patient Information Sheet which contained all the relevant details regarding the study.

The study was designed as cross-sectional analytical study for our study. Patients from all strata of the society avail services of this hospital. The study also had a comparison group to ascertain the strength of the above association. 60 patients were required to be enrolled in the study during the study period. The sampling techniques utilized were non-probability purposive sampling in which patients were recruited consecutively as per the requirements of the investigators.

The information of the family history of hypertension and other CVD was collected for all study subjects. All study subjects were non-smokers. None of the patients had clinical evidence suggestive of CAD based upon history, electrocardiography and echocardiography. The subjects who were taking any medical vitamin preparations or drugs were not included. The total number of the control subjects was 60. The control group for comparison with the patients comprised 60 sex-matched apparently healthy subjects fulfilling inclusion criteria for the comparison group.

The controls were selected from amongst the remaining patients in the ward who had similar characteristics to cases except for the presence of hypertension (Normotensive).

All controls demonstrated similar findings at physical examinations as their matched cases but had normal BP values (SBP <120 mm Hg and DBP < 80mmHg).

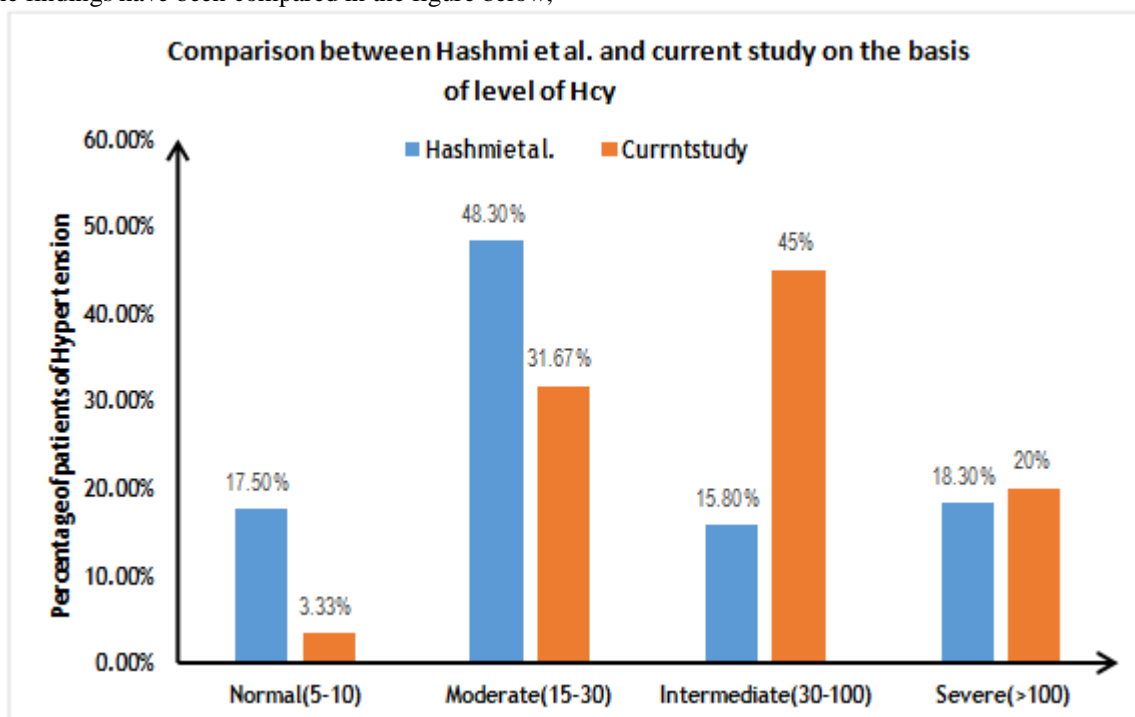
### **III. OBSERVATION & DISCUSSION**

The mean age of patients in the hypertension group was 48.0 years  $\pm$  9.15 and in the comparison group mean age was 48.69 years  $\pm$  9.12. In our study there was no difference in the age of the two groups. Patients enrolled in the current study included 33 (55%) male patients and 27 (45%) female patients of hypertension and same numbers of normotensive patients in comparison group.

60 patients of hypertension have been included in the study out of which 12 (20%) patients had severe hyperhomocysteinemia, 27 (45%) patients had intermediate, 19 (31.67%) patients had moderate and 2 (3.33%) had normal serum homocysteine level. In the study conducted by Hashmi et al. 120 patients of Hypertension were included, out of which 22(18.3%) had severe, 19(15.8%) had intermediate, 58(48.3%) had moderate and 21(17.5%) had normal serum Homocysteine level<sup>9</sup>.

The percentage of patients having severe Homocysteine level in our study is similar to the findings of Hashmi et al. The percentage of intermediate Homocysteine is greater in our study which can be explained by the fact that our sample size was half in comparison to that of Hashmi et al. In the study done by Hashmi et al., the mean plasma homocysteine level in 120 patients of Hypertension was 72.83( $\pm$ 12.61) (9). In our study the mean homocysteine levels in cases was 59.33( $\pm$ 35.83). The lesser mean in our study can be explained by the fact that greater percentage of patients are in intermediate Homocysteine levels in the current study which is around thrice than that of Hashmi et al.

The findings have been compared in the figure below,



**Figure 14: Comparison between Hashmi et al. and current study on the basis of level of Homocysteine**  
 In the study conducted by P S UshaRani et al., the levels of Homocysteine found in males and females is as follows(10),

Grading of Homocysteine levels	Percentage of Male Patients(N=20)	Percentage of Female patients(M=10)	Total (N=30)
Severe (>100µmol/L)	15%	0	10%
Intermediate (30-100 µmol/L)	40%	40%	40%
Moderate (15-30µmol/L)	25%	50%	33.33%
Normal (5-15µmol/L)	20%	10%	16.67%

Similar findings were obtained in our study as follows,

S. Homocysteine level	Percentage of Male Patients(N=33)	Percentage of Female patients(N=27)	Total(N=60)
Severe (>100 µmol/l)	12.12%	29.63%	20%
Intermediate (30-100 µmol/l)	57.58%	29.63%	45%
Moderate (15-30 µmol/l)	27.27%	30.30%	31.67%
Normal (5-15 µmol/l)	3.03%	3.03%	3.33%

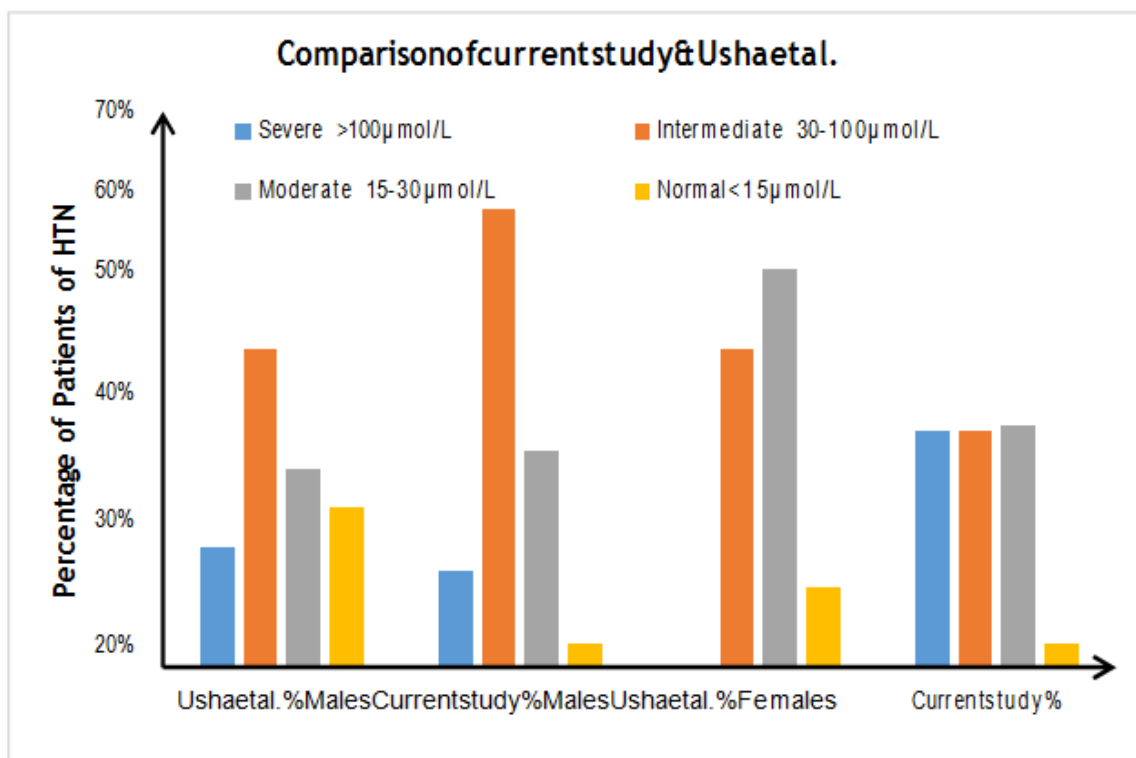


Figure 15: Comparison of current study & Usha et al.

The greater percentage of male patients having intermediate Homocysteine levels in our study and lesser percentage of female patients having intermediate and moderate Homocysteine levels in comparison to Usha et al. can be explained by the fact that the sample size of Usha et al. was 30 as compared to 60 in the current study.

In our study the percentage of patients of HTN are as given below,

S. Homocysteine	Hypertension		Total
	Stage 1	Stage 2	
Normal	02 (5.88%)	00	02 (3.33%)
Moderate	18 (52.94%)	01 (3.85%)	19 (31.67%)
Intermediate	14 (41.18%)	13 (50%)	27 (45%)
Severe	00	12 (46.15%)	12 (20%)
<b>Total</b>	<b>34 (56.67%)</b>	<b>26 (43.33%)</b>	<b>60 (100%)</b>

In current study we ave included 60 patients of essential Hypertension, Out of which 26(43.33%) patients having stage 2 (BP>160/90) & 34(56.67%) Patients having stage 1 (BP<160/90).So, majority of patients in this study had

Stage 1 Hypertension.

In current study there were 26 patients who had stage 2 HTN (BP > 160/90) out of which 12 (46.15%) had severe, 13 (50%) patients had intermediate and 1 (3.85%) patient had moderate hyperhomocysteinemia. So, majority of patients of stage 2 hypertension in current study had intermediate hyperhomocysteinemia, whereas majority of patients of stage 2 HTN in Hashmi et al. had moderate hyperhomocysteinemia.

In current study 34 patients had stage 1 HTN out of which 14 (41.18%) patients had intermediate, 18 (52.94%) patients had moderate and 2 (5.88%) patients had normal Homocysteine levels. So, majority of patient of stage 1 hypertension in current study had moderate hyperhomocysteinemia, which is comparable to Hashmi et al.

In African American women, Homocysteine was significantly correlated with both the systolic BP (r =0.22,P=.02) and diastolic BP(r=0.24,P=.01).There was no significant correlation in their male counterparts (systolic BP, r=0.05,P=.71;diastolic BP, r=0.03, P=

.83). In current study Homocysteine significantly correlated (r= 0.775 and 0.621, P < 0.05) with SBP and DBP.A strong correlation also found in males and females in our study (r=0.713 and 0.847). This proves our hypothesis<sup>11</sup>.

#### **IV. RESULTS**

In this study we have included 60 patients of essential Hypertension and 60 Normotensive patients for the comparison. Out of 60 cases, most of the patients (40%) were in range of 40-49 years. The second common age groups of patients (26.67%) were from the age group of 50-59 years. Mean age of the study population was  $48 \pm 9.15$  years.

In comparison group we have included normotensive patients in the age from 30-70 years. Out of 60 patients, most of the patients (36.67%) were in range of 40-49 years. The second common age groups of patients (31.67%) were from the age group of 50-59 years. Mean age of the study population was  $48.69 \pm 9.12$  years.

In our study we have included 33 (55%) male patients and 27 (45%) female patients of hypertension and same numbers of normotensive patients in comparison group.

Out of 60 patients of Hypertension 12 (20%) patients had severe hyperhomocysteinemia, 27 (45%) patients had intermediate, 19 (31.67%) patients had moderate and 2 (3.33%) had normal serum homocysteine level.

In comparison group, out of 60 normotensive patients 4 (6.67%) patients had intermediate, 15(25%) patients had moderate and 41(68.33%) had normal serum homocysteine level.

Out of 33 total male hypertension patients 4 were having severe Hyperhomocysteinemia, 19 intermediate, 9 moderate and 1 normal. Among the 27 females 8 were having severe, 8 were intermediate, 10 were moderate and 1 was normal. The percentage of males having intermediate hyperhomocysteinemia was significantly higher than that of females ( $P < 0.05$ ).

Out of 33 total male normotensive patients of Comparison group 1 intermediate, 9 moderate and 23 normal. Among the 27 females 3 were intermediate, 6 were moderate and 18 was normal.

The mean homocysteine level in cases was  $59.33 \mu\text{mol/l}$  (males  $57.21 \mu\text{mol/l}$  and females  $61.93 \mu\text{mol/l}$ ). Similarly, the mean Homocysteine levels in controls was  $16.83 \mu\text{mol/l}$  (males  $15.18 \mu\text{mol/l}$  and females  $18.85 \mu\text{mol/l}$ ). The difference between the mean Homocysteine levels in cases and controls was statistically significant. This difference was significant in either gender in both the groups.

Mean Homocysteine levels among female patients of Hypertension ( $61.93 \mu\text{mol/l}$ ) was higher than that of males ( $57.21 \mu\text{mol/l}$ ). Mean Homocysteine levels among females in the comparison group ( $18.85 \mu\text{mol/l}$ ) was higher than that of males ( $15.18 \mu\text{mol/l}$ ). However, the difference was found to be statistically significant.

In current study we have included 60 patients of Essential Hypertension. Majority of patients (56.67%) had BP  $< 60/90\text{mm/Hg}$ .

In our study out of 60 patients of Hypertension 32 patients were in stage 1 and 28 were in stage 2 class of Hypertension. In stage 1 patients of Moderate Hyperhomocysteinemia were high (50%) whereas in stage 2 patients of Intermediate Hyperhomocysteinemia were high (58.82%).

The mean Homocysteine levels in patients of stage 2 hypertension ( $88.04 \pm 28.72$ ) is more than that of patients in stage 1 of the disease ( $37.38 \pm 22.85$ ). This difference is also found to be statistically significant. This proves our alternative hypothesis that there is an association between greater blood pressure and serum homocysteine. The Pearson correlation coefficient  $r$  value was found to be 0.775 ( $P$  value  $< 0.05$ ) which indicates a strong positive correlation between the two variables.

In current study Homocysteine significantly correlated ( $r = 0.775$  and  $0.621$ ,  $P < 0.05$ ) with SBP and DBP. A strong correlation also found between Homocysteine and Hypertension both in males and females in our study ( $r = 0.713$  and  $0.847$ ). This proves our hypothesis.

#### **V. CONCLUSION**

It is observed that serum homocysteine appears to be raised in patients with hypertension. The hyperhomocysteinemia may be involved in the induction and sustaining of hypertension. Therefore, more advance studies and clinical trials focused on plasma homocysteine and blood pressure will improve our understanding of these associations with the goal of reducing the public health burden of hypertension. Our study showed that the prevalence of hypertension accompanied by Hyperhomocysteinemia was very high. Patients with hyper homocysteinemia are more pronetohypertension So, patients with poor control of blood pressure should search for Hyperhomocysteinemia.

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