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# "EFFECT OF ANTIHYPERTENSIVE DRUG THERAPY ON COGNITION AND PSYCHOMOTOR PERFORMANCE OF HYPERTENSIVE PATIENTS: AN OBSERVATIONAL STUDY."

General Surgery

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## ABSTRACT

**Background:** The incidence of hypertension (HTN) has been increasing worldwide. Hypertension is associated with significant cognitive and psychomotor effects and anti-HTN themselves are reported to cause cognitive and psychomotor impairment in few studies. Effects of anti-HTNs are however controversial due to conflicting results of various studies.

**Objective:** This study is planned to explore whether antihypertensive medication has a significant influence on cognitive and psychomotor performance in hypertensive patients.

**Methods:** In this cross sectional observational study hypertensives (25-50 yrs) of either sex were included. Patients were grouped into control (freshly diagnosed HTNs) and test groups 1 (Anti-HTNs <6 month) and 2 (Anti-HTNs >6 month). The effects of anti-HTNs on cognitive and psychomotor performance were assessed using DSST, TMT & WMS tests; and compared amongst the groups. Data obtained was analyzed using student's't'-test of OpenEpi statistical software.

**Results:** Study clearly revealed that anti-HTNs themselves exhibit significant impairment in cognitive and psychomotor performance; DSST ($p<0.01$), TMT ($p<0.05$) and WMS ($p<0.05$) when compared to group 1 and control. Conclusions: Though Anti-HTNs are lifesaving drugs in HTNs it is noteworthy revelation that they impair cognitive and psychomotor performance of the patients, hence further studies to ascribe this effect to specific anti-HTN class is essential.

## KEYWORDS

Anti-HTNs DSST TMT WMS

**Introduction:**

The major goal of drug treatment in hypertension is not to alleviate symptoms but to prevent cardiovascular and cerebrovascular complications.[1] The association of some antihypertensive drugs with changes in psychomotor performance, mood and intellect raises a relevant and inadequately researched aspect of therapeutics of hypertension and the choice of antihypertensive therapy.[2, 3] This study is aimed at evaluating whether psychomotor performance of hypertensive patients on antihypertensive treatment for > 6months is better than those are freshly diagnosed or on anti-HTNs for < 6 months or it get impaired following anti-HTN treatment over a period of time as reported in earlier few studies.[2-4]

The current literature on the effects of antihypertensive therapy on cognition and psychomotor performance is conflicting and controversial. Improvement on psychomotor tests of attention and speed was seen in young patients following antihypertensive treatment during a 15 month prospective study.[5, 6] Conversely, antihypertensive was associated with worsening of attention and reaction time measures in hypertensive subjects in other studies.[3, 7] It is difficult to determine from literature whether reducing blood pressure reverses the psychomotor impairment observed in untreated hypertensive patients. The psychomotor effects of beta-adrenoceptor blockers have been most extensively examined, whereas there are few reports on diuretics, calcium channel antagonists or ACE inhibitors. But review of literature offers no concrete data on effects of anti-HTN drugs on cognition and psychomotor performance and its relation with blood pressure control.

In the limelight of all available knowledge, present study primarily focuses on effects of ant-HTNs on cognition and psychomotor performance of HTNs.

**Materials and Methods:**

In this observational cross sectional study adult hypertensive patients of either sex those were either freshly diagnosed or on anti-HTN therapy for < 6 month/ >6 months; were included. Patients those with history of any other disease (e.g. diabetes, stroke, IHD etc.) and medical treatment for the same were excluded. Patients and family member were explained in detail about the nature of study, its purpose and study procedure in their own language. Written informed consent was obtained from those patients, who were willing to participate in the study before they were included in the study.

After getting the protocol approved by institutional ethics committee (Ref. SKNMC/Ethics/App/2016/179) initial screening was done, patients were enrolled into their respective groups i.e. control and test groups 1, 2 (n= 50) and the data regarding age, sex, past medical history, family history of any chronic disease, physical examination (height, weight, body mass index) and clinical examination (blood pressure, ECG) was recorded. Apart from the routine tests advised to a patient i.e. blood sugar and lipid profile, additional paper pencil tests such as Digit Symbol Substitution Test [DSST]; Trail Making Test [TMT]; for psychomotor performance and Wechsler Memory Scale [WMS] for cognition; [1] were performed in all HTN patients. Extent of blood pressure control was assessed and effect of anti-HTNs on cognition and psychomotor performance among groups was compared. Demography and socio-economic status was also studied. Data was analyzed using appropriate statistical test in OpenEpi statistical software.

**Results:**

Cross sectional observational study included adult hypertensive patients of either sex of age between 25- 50 years. There were total 150 patients enrolled in this study either in test group 1, 2 (anti-HTNs for <6/>6 months respectively) or in control group (n= 50 in each group) according to study protocol. Out of 50 participants in test groups 1, 2 female participants were 22 and 26 respectively the mean age of participants was 43.07 yrs. In control group out of 50 participants, 28 were females and the mean age of participants was 44.53 yrs.

The baseline characteristics and demographic profile of participants in all the groups were comparable. Demographic characters and observations in DSST, TMT & WMS are shown in table no 1, 2 respectively. Whereas, effect of blood pressure on cognition and psychomotor performance of hypertensive patients presented in fig 1 & table no 3.

**Table 1: Demographic profile of participants**

| Demographic characters | Control | Group 1 | Group 2 |
|---|---|---|---|
| Age | 44.53±3 | 43.07±4 | 43.07±4 |
| Sex (M/F) | 28(23) | 22(28) | 26(24) |
| BMI | 23.8±3 | 26.5±4.8 | 23.8±5.1 |

(n=50 in each group) Values are expressed as mean SD; Body Mass Index (BMI)

**Table 2: Effect of Anti-hypertensive therapy on cognition and psychomotor performance**

| Groups (n=50) | SBP | DBP | DSST SCORE [max.100] | TMT SCORE [max.02] | WMS SCORE [max.11] |
|---|---|---|---|---|---|
| Control | 139.2±0.06 | 96±0.04 | 89±0.4 | 1.96±0.3 | 9.26±0.63 |
| Group 1 | 138.4±0.03 | 94±0.03 | 82±0.2* | 1.92±0.1 | 8.82±0.68* |
| Group 2 | 126.2±0.04 | 86±0.04 | 78±0.6** | 1.89±0.2** | 7.24±0.54** |

(n=50 in each group) Values are expressed as mean SD; *p<0.05, **p<0.01 compared to control by student's-t test. Diastolic blood pressure (DBP), Systolic blood pressure (SBP), Digit symbol substitution test (DSST), Trail making test (TMT), Wechsler memory scale [WMS]

**Table 3: Effect of blood pressure on cognition and psychomotor performance of hypertensive patients**

| SBP (mm of Hg) | DSST SCORE [max.100] | TMT SCORE [max.02] | WMS SCORE [max.11] |
|---|---|---|---|
| 130-140 | 88.76±0.4 | 1.97±0.3 | 9.86±0.63 |
| 141-150 | 86.42±0.5 | 1.94±0.6 | 9.26±0.54 |
| 151-160 | 78.26±0.6* | 1.94±0.2* | 8.82±0.68* |
| 161-170 | 73.48±0.7** | 1.90±0.4** | 7.84±0.54** |
| 171-180 | 72.76±0.8** | 1.86±0.3** | 7.18±0.36** |

(n=150) Values are expressed as mean SD; *p<0.05, **p<0.01 (ANOVA followed by Dunnett's test). Systolic blood pressure (SBP), Digit symbol substitution test (DSST), Trail making test (TMT), Wechsler memory scale [WMS]

**Figure 1: Effect of blood pressure on cognition and psychomotor performance of hypertensive patients**

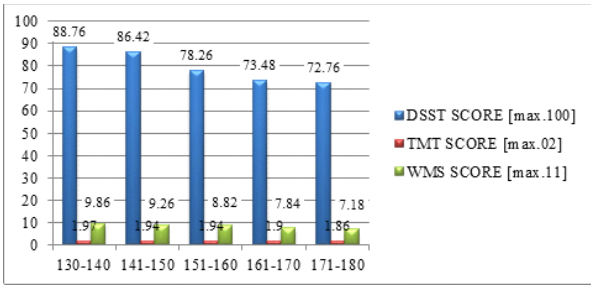
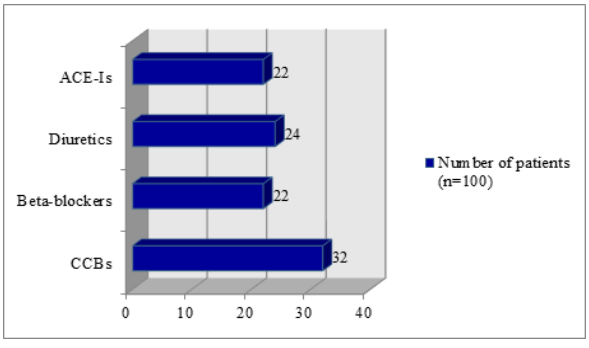



**Figure 2: Various anti-hypertensives prescribed to the patients**




**Discussion:**

Main objective of treatment of hypertension is prevention of cardiovascular complications without adverse drug reactions. The cognitive & psychomotor effects of antihypertensive drugs during chronic treatment yet remains uncertain, though psychomotor performance can be measured objectively. The confounding adverse effects of cerebrovascular disease and hypertension itself are reasonable for this uncertainty. To date there is insufficient good quality data on cognitive & psychomotor effects of anti-HTNs differentiating commonly used agents. However, the beneficial effect of anti-HTNs tends to more than offset any adverse effects of the agents used.

Results of present cross sectional study are presented in tables 1-3 & figure 1, 2. From the results it become evident that anti-HTNs significantly impair cognition and psychomotor performance of hypertensive patients over period of time (p<0.05, p<0.01). These results are in agreement with the earlier studies that mention antihypertensives themselves cause impaired cognition and psychomotor performance [1,2] whereas, contradictory to the results of studies stating cognition and psychomotor performance is improved with anti-HTNs. [3,4] In present study however cognition and psychomotor performance was found to be better in patients with better blood pressure control (see figure 1). There are few studies that mention calcium channel blockers, beta-blockers and diuretics impair, while angiotensin converting enzyme inhibitors improve cognition and psychomotor performance. [1,8-10] In this study majority of the hypertensive patients anti-HTNs given were calcium channel blockers, beta-blockers and diuretics compared to angiotensin converting enzyme inhibitors, this could be the reason for contradictory results.(see figure 2) However effects of individual anti-HTN on cognition and psychomotor performance was not studied in present study hence these effects couldn't be ascribed to specific anti-HTN agent, it is a limitation of this study. Further studies to explore and confirm the long term detrimental effects of specific anti-HTN need to be carried out. However results of the present study could serve noteworthy accumulation in the data on effects of anti-HTNs on cognition and psychomotor performance.

**Conclusions**:

To conclude it's uncertain, whether reducing blood pressure reverses the psychomotor impairment and to what extent the choice of individual drugs determines any change in cognition and psychomotor performance. Since experimental data on cognition and psychomotor performance in hypertensive patients is lacking results of the present study could be a good addition in the same. However further studies to explore effects of chronic use of specific anti-HTNs are necessary.

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