

## COGNITIVE DECLINE AMONG PATIENTS WITH HYPERTENSION AND ASSOCIATED SOCIO-DEMOGRAPHIC FACTORS

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### ABSTRACT

**Objective:** To determine the frequency of cognitive decline among the patients of hypertension and analyze the associated socio demographic factors.

**Study Design:** Cross sectional study.

**Place and Duration of Study:** Pak Emirates Military Hospital Rawalpindi, from May to Jul 2018.

**Methodology:** A total of 200 patients of hypertension diagnosed for >1 year by a consultant medical specialist were included in the study. Cognitive decline was assessed by using the British Columbia Cognitive Complaints Inventory (BC-CCI). Socio-demographic factors in the study included age, education, smoking, poly-pharmacy and duration of illness. They were correlated independently with the cognitive decline by using the binary logistic regression.

**Results:** Out of 200 patients of hypertension, 105 (52.5%) had no cognitive decline, 61 (30.5%) had mild, 23 (11.5%) had moderate and 11 (5.5%) had severe cognitive decline. Mean age of the study participants was  $43.74 \pm 3.15$  years. Mean duration of hypertension among the patients in this study was  $7.98 \pm 3.35$  years. Tobacco smoking and long duration of illness had significant association with cognitive decline ( $p$ -value <0.05) when binary logistic regression was applied.

**Conclusion:** This study showed a high frequency of cognitive decline among the patients suffering from hypertension. Special attention should be paid on individuals with long duration of illness. Tobacco smoking should be discouraged among the patients suffering from hypertension in order to prevent the problems related to cognition. Regular screening of cognitive decline should be performed on high risk cases in the hypertension clinics.

**Keywords:** Cognitive decline, Hypertension, Socio demographic factors.

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### INTRODUCTION

Hypertension is a chronic illness affecting all the systems of the body to some extent. Despite preventive strategies and awareness programs, incidence of this multisystem disease is on a rise in all parts of the world including Pakistan<sup>1</sup>. Cognition is a complex function of the body though directly linked with the brain but affected by functioning of other parts and systems of the body<sup>2,3</sup>. Various medical conditions including DM, HTN, IHD and CKD affect the cognition of an individual and produce a significant decline in this ability<sup>4-7</sup>.

Hypertension is a chronic disease which causes various changes in the vascular and end-organ level which affects the overall physiological well-being of the body<sup>8</sup>. Treatment of hypertension also involves various agents which have been linked with cognitive problems including the decline in this ability<sup>9</sup>. Therefore physiological and psychological effects of chronic illness and its medical treatment both predispose the individuals towards this problem which not only affect the individual but also the people around him

and his occupational commitments.

Literature of recent past has supported the association of hypertension and cognitive decline among different populations of the world. A large study revealed that hypertension has a strong association with cognitive decline<sup>10</sup>. Hypertension was the most common cardiovascular ailment among the patients of cognitive decline in a study done in our neighboring country Brazil. A very important paper discussed that cognitive problems are highly prevalent among the hypertensive patients and usually deteriorate with time. Special attention has been paid on the recognition and prevention of cognitive decline among the hypertensive individuals and measures to improve their overall quality of life<sup>8</sup>. Good quality of life and life satisfaction has been strongly linked to adequate cognitive abilities in various studies done in the past. Increasing age, race, obesity, tobacco smoking, life style, education polypharmacy and total cholesterol levels have been linked with the presence and severity of cognitive decline among the patients suffering from a chronic metabolic illness like hypertension<sup>10</sup>.

A study has been done in our set up regarding the decline in cognition in chronic renal disease<sup>7</sup> but no work so far has been done on the patients of hyper-

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Received: 03 Jan 2019; revised received: 05 May 2020; accepted: 04 Aug 2020

tension. Our study aimed to assess the presence and severity of cognitive decline among the patients of hypertension and also analyze the socio-demographic factors related with cognitive decline in these patients.

## METHODOLOGY

This cross sectional descriptive study was conducted at Pak Emirates Military Hospital (PEMH), from May to July 2018. Non-probability consecutive sampling was done from the patients of hypertension reporting in the medical outpatient department of PEMH Rawalpindi. Sample size was calculated by using the WHO sample size calculator by using population prevalence percentage of 85%<sup>6</sup>. Patients of both genders between the age of 25-50 years who had been suffering from essential hypertension for at least one year and have given written informed consent were included in the study. Patients older than 50 years were not included because cognitive decline in them could be attributed to senile changes instead of hypertensive phenomenon. Non-consenting subjects and those with age less than 25 or more than 50 were excluded from the study. Patients with secondary hypertension and cognitive problems before the diagnosis of hypertension were not included in the study. Patients with any other physical or psychiatric illness and illicit substance use were also excluded from the study. After the application of inclusion and exclusion criteria, 200 subjects were included in the final analysis.

British Columbia Cognitive Complaints Inventory (BC-CCI): It is a standardized screening tool for measuring the cognitive decline of the individuals. It is 6-item self-rating scale which takes <5 minutes to complete. Score >4 by Likert scoring is taken as the cut off score. For assessing the severity of cognitive decline following classes were made.

Normal 0-4, Mild cognitive decline 5-9, Moderate cognitive decline 9-14, Severe cognitive decline 15-18<sup>15</sup>.

The sample was drawn from the patients of hypertension reporting in medical OPD of PEMH Rawalpindi and fulfilling the inclusion and exclusion criteria. After getting ethics approval from the hospital ethical review board committee and written informed consent form all the participants of this study BC-CCI questionnaire was administered to the patients under the supervision of a health professional who translated or explained the questionnaire to those who had ambiguity in any point. Subjects were asked to answer the questions according to their condition in last one month. Personal data and correlating factors such as age, education, smoking, polypharmacy and duration

of illness were filled by the patient on a separate proforma attached to the BC-CCI questionnaire. Duration of illness was classed as disease lasting for less than or more than five years. Use of more than one drug for hypertension was regarded as polypharmacy. Matriculation was used as cut-off education for this study. Confounding variables were identified and adjusted by detailed history taking, examination and review of all the old documents possessed by the patient.

Descriptive statistics were used to describe the characteristics of participants and the distribution of BC-CCI score. Variables in this study included age, education, smoking, poly-pharmacy and duration of illness. Between-group variances in categorical correlates were determined using chi-square. All statistical analysis was performed using Statistics Package for Social Sciences version 24. Chi-square test was used and differences between groups were considered significant if *p*-values were less than or equal to 0.05. Binary logistic regression analysis was done to find the relationship between variables and cognitive decline.

## RESULTS

A total 220 patients of hypertension were approached to participate in this study. All were between the age of 25-50 years. Five did not give consent for enrolment in the study. Ten were ineligible due to inclusion/exclusion criteria (4 were using illicit substance, 2 had clinical depression, 3 had comorbid DM, 1 had cognitive dysfunction prior to the onset of HTN). Five did not provide all the data correctly at the base line. Thus, 200 patients of HTN were finally included in the study analysis. Out of these 200 patients, 105 (52.5%) had no cognitive decline, 61 (30.5%) had mild, 23 (11.5%) had moderate and 11 (5.5%) had severe cognitive decline. Mean age of the study participants was  $43.74 \pm 3.15$  years. Mean duration of hypertension among the patients in this study was  $7.98 \pm 3.35$  years. Increasing age, tobacco smoking, polypharmacy and duration of illness had significant association with cognitive decline (*p*-value <0.05) while education was not found significantly associated in our study (table-I). Binary logistic regression only confirmed the strong association of tobacco smoking and long duration of illness with the cognitive decline in hypertensive patients (table-II).

## DISCUSSION

Chronic illnesses like DM, asthma, hypertension etc. have a drastic effect on the overall functioning of the body. All the biological functions of the body are affected in one way or the other. Cognitive ability is

one of these, which not only affect the individual but also the people around him. Sometimes it is suffering of the others or the occupational problems with which the patient presents to the OPD. More than 45% of participants of our study showed some level of cognitive impairment. No population based study has been available on patients of hypertension regarding their cognitive function in Pakistan however these results

and pharmaco-dynamic properties of anti-hypertensive drugs which not only cause endothelial damage but also cause its dysfunction leading to the alteration in the physiology of blood flow to the cerebral hemispheres leading to various problems including the cognitive decline<sup>17</sup>.

Increasing age was not a significant correlate

**Table-I: Characteristics of the hypertension patients and their BC-CCI score.**

Socio Demographic Factors	No Cognitive Decline (BC-CCI 0-4)	Mild Cognitive Decline (BC-CCI 5-9)	Moderate Cognitive Decline (BC-CCI 9-14)	Severe Cognitive Decline (BC-CCI 15-18)	p-value
<b>Age</b>					
25-40	51 (48.6%)	20 (32.8%)	08 (34.8%)	01 (9.1%)	0.029
>40	54 (51.4%)	41 (67.2%)	15 (65.2%)	10 (90.9%)	
<b>Education</b>					
10 or less	75 (71.4%)	43 (70.5%)	19 (82.6%)	10 (90.9%)	0.361
>10	30 (28.6%)	18 (29.5%)	04 (17.4%)	01 (9.1%)	
<b>Duration of Illness</b>					
<5years	96 (91.4%)	43 (70.5%)	19 (82.6%)	06 (54.5%)	0.001
>5 years	09 (8.6%)	18 (29.5%)	04 (17.4%)	05 (45.5%)	
<b>Tobacco Smoking</b>					
Non Smoker	56 (53.3%)	19 (31.1%)	08 (34.8%)	03 (27.3%)	0.020
Smoker	49 (46.7%)	42 (68.9%)	15 (65.2%)	08 (72.7%)	
<b>Poly-pharmacy</b>					
No	50 (47.6%)	21 (34.4%)	10 (43.5%)	01 (9.1%)	0.053
Yes	55 (52.4%)	40 (65.6%)	13 (56.5%)	10 (90.9%)	

**Table-II: The correlated factors relating to presence of cognitive decline among the patients of hypertension: the binary logistic regression analysis.**

	p-value	Odds ratio	Confidence Interval	
			Lower	Upper
Age (ref. was <25-40 years)	0.085	1.738	0.927	3.255
Duration of illness (reference was <5 years)	0.001	4.275	1.817	10.059
Smoking (ref. was no smoking)	0.009	2.295	1.232	4.274
Education (ref. was more than or equal to matriculate)	0.418	1.339	0.660	2.715
Poly-pharmacy (ref. was no Poly-pharmacy)	0.171	1.550	0.828	2.904

are in accordance with the studies done on similar subject in other parts of the world<sup>10,11</sup>. Results of our study show a true reflection of cognitive problems in hypertensive population of our set up as our study sample had no other diagnosed physical or mental illness. Important reason may be vasculopathy (atherosclerosis, vascular stiffening or remodeling and reduction in cerebral blood flow) or stress encountered due to a chronic long standing illness. Treatment options may pose additional risk to this problem<sup>11-16</sup>.

Cognition of an individual has multi dimensional basis. Physiological, neurological, endocrine and psychological factors affect this vital function of the body. Patient of hypertension can have one or more altered factors which may lead to this problem. There is a complex interaction between etiology of hypertension

with cognitive decline in our study when binary logistic analysis was done. Different results have been reported in the studies done in past<sup>10,11</sup>. Reason for this might be narrow age group include in our analysis. Further studies with wide range of age and strict control of confounding factors may give better results regarding this phenomenon.

Smokers in our study showed more chances of having cognitive impairment as compared to non-smoker hypertensive patients. Similar results are revealed in other studies regarding relationship of cognitive function and smoking among the hypertensive patients<sup>18,19</sup>. Nicotine and tar are the active ingredients of tobacco cigarette which can have both direct and indirect effect on the cerebral blood flow of an individual leading to cognitive problems.

Most of the anti-hypertensive drugs interfere with phosphodiesterase pathway or intracellular calcium metabolism. Mitochondrial pathways are also affected leading to oxidative stress on cellular level which can affect the cognition of an individual in number of ways. If the patient is using more than one antihypertensive or combination drugs he is more likely to suffer from cognitive problems including the decline in cognition<sup>16,20</sup>. This association was supported by our study analysis.

Our study has few limitations as well. Randomized selection of study subjects from all the hypertensive males from all over the country was not done. Therefore, the results of the present study cannot be generalized. Cross-sectional study design was used which cannot confirm the cause and effect relationship between the variables. Methodological issues also arise with the use of self-administered tool to detect the presence and severity of cognitive decline as patients may have a chance to under or over report the symptoms. Thus larger studies with more sophisticated study design should be performed in future with a large sample size in order to generalize the results.

### CONCLUSION

This study showed a high frequency of cognitive decline among the patients suffering from hypertension. Special attention should be paid on individuals with long duration of illness. Tobacco smoking should be discouraged among the patients suffering from hypertension in order to prevent the problems related to cognition. Regular screening of cognitive decline should be performed on high risk cases in the hypertension clinics.

### CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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