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Research Article

Assessment of Cognitive Performance in Prehypertensives and Normotensives in the age group 15-30 years

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Abstract:
Aims and Objectives: To assess the cognitive function of pre-hypertensives as compared to normotensive individuals in the same age group (15 – 30 years).
Materials and Methods: This is a cross sectional study conducted on a sample size of 100 individuals belonging to the age group of 15 -30 years. Their blood pressure was recorded and the study participants were divided into pre-hypertensives and normotensives. Cognitive performance of both the groups was tested with the Montreal Cognitive Assessment test and compared.
Results: The study results showed a statistically significant difference between the cognitive function of pre-hypertensive and normotensive males but no such difference in females.
Conclusion: The study suggests that there is some cognitive decline with increasing Blood Pressure even in the pre-hypertensive range in males. professor

1 INTRODUCTION

Vascular risk factors are known to have a deleterious effect on the cerebrovascular system. The burdens caused by these on brain functions accumulate sub clinically over years until they finally lead to disease. One of the most common of these is Cognitive impairment which goes on to produce diseases such as Dementia and Alzheimer's as age progresses.

Studies have shown that there exists a linear relationship between Blood pressure and the risk of developing a stroke [1]. There also subsists an established relation between cerebral and cardiovascular diseases and cognitive impairment in a large population [2][3][4] .Both these pathologies have hypertension as a major risk factor. It has been suggested by several researches conducted on hypertensive individuals that there is a decline in cognition in such patients as compared to normotensives of the same age group[5][6] . It was also seen that reduction in blood pressure to normal with use of drugs such as ACE inhibitors or calcium channel blockers led to an improvement in cognitive function [7].

The term prehypertension was coined by the Joint National Committee 7 to include all the individuals who had a blood pressure below 140/90mm Hg but above the normal value of 120/80 mmHg. It was designated that individuals belonging to this group had a higher risk of developing cardiovascular diseases and progressed to develop hypertension sooner than those with normal blood pressure.

Prehypertension by itself does not indicate that the individual may have a disease. Rather it's a warning that disease may follow. Studies have established that pre-hypertensive individuals were at a higher risk of developing hypertension than normotensives of the same age group [8].

The role of hypertension in begetting several pathologies has been recognized since long. Recent researches have shown that even pre-hypertension in the low range has an increased risk of cardiovascular morbidities [9]. Very few studies however have been undertaken to study whether other consequences of hypertension may be found in the earlier stage of pre-hypertension itself. This study will look into the possibility of cognitive impairment in seemingly asymptomatic pre-hypertensive persons to identify if there is prevalence of any cognitive impairment in such individuals as compared to normotensives in the age group of 15-30 years. This age group is considered as the incidence of pre-hypertension is found to be higher in younger individuals [10][11] and pathologies identified in this age group has potential to be reversed as compared to older persons.

objectives

To assess the cognitive function in pre-hypertensive individuals as compared to normotensives of the same age group (15-30 years).

MATERIALS AND METHODS

The study was conducted in Acharya Vinobha Bhave Rural Hospital, Sawangi. This is a rural setting and majority of the patients come from rural backgrounds.

Type of Study

This was a cross- sectional study where the baseline and cognitive assessment of the patient was carried out after obtaining informed consent. The patients were assigned to the normotensive or pre-hypertensive category and their cognitive fitness compared.

Study Participants

They study participants were the patients visiting the medicine OPD in AVBR Hospital as well as staff and students of the Medical College. According to the Census method, all consenting individuals fulfilling the inclusion and exclusion criteria were included in the study.

Sample Size:

The sample size for this study was 100.

Inclusion Criteria:

• Age group: 15-30 years (both male and female patients).

• Normotensive individuals: ≤120/80 mmHg, supine position without any anti-hypertensive drugs.

• Pre-hypertensive individuals: 121-139/81-89 mmHg, supine position without any anti-hypertensive drugs.

Exclusion Criteria:

• Patients of Hypertension.

• History of stroke, untreated thyroid disorders.

• History of alcohol addiction, chronic smokers, dementia, psychiatric disorders, in family.

• History of hearing impairment, severe end organ damage, musculoskeletal disorders.

Data Collection

A. *Measurement of Blood Pressure:*

For each study participant, the blood pressure was measured three times with an interval of 5 minutes after ensuring the individual was completely relaxed. This was done using a mercury sphygmomanometer with the patient in supine position. According to the Joint National Committee report 8[12], all individuals with BP ≤120/80 mmHg were considered normotensive and those with BP between 120/80 mmHg to 139/89 mmHg, pre-hypertensive.

B. *Baseline Assessment:*

Patient characteristics recorded at baseline included:

- Age
- Gender
- Blood Pressure
- BMI
- Waist Hip ratio
- Waist Circumference
- Comorbidities
- Family history of Neurodegenerative diseases.

All anthropometric measurements and interpretations were carried out according to WHO guidelines [13].

Assessment of Cognitive Function:

Cognitive assessment was done with the Montreal Cognitive Assessment (MoCA)[14] test. It is a brief screening tool for cognitive impairment developed by Dr.Ziad Nassredine, MD and is free to use. The test assesses different areas of cognitive domain such as attention and concentration, executive functions, calculations, memory, language, visuoconstructional skills, conceptual thinking, and orientation. The test is administered in a time of 10 minutes. The total score is 30 and any score above 26 is considered normal.

Steps to avoid bias:

In order to reduce bias, the study was a Single Blind Study (Assessor Blind) where the assessment of cognitive function was carried out by a third person and the assessor carried out the baseline assessment including anthropometry and blood pressure. The cognitive assessment was carried out in English as all study participants in this study were fluent in the language.

Statistical Analysis:

A two-tailed independent samples t-test was conducted using SPSS software to check significance in the result and a regression analysis was done to adjust for patient characteristics.

RESULTS

During the study period (June 2014- July 2014), a total of 100 study participants who fulfilled the inclusion criteria and consented to the study were examined for Blood pressure, after which they were categorized into normotensive or pre-hypertensive category. They were further tested for cognitive impairment.

There were no drop-outs in the study and all 100 participants' results were valid for analyses.

Amid normotensives, 59.75% got a score of 26 and above in the MOCA test which indicated normal cognitive function, whereas amongst pre-hypertensives, this rate was 16.6%.

CHARACTERISTICS	NORMOTENSIVES (Mean +/- SD	PREHYPERTENSIVES (Mean +/- SD	P VALUE
AGE			
Male	22.5 (2.49)	23.6 (2.05)	0.24 (NS)
Female	20.82(0.2)	21.4 (0.9)	**0.001 (S)**
BMI			
Male	23.1 (2.2)	24.6 (1.8)	0.07 (NS)
Female	21.5 (2.5)	24.5 (2.5)	**0.0015 (S)**
WAIST CIRCUMFERENCE			
Male	32.6 (2.5)	34.5 (2.79)	0.06 (NS)
Female	26.3 (4.1)	30.4 (3.4)	**0.0055 (S)**
WAIST-HIP RATIO			
Male	0.79 (0.02)	0.82 (0.04)	**0.0058(S)**
Female	0.76 (0.03)	0.81 (0.02)	**< 0.0001(S)**
MOCA SCORE			
Male	26 (2.25)	23.3 (1.8)	**0.0027 (S)**
Female	26 (2.64)	24.4 (1.4)	0.08 (NS)
BLOOD PRESSURE			
Systolic			
Male	108.9 (8.9)	126.6 (2.6)	**<0.0001 (S)**
Female	109.4 (8.2)	124.8 (2.3)	**<0.0001 (S)**
Diastolic			
Male	73.3 (8.4)	87.7 (3.74)	**<0.0001 (S)**
Female	72.5 (7.5)	89.1 (2.3)	**<0.0001 (S)**

TABLE 1 – PATIENT CHARACTERISTICS

An independent samples t-test was done to compare the MOCA scores of normotensive and pre-hypertensive individuals.

It was found that among females, there seemed to be *no statistical significance* (t = 1.77 and p= 0.081) between the Cognitive test scores of pre-hypertensive (M = 24.4 and SD =1.4) and normotensives (M =26 and SD = 2.64). However the male subjects showed a ***statistically significant*** difference (t = 3.24 and p = 0.0027) between normotensives (M =26 and SD =2.25) and pre-hypertensives (M =23.3 and SD =1.8).

These results suggest that there is some cognitive impairment amongst pre-hypertensive males.

DISCUSSION:

The Global Status on Non-Communicable Diseases Report (2011) has reported that there were more than 2.5 million deaths from cardiovascular disease in India in 2008, a third of which was due to stroke. This is the third cause of death amongst chronic medical conditions in India, the fourth being dementia [15]. In the INTERSTROKE study [16], hypertension accounted for 34.6% of population attributable risk of various cardiovascular risk factors for stroke. Persons with prehypertension or high normal blood pressure have a much higher chance of developing hypertension than those who are normotensive [8]. Recent studies have shown that several pathologies that were earlier thought to present in hypertensives were seen to begin at a pre-hypertensive stage itself [9][17][18].

The results of the present study show that while there seemed to be no difference in the Cognitive assessment test scores between pre-hypertensive and normotensive females, there seemed to be a statistically significant difference between the test scores amongst males in the two categories. This variation could be attributed to gender differences in cognition as a result of difference in the proportion and asymmetry of the principle brain tissue volumes [19].

The poor cognition in pre-hypertensive males was also negatively associated with waist-hip ratio but not associated with an increased BMI or abdominal circumference. This would indicate that pre-hypertension by its self could have a detrimental effect on cognition. This shows a trend toward diminished cognition in the future.

The effect of prehypertension on systemic hemodynamic factors when studied showed that even a minor rise in blood pressure, as seen in prehypertension could impair hemodynamics and cardiovascular function[20]. The relation between hypertension and cognition has already been studied and established. Here we see that this relation holds true for high normal blood pressure or prehypertension as well.

This study had a few limitations. As true for risk factors for cardiovascular diseases and cognitive diseases, it is possible that several variables confound the relation of blood pressure to cognition. Factors such as age, BMI and obesity though were taken into consideration into the study design; other factors such as addictions, sleep status, stress levels and emotional state, lack of concentration during the test were not accounted for. It cannot be ruled out that the impairment in cognitive performance in males was seen as a result of not incorporating these factors in the study design especially since effect of addictions such as alcohol and smoking are known to have a detrimental effect on cognition[19][21].

In addition to this, the test used for cognitive assessment in this study was simply a screening test. A more detailed test would reveal further insight into amount of impairment of cognition and the area of cognition most affected. Further, had the study been carried out over a longer duration with a much larger sample size, it would have been more effective in studying the effect of Blood pressure on Cognition.

This study shows that cognitive impairment is seen in pre-hypertensive males as compared to normotensives, although a similar decline in cognition was not appreciable in females. Further studies could be done to find the area of cognition impaired and the amount of impairment and take into account,

all the confounding factors into its study design. It may also be studied whether decrease in blood pressure levels to normal could lead to improvement in cognition.

CONCLUSION:

Cognitive decline is an invalidating disorder and its occurrence increases with age. There have been several risk factors identified that lead to cognitive impairment. Along with factors such as age, gender, family history, addictions there is also high incidence of cognitive decline seen in those with major risk factors of cardiovascular diseases [22]. Out of these, hypertension is frequently associated with impairment in cognition as it favors demyelination, hypo perfusion and micro vascular changes in the brain.

Notably, this relation between hypertension and cognition also holds true for prehypertension. High normal blood pressure heralds a continuum of brain damage that if detected earlier can be treated simply by life style modification. Dementia being one of the major killers globally, any and all steps that can prevent it should be taken. More research is to be conducted in this area to acquire further knowledge in this matter.

SUMMARY:

The present study was conducted on normotensive and pre-hypertensive individuals in the age group 15-30 years to compare their cognitive function. The study was carried out over a period of two months on 100 individuals who fulfilled the inclusion criteria. It was a cross sectional study where the participant's blood pressure was taken initially and they were further tested for cognitive impairment using a Montreal Cognitive Assessment Test.

On comparison of the test scores between the two groups by an Independent samples t-test, it was found that there seemed to a statistically significant between the scores of normotensive and pre-hypertensive males. No such difference was found between females.

The result suggested that Cognitive Impairment is present among males even in the high normal blood pressure range.

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