The relationship of hypertension and dementia in the elderly: A comparative cross-sectional Study

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ABSTRACT

Background: Ageing and vascular factors are the dominating causes for the onset and progression of dementia. Memory declines with age and such declines can be especially worrisome to older individuals concerned about the potential onset of dementia.

Objectives: In the hypertensive and normotensive, elderly medicine OPD participants, of a tertiary care centre in Siddipet, Telangana; to find out: the prevalence of dementia and mild cognitive impairment (MCI); the relation between hypertension and dementia; and memory mistakes committed.

Methodology: A comparative cross-sectional study was done in 2020-21 at Siddipet GGH, Telangana State. 80 Hypertensive and 80 normotensive participants were recruited and assessed on socio-demographic factors like age, occupation, behavioral risk factors; along with measures like BMI and blood pressure. Participants were evaluated for cognitive functioning and memory failures with the help of HMSE and MMQ-ability questionnaires respectively.

Results: The prevalence of severe cognitive impairment/dementia was found to be 3.75% in our study participants. A statistically significant difference was found in the distribution of the HMSE as well as memory mistakes scores (p-value <0.001) when compared between hypertensive and normotensive participants. Memory mistakes/memory failures were seen in all the participants. The highest and lowest scores obtained in the MMQ-Ability questionnaire were 73 and 18 respectively.

Conclusion: This study throws light on the cognitive and memory related problems prevalent in the elderly population. More studies need to be conducted to capture the bigger picture on how these problems affect the day-to-day life of elderly.

KEYWORDS: Dementia, Memory, Cognitive Dysfunction

INTRODUCTION

Hypertension affects 22% of adults around the world and kills nine million people every year with major burden in low- and middle- income countries which have weaker health systems. [1, 2]Dementia is one of the major causes of disability and dependency among older people worldwide and affects 5% of the world's elderly population with 60% of people with dementia currently live in low- and middle-income countries. Old age is the strongest known risk factor for the onset of dementia (90% cases). Mild cognitive impairment (MCI) is globally prevalent in 3% to 42% of population. Aging and vascular factors are the dominating causes for the onset and progression of dementia. Memory declines with age and such declines can be especially worrisome to older individuals concerned about the potential onset of dementia. Evidence from several prospective studies has suggested hypertension as a risk factor for developing dementia.The Maastricht aging cohort study reported that the risk of developing dementia was as high as 30% in cognitively intact hypertensive subjects.Hypertension is the most consistent risk factor for dementia and causes cognitive function decline in old age. [3–6]

Cognitive problems like dementia and MCI, there is lack of evidence from Indian studies. [7]In elderly individuals, data on the effect of BP control on cognitive decline are still inconsistent. [8]

This study compares hypertensives and normotensives with regards to cognitive functions and gives insight into memory problems of elderly. This study is one of the firsts to explore hypertension, dementia, MCI all in a single study in the elderly in South India and might be the first to explore elderly's memory mistakes in the country. This study aimed to find out: the prevalence of dementia and mild cognitive impairment (MCI); the relation between hypertension and dementia; and memory mistakes committed in the hypertensive and normotensive, elderly medicine OPD participants, of a tertiary care centre in Siddipet, Telangana.

MATERIALS & METHODS

A Comparative cross-sectional study was conducted at Siddipet Government General Hospital (GGH) in Siddipet District, Telangana State from February 2020 to February 2021. Sample size calculation was done using OpenEpi software version3 open-source calculator with power of 80% and two-sided significance level of 95%. A sample size of 160 with 80 Hypertensive participants and 80 normotensive participants was obtained. All consecutive male and female elderly participants attending general medicine OPD were taken into the study till sample size was achieved. We included male and female participants with age > 60 years attending the general medicine OPD of Siddipet GGH With hypertension (Hypertensive group) and without hypertension (Normotensive group). Participants having any psychiatric illness or problem with comprehension were excluded.

Project was approved by Institutional Review Board of Siddipet Government Medical College. Written consent was obtained from all the participants at the time of interview.

Data collection involved socio-demographic details, disease or comorbidity details and disease treatment details of the participants along with anthropometric measures such as Height, Weight, BMI and Blood pressure.

Cognitive functioning was evaluated in all participants enrolled in the study using the Hindi version of Modified Mini-Mental State Examination (MMSE) known as Hindi Mental state examination (HMSE).[9] Total score is 30 where no, mild and severe cognitive impairment are defined by scores of 24-30, 18-23 and 0-17 respectively. For assessing memory mistakes, the Multifactorial Memory Questionnaire (MMQ)[10] was used where Memory mistakes were marked with a Likert scale of 'always (0) to never (4)' on the basis of subjective reporting of forgetfulness or memory mistake experienced by the participant in the past 2 weeks. Total score was given out of 80.

Some operational definitions used were: Elderly- 'adults aged 60 years or more', Hypertension- is 'systolic blood pressure of more than 140mmHg or diastolic blood pressure of more than 90mmHg on two or more measurements on separate occasions, history of hypertension in previous treatment records, or current use of any anti-hypertensive agents for treatment of hypertension as per medical records', Dementia/Severe cognitive impairment- 'Participant with a score of <18 in HMSE', Mild cognitive impairment- 'Participant with score of 18-23 in HMSE.'

Data collection was done in general medicine OPD of a tertiary care centre at Siddipet, Telangana between 10 AM to 1 PM on weekdays. Data was collected using Epicollect 5 software and analyzed using EpiData analysis software from "The EpiData Association" Odense, Denmark. Continuous outcome variables like HMSE score and Memory mistakes score, based on non-parametric distribution were subjected to Kruskal Wallis test. Categorical variables were subjected to tests like Chi-square test with Pearson correction. Value of significance was taken at p-value of 0.05. The **STROBE checklist** was used for reporting our data.

RESULTS

A total of 160 participants were recruited in this study. Out of which 80 were normotensive and 80 were hypertensive. Table 1 and Table 2 show the distribution of socio-demographic factors, disease and behavioural characteristics of the study participants in relation to severity of cognitive impairment.

The prevalence of severe cognitive impairment/ dementia was found to be 3.75% in our study participants. The difference among hypertensives and normotensives with respect to total HMSE score (55 vs 106) and Memory mistakes score (51.5 vs 109.5) was found to be statistically significant (p<0.01) as per Kruskal-Wallis Test. Higher scores depict better performance among normotensives regarding both cognition and memory.

Figure 1 shows the distribution of hypertensive and normotensive participants according to categories based on their HMSE scores in the HMSE questionnaire. Majority of the normotensive participants were found to be in normal cognition category while majority of hypertensive participants were found to be in MCI category according to their HMSE scores.
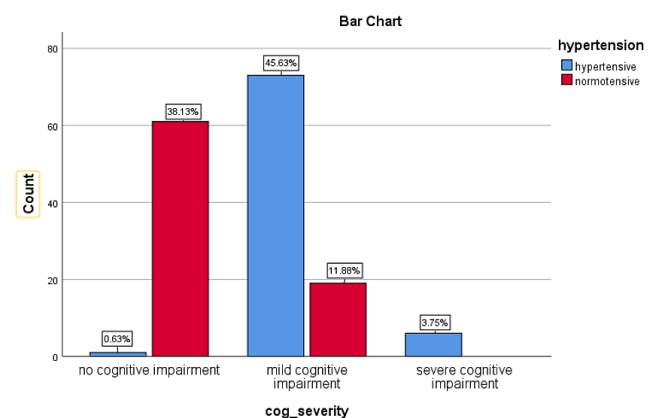
Figure 1: Graph depicting frequency of No, Mild and Severe cognitive Impairment among hypertensives and normotensive participants (N=160)

Memory mistakes or memory failures were seen in all the participants. The highest and lowest scores obtained in the MMQ-Ability questionnaire were 73 and 18 respectively. Table 3 shows the common memory mistakes made by hypertensive and normotensive patients over the past two weeks, among the twenty memory mistakes for which all the participants were evaluated.

Study characteristic	Cognitive Impairment No (%)			Total	p-value
	No (62)	Mild (92)	Severe (6)		
Age					
60-74	48(35.8)	81 (60.4)	5 (3.7)	134	0.215
>75	14 (53.8)	11 (42.3)	1 (3.8)	26	
Gender					
Male	42 (43.8)	51 (53.1)	3 (3.1)	96	0.273
Female	20 (31.3)	41 (64.1)	3 (4.7)	64	
Education status					
Literate	54 (41.5)	71 (54.6)	5 (3.8)	130	0.299
Illiterate	8 (26.7)	21 (70)	1 (3.3)	30	
Marital status					
Married	44 (36.7)	72 (60)	4 (3.3)	120	0.527
Widow/widower	18 (45)	20 (50)	2 (5)	40	
Occupation					
Retired	5 (45.5)	5 (45.5)	1 (9.1)	11	
Farmer	10 (26.3)	28 (73.7)	0 (0)	38	
Shopkeeper/vendor	15 (39.5)	21 (55.3)	2 (5.3)	38	0.117
Daily wage labourer	9 (60)	6 (40)	0	15	
Housewife	6 (23.1)	18 (69.2)	2 (7.7)	26	
Unemployed	17 (53.1)	14 (43.8)	1 (3.1)	32	

Table 1: Socio-demographic characteristics in relation with Severity of Cognitive Impairment, N=160

DISCUSSION

This study showed statistically significant difference between normotensives and hypertensives when seen in relation with different severity grades of cognitive impairment.

In the study by Gambhir et al. [11] the prevalence of dementia was ascertained to be 2.74% which is comparable to our study's prevalence of 3.75%. [12] The cognitive functional status was found to be correlated with age, sex, literacy and nutritional status while no statistically significant difference was found in our study between cognition and age, sex, literacy and nutritional status of the participants. Shaji et al. [12] reported dementia in 3.4 per cent of elderly population in rural population of Kerala, India.

Among literature on dementia from other countries, a community-based study from Northern Italy [13] reported prevalence of 9.8% in elderly more 60 years of age while an epidemiological study from Brazil [14] reported prevalence of 7.1% in elderly age ≥65 years. A population-based study from urban area of Venezuela [15] reported prevalence of

8.04% in people ≥55 years age and the prevalence rate for dementia among elderly people reported from semi-urban area of Sri Lanka [16] was 3.98%.

Jacob et al. [17] (2007) in a study conducted in Vellore, India stated that the differences in information, interview schedules, diagnostic criteria and settings contribute to variation in identification of people with dementia. The assessment of the clinical state is influenced by education, level of baseline function, impairment in current functioning, life style and demands on the person, tolerance of impairment and expectation by relatives and by differences between patients attending hospitals and those living in the community.

Many studies in India and around the world showed association of age, sex, education and BMI with severity of cognitive impairment while no such relation could be ascertained in our study. This could be attributed to the difference in study population and methodology used in different studies. On the other hand, this study showed cognitive impairment to be related to the duration of hypertension and presence of other cardiovascular comorbidities which is also supported

Study characteristic	Cognitive Impairment n (%)			Row Total	*p-value*
	No (62)	Mild (92)	Severe (6)		
Presence of co-morbidity					
Hypertension	1 (1.3)	73 (91.3)	6 (7.5)	80	<0.001
Diabetes	7 (24.1)	20 (69)	2 (6.9)	29	0.158
Heart Disease	1 (8.3)	11 (91.7)	0	12	0.045
CVA	0	6	0	6	-
Asthma	1	0	0	1	-
Behavioural risk factors					
Current tobacco users	21 (32.8)	40 (62.5)	3 (4.7)	64	0.431
Current alcohol users	18 (37.5)	27 (56.3)	3 (2.7)	48	0.55
Body Mass Index					
Underweight (<18.5)	0	0	0	0	
Normal (18.5-22.9)	18 (41.9)	25 (58.1)6	0	43	0.224
Overweight (23-24.9)	28 (37.8)	44 (59.5)	2 (2.7)	74	
Obese (≥25)	16 (37.2)	23 (53.5)	4 (9.3)	43	
Duration Of Hypertension					
0-5 years	0	44 (89.8)	5 (10.2)	49	<0.001
>5 years	62 (55.9)	48 (43.2)	1 (0.9)	111	

Table 2: Disease and behavioural characteristics in relation with Severity of Cognitive Impairment, N=160

by another previous research on this subject.

MEMORY MISTAKES (MMQ-ABILITY)

MMQ questionnaire is still not widely explored in the Indian scenario and hence there was deficiency of literature from India on this domain. Nonetheless, ample evidence is present globally about the use of MMQ in ascertaining memory problems of the elderly as produced by Troyer et al.[18](2019) in their systematic review and meta-analysis on use of MMQ questionnaire for assessment of memory domains throughout various studies across the world. They concluded MMQ to be a valid, reliable, and responsive measure across diverse settings and populations.

In our study significant difference was found between memory mistake scores of hypertensives and normotensives as mentioned in the results. In our study we utilized only the ability scale due to resource-time constraints. The use of full MMQ questionnaire can give deeper insight into the memory related difficulties faced by the elderly.

Interpretation of findings: As this study promptly indicates, hypertension is definitely a huge contributor in the onset or severity of cognitive impairment in the elderly. Hypertension control needs to be emphasised more to the patients and the relationship between dementia and hypertension needs to be included as a topic for health education to the hypertensives. Thus, we can motivate the hypertensives to take better measures in their BP control and treatment-follow up routine.

Limitations of the project: Due to the Covid-19 pandemic, data collection of this project faced a lot of problems and there was difficulty in communicating with the elderly while following the norms for safety applicable during the pandemic. In future such circumstances can be avoided by keeping some flexibility in the methodology regarding how the data will be collected. Such flexibility may include online modes of data collection as well as changing the site of data collection from an unfavourable place to a more suitable place for the interview. As such circumstances were not

Groups	Mistake number	Mistake type
HYPERTENSIVES	MM1	Forget to pay a bill on time.
	MM3	Have trouble remembering a telephone number you just looked up.
	MM4	Not recall the name of someone you just met.
	MM9	In conversation, have difficulty coming up with a specific word that you want.
	MM11	Forget to take medication.
	MM12	Not recall the name of someone you have known for some time.
	MM14	Forget what you were going to say in conversation.
	MM18	Misplace something that you put away a few days ago.
	MM19	Forget to buy something you intended to buy.
	MM20	Forget details about a recent conversation.
NORMOTENSIVES	MM 3	Have trouble remembering a telephone number you just looked up.
	MM 4	Not recall the name of someone you just met.
	MM16	Forget a telephone number you use frequently.
	MM17	Retell a story or joke to the same person because you forgot you already told him.
	MM 20	Forget details about a recent conversation.

Table 3: Common Memory mistakes committed by Hypertensive and Normotensive participants over past two weeks.

adjusted for in the study, this accounts as a limitation for this study. A facility-based study like ours cannot show the true prevalence of cognitive impairment in general population. Community based research should be taken up to determine the same. Regarding MMQ, we utilised only the ability scale while the use of full MMQ questionnaire can give deeper insight into the memory related difficulties faced by the elderly.

CONCLUSION

In this comparative cross-sectional study conducted in medicine OPD patients (age > 60) of a tertiary care hospital in Siddipet, the prevalence of severe cognitive impairment/ dementia was found to be 3.75%.

Dementia and MCI were found to be more common among hypertensives (statistically significant) compared to normotensive participants. Memory mistakes were seen in all the participants in the study in the past two weeks, and more memory mistakes were committed by hypertensives compared to normotensive participants.

This study throws light on the cognitive and memory related problems prevalent in the elderly population. More studies need to be conducted to capture the bigger picture on how these problems affect the elderly in their day-to-day life. In order to tackle these problems regular screening

of elderly patients can be done on OPD basis in order to identify the onset of MCI or dementia early in the course of illness so as to take appropriate measures in sustaining the quality of life of the patients. The family of elderly at risk of dementia should be educated towards dementia related risks and problems, so they can support the patients better in health-care and other decision-making.

Health sector needs to pay more attention to dementia as it largely affects the quality of life of the patients as well as the caregivers. Appropriate care-regimens, financial aids, screening camps and health education are such measures which can change the scenario of the life of a person with risk of dementia. Also, elderly should be motivated to involve themselves in cognitive exercises in order to delay the onset of dementia and other cognitive problems.

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