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Original Research Paper

Medicine

CLINICAL RISK FACTORS ASSOCIATED WITH POST STROKE VASCULAR COGNITIVE IMPAIRMENT

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ABSTRACT

OBJECTIVE: To assess clinical risk factors associated with post stroke vascular cognitive impairment at 6 months post stroke.

METHODOLOGY: This study was conducted in medicine department of Gandhi medical college and Hamidia hospital,Bhopal.It was a prospective observational study.total of 86 patients were included in this study.

RESULTS: In this study ,the frequency of patients having post stroke vascular cognitive impairment (VCI) is 40%.

10% of patients had vascular dementia.30% of the patients had vascular mild cognitive impairment,46% of patients had no vascular cognitive impairment.

CONCLUSION: Post stroke cognitive impairment is very commonthe risk factors of development of vascular cognitive impairment following stroke in this study are lower educational status,hypertension,diabetes mellitus,dyslipidemia,prior stroke,high NIHSS score,high systolic blood pressure,.Better insight into the risk factors mentioned is important for prevention of vascular cognitive impairment.

KEYWORDS :

INTRODUCTION :

Cognitive impairment due to cerebrovascular disease is termed "Vascular Cognitive Impairment" (VCI) and forms a spectrum that includes Vascular Dementia (VaD) and milder forms of cognitive impairment referred to as Vascular Mild Cognitive Impairment (VMCI).[1] While VaD is the second most common cause of dementia, the milder form VMCI is much more common. Nearly half of individuals with VMCI convert to dementia after five years.[2] Vascular cognitive disorders are poised to become the silent epidemic of the 21st century and contribute significantly to mortality, disability, and decreased quality of life.[3]

It is now clear that VCI is not a single entity but represents a complex neurological disorder that occurs as a result of interaction between vascular t risk factors such as hypertension, diabetes, obesity, dyslipidemia, and brain parenchymal changes such as macro and micro infarcts, haemorrhages, white matter changes, and brain atrophy occurring in an ageing brain. Since VCI is amenable to prevention and treatment, there is a pressing need to identify factors that protect or predispose to it.[4]

Post stroke dementia (PSD) has been an emerging field of research over the last decade.[5,10] The frequency of post stroke dementia has been found to be higher than previously expected, stoke increases the risk of dementia 4-10 times.[8-12] Reasons for a stroke patient to become demented are still insufficiently understood. All individuals with stroke do not develop dementia, therefore, it is important to determine the risk factors. Some studies have investigated these risk factors, but there has not been a consensus about them[6,7,8,10]. Demographic, clinical, stroke related, and lesion related radiological factors have been reported to predict dementia in stroke patients.

AIMS & OBJECTIVE :

- This study w3as aimed to study the cognitive functions at 3 months post stroke.
- To determine the clinical, laboratory predictors of post stroke cognitive impairment.
- The search for predictors of cognitive decline would provide useful tools for preventive and therapeutic trials in vascular dementia and vascular cognitive impairment.

MATERIAL AND METHODS

This study was conducted in Medicine Department of Gandhi Medical College and Hamidia Hospital Bhopal.

TYPE OF STUDY

- Prospective observational study

SAMPLE SIZE

- 86 patients.

INCLUSION CRITERIA

- Patients were consecutive acute stroke patients either ischemic or hemorrhagic admitted over a period of 1 year in hamidia hospital.

EXCLUSION CRITERIA

- Patients with aphasia
- Patients with reduced level of consciousness.
- Patients with stroke associated with tumors, trauma ,subarachnoid hemorrhage.
- Patients with transient ischemic attack.
- Patients with severe hearing and visual impairment. ,,
- Previously diagnosed case of Dementia/cognitive impairment, Mental Retardation
- Patients with history of psychosis or other psychiatric and neurological disorder.
- Brain ischemia due to cardiorespiratory arrest.
- History of any neurosurgical operation.
- Patients not willing to participate in study.
- We prospectively evaluated 86 consecutive stroke patients for 6 months after incident stroke for development of VCI. Patients with VCI comprised of those with Vascular mild cognitive impairment(VMCI) and vascular dementia (VaD).
- Methods-A standard protocol was prospectively applied at admission 6 months after stroke; this protocol included clinical, functional, and cognitive assessments, hemogram and serum biochemistry, ECG, Non Contrast CT scan, 2D ECHO, Carotid Doppler and MMSE (mini mental state examination).
- Association International pour Recherche et l'Enseignement en Neurologic (NINDS-AIREN) criteria was used for vascular dementia.
- **Demographic and clinical characteristics** Included are age, sex, educational level (low level of education was defined as less than 10 years of formal education), socioeconomic status, occupation, family history of dementia, smoking habits, hypertension, diabetes mellitus, hypercholesterolemia, atrial

fibrillation [AF], ischemic heart disease [IHD], history of alcohol intake, transient ischemic attacks, prior stroke and any other systemic illness . All patients were subjected to cardiac examination included an electrocardiogram (ECG) and echocardiography of the heart. Clinical features like urinary incontinence, sensory abnormality, gait abnormality, bulbar features, peripheral signs of atherosclerosis and blood pressure were noted. Stroke severity was assessed by the national institute of health stroke scale (NIHSS).

Laboratory Measurement : Included are blood sugar on admissi9on, renal and liver functions and lipogram (serum total cholesterol [TC], tr5iglycerides [TG], low-density lipoprotein cholesterol [LDL-c], high density lipoprotein cholesterol [HDL-c], complete blood picture.

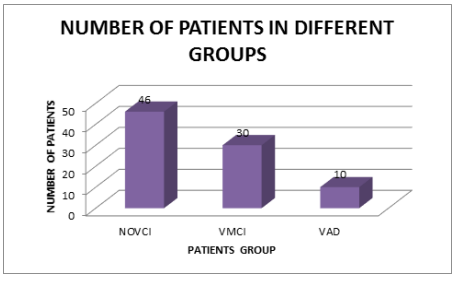
Cognitive assessment

Higher mental functions were clinically evaluated, for which Mini-Mental State Examination (MMSE), a widely used scale for the screening test for dementia is used. It consists of a variety of questions grouped into seven categories, each representing a different cognitive domain or function (orientation to time, orientation to place, repetition of words, attention, calculation, recall of words, language, visual construction. To determine whether patient had pre-stroke cognitive decline, a reliable proxy accompanying the patient was interviewed, retrospectively as to whether patient exhibited any signs of cognitive impairment in the form of memory impairment, apraxia, aphasia, agnosias, executive dysfunction before stroke and interference with daily activities because of them. Cognitive assessment is again done at follow up after 6 months to study cognitive impairment.

OBSERVATIONS

TABLE : 1
NUMBER OF PATIENTS IN DIFFERENT GROUPS

Patient Group	Frequency	Percent
NOVCI	46	46.0
VMCI	30	30
VAD	10	10
Total	86	86



In this study, the frequency of patient's having post stroke vascular cognitive impairment (VCI) is 54% (54/100)

10% (10/100) of the patients had VaD (Vascular Dementia)

30% (30/100) of the patients had VMCI (Vascular Mild Cognitive Impairment).

46% (46/100) of the patients had No VCI (No Vascular Cognitive Impairment)

TABLE : 2 & 3
DISTRIBUTION OF PATIENTS IN DIFFERENT GROUPS ACCORDING TO SEX

Sex	Patient Group					
	Count	Row N %	Count	Row N %	Count	Row N %
Female	15	40.5%	15	40.5%	7	18.9%
Male	31	49.2$	21	33.3%	11	17.5%

Sex	NOVCI	VCI (VMCI & VaD		Significance		
	Count	Row N %	Count	Row N %	Count	Row N %
Female	15	40.5%	22	59.5%	0.70	0.401
Male	31	49.2%	32	50.8%		

In our study, out of 86 patient there are 60 males and 26 females.

Although the VCI (Vascular cognitive impairment) occurred more frequently in females, the difference was not statistically significant.

In our study mean age of patient having no vascular cognitive impairment is 62+5 years.

Mean age of patients having mild vascular cognitive impairment is 65+6 years.

Mean age of the patients having vascular cognitive impairment (VCI) is more than patients having no cognitive impairment, though thje difference is not statistically significant.

TABLE : 5 & 6
SOCIO-ECONOMIC STATUS AND LOW EDUCATION LEVEL IN DIFFERENT GROUP

	Patient Group					
	Count	Row N %	Count	Row N %	Count	Row N %
Low Education	Absent	24	58.5%	12	29.3%	5	12.2%
	Present	22	37.3%	24	40.7%	13	22.0%
Socio Economic Status	Low	26	41.9%	23	37.1%	13	21.0%
	Middle	20	52.6%	13	34.2%	5	13.2%

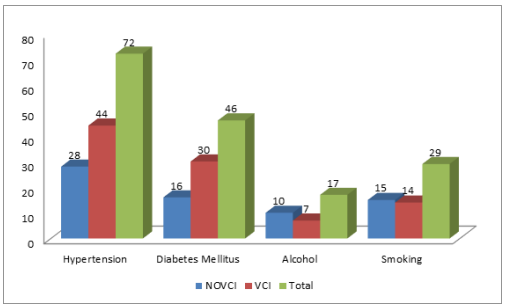
In our study, patients with vascular cognitive impairment (VCI) had significantly lower educational status (p=0.036) in terms of years of formal education, as compared to those who did not develop vascular cognitive impairment (VCI).

TABLE : 8

	VCI				Significance		
	NOVCI		VCI				
	Count RowN %	Row N %	Count	Row N %	Chi Square	P Value	
Hypertension	Absent	18	64.3	10	35.7	5.23	0.002
	Present	28	38.9	44	61.1		
Diabetes Mellitus	Absent	30	55.6	24	44.4	4.32	0.038
	Present	16	34.8	30	65.2		
Alcohol	Absent	36	43.4	47	56.6	1.36	0.224
	Present	10	58.8	7	41.2		
Smoking	Absent	31	43.7	40	56.3	0.54	0.463
	Present	15	51.7	14	48.3		
Tobacco Chewer	Absent	31	47.7	34	52.3	0.21	0.644
	Present	15	42.9	20	57.1		
Ischemic Heart Disease	Absent	42	48.3	45	51.7	1.40	0.237
	Present	4	30.8	9	69.2		
Dyslipidemia	Absent	31	55.4	25	44.6	4.48	0.034
	Present	15	34.1	29	65.9		
Prior Stroke	Absent	38	52.1	35	47.9	3.99	0.046
	Present	8	29.6	19	70.4		
Family H/o Dementia	Absent	43	47.3	48	52.7	0.64	0.424
	Present	3	33.3	6	66.7		

Amongst the various risk factors hypertension, diabetes mellitus, prior stroke, dyslipidemia, ischemic heart disease, tobacco chewing, smoking and family history of dementia were more frequently seen in VCI (vascular cognitive impairment) group than NO-VCI group. However only Hypertension (P=0.022), diabetes mellitus (P=0.038), dyslipidemia (P=0.034) were significantly associated with development of vascular cognitive impairment.

GRAPH SHOWING RISK FACTOR PROFILE BEWEEN PATIENT'S HAVING NO-VCI AND VCI



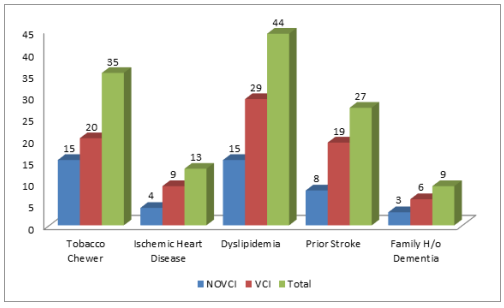


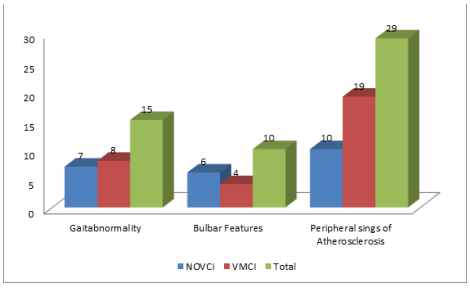
TABLE : 9

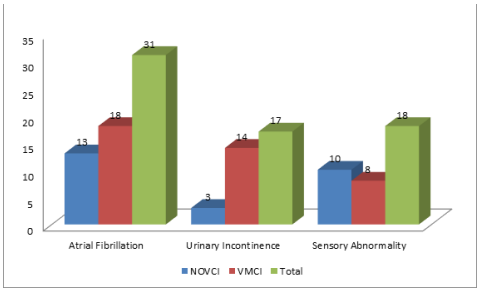
	NOVCI	VCI	Significance			
	Mean	Standard Deviation	Mean	Standard Deviation	T Test	P Value
Systolic BOP	148	28	158	29	1.96	0.049
Diastolic BP	83	9	88	16	1.58	0.117
MIHSS	5	2	7	3	3.55	0.0006

In this study, after statistical analysis the clinical parameters which were significantly associated with development of vascular cognitive impairment are urinary incontinence (p=0.01), systolic blood pressure (p=0.049), and baseline stroke severity score (p=0.001).

Though the clinical parameters like gait abnormality, peripheral signs of atherosclerosis and atrial fibrillation are more frequently found in VCI group but the difference was not statistically significant.

GRAPHS CLINICAL PARAMETERS IN DIFFERENT GROUPS





On statistical analysis, out of various demographic parameters, clinical parameters, laboratory parameters, risk factor profile and features, noen of them was significantly differ in two groups.

DISCUSSION

Cognitive impairment is commonly seen after stroke. It significantly adds to stroke morbidity besides physical disabilities caused by stroke itself, ultimately resulting in poor functional outcome over a period of time. Vast research has been done on post-stoke cognitive dysfunction, most of the data being from the developed countries with relatively scarce data from developing countries like ours.

In the present study, the frequency of VaD was 10% whereas that of VMCI was 30%. Most of the studies done previously had focussed on VaD [253-255] with little emphasis on VMCI (mild cognitive impairment} [256-257] which may be considered as a prodromal phase of VaD. Most of these studies revealed similar rates of post stroke dementia, Khedr et al.[253] reporting a rate of 21% in a study of 81 patients at 6 months and Sachdev et al.[257] reporting a rate of 21.3% in individuals aged 50-85 years at 3-6 months after the incident stroke,

In the present series, patients who developed VCI had lower educational status and belonged to low socio-economic status as compared to patients who did not develop VCI. This emphasizes the fact that those with lower level of education are more vulnerable to develop cognitive impairment after stroke probably due to the fact that those with higher level of education have more cognitive reserve thus increasing the threshold of clinically manifested cognitive dysfunction

Patients in VCI group were older than those in No-VCI group, although this difference was not significant.

In this series, patients who developed VCI were more likely to have diabetes mellitus, hypertension, prior stroke, urinary incontinence, abnormal ecg, and high systolic blood pressure, LDL levels and more NIHSS score on admission. Khedr et al.[253] revealed that hypertension, atrial fibrillation, ischemic heart disease, and family history of dementia were significantly associated with post stroke dementia. Hebert et al.[262] found that diabetes, hypertension in females, and presence of apolipoprotein E were found to be associated with vascular dementia as compared to control. Pohjasvaara et al.[258] found that total cholesterol, dysphasia, gait impairment, urinary incontinence were significantly associated with post stroke dementia.

The risk factors predispose the individuals to develop VCI by increasing the risk of stroke itself and recurrent strokes leads to cumulative cognitive dysfunction ultimately leading to VaD. So the more the risk factors, the more is the risk of developing recurrent strokes and hence the chances of developing VCI. Hyperglycemia during the acute phase of stroke may be stress related or may be due to preexisting diabetes. It may exacerbate the cellular damage in metabolically challenged tissue i.e. penumbra. It does so by inducing lactic acidosis as a result of anaerobic metabolism and by producing free redicals.

On statistical analysis, the parameters which were significantly associated with low level of education (<10 years of formal education), hypertension, diabetes mellitus. dyslipidemia, prior stroke, urinary incontinence, abnormal ecg, higher LDL level, higher systolic blood pressure.

This study had several limitation. First, we excluded a fair number of patients for various reasons. This could have led to underestimation of the prevalence of post stroke cognitive dysfunction. Secondly, follow-up duration in this study was limited to 6 months. Studies have revealed that cognitive impairment may improve over a period of time, hence, longer follow-up with larger homogenous study population is required to study the evolution of post-stroke cognitive impairment. Thirdly we used CT scan for neuroimaging

whereas MRI is more sensitive than CT.

SUMMARY & CONCLUSION

This study was aimed to study the cognitive functions at 6 months post stroke and to determine the clinical, neuro-imaging, laboratory predictors of post stroke cognitive impairment.

This was a prospective observational study condbfted in department of Medicine, Gandhi medical college and Hamidia hospital Bhopal for a duration of 1 year and following observations were made:

1. In this study the frequency of patient's having post stroke vascular cognitive impairment (VCI) is 40% (40/100). 10 (10/100) of the patients had VaD (vascular dementia), 20 & (20/100) of the patients had VMCI (vascular mild cognitive impairment), 46 % (46/100) of the patients had NO VCI (no vascular cognitive impairment).
2. There was no gender preponderance in both the groups.
3. In our study mean age of patients having no vascular cognitive impairment is 62±5 years. Mean age of patients having mild vascular cognitive impairment Is 63±6 years and Mean age of patients having vascular dementia (VaD) is 65 ± 6 years.
4. In this study 62% of the patient's belongs to low socioeconomic status and 38% of the patient's belongs to middle socioeconomic status.
5. In our study, patients with vascular cognitive' impairment (VCI) had significantly lower educational status (p-0.036), as compared to those who did not develop vascular cognitive impairment (VCI).
6. There was significant association of risk factors like Hypertension (p=0.022) diabetes mellitus (p=0.038), dyslipidemia (p=0.034), prior stroke (p=0.046) with development of Vascular cognitive impairment.
7. In this study, though the risk factors like ischemic heart disease, tobacco chewing, smoking and family history of dementia were more frequently seen in VCI (vascular cognitive impairment) group than NO-VCI group the difference is not significant.
8. In this study, the clinical parameters which were significantly associated with development of vascular cognitive impairment are urinary* incontinence (p=0.01), systolic blood pressure (p-0.049), and baseline stroke severity score (p=<0.001).
9. The clinical parameters like gait abnormality, peripheral signs of atherosclerosis and atrial fibrillation are more frequently found in VCI group but the difference was not statistically significant.
10. The laboratory parameter which is significantly associated with Vascular cognitive impairment is high LDL level (p =0.041).
11. The parmeters like high blood sugar on admission, high triglyceride level, high cholesterol level were frequently found in vascular cognitive impairment group but are not statistically significant.
12. Out of various demographic parameters, clinical parameters, laboratory parameters, risk factor profile and none of them was significantly differ in VMCI (vascular mild cognitive impairment) and VaD (vascular dementia)group.

CONCLUSION

To conclude, post-stroke cognitive impairment is commonly seen and is associated with considerable morbidity and poor functional outcome. Both ischemic and hemorrhagic strokes may result in cognitive impairment. The predictors of development of vascular cognitive impairment following stroke in this study are lower educational status, Hypertension, Diabetes Mellitus, Dyslipidemia, Prior stroke, Urinary incontinence. High systolic blood pressure, NIHSS score, LDL level, abnormal ECG, strategic site lesion and greater severity of age related white matter changes. Better insight into the risk factors for post stroke cognitive impairment may provide preventive an therapeutic opportunities for Vascular cognitive impairment.

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