Original Research Article

Clinical profile of cerebrovascular accident patients with special reference to serum homocysteine level

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Abstract

Background: Cerebrovascular accident (CVA) remains a major cause of morbidity and mortality worldwide. There is growing evidence that high homocysteine level contribute to the pathogenesis of ischemic stroke. High hohmocysteine levels are associated with increased risk of cardiovascular and cerebrovascular disease, although there are few studies that show no increase in risk, and there is still debate as to the strength and validity of the association. This study has been undertaken to correlate the serum homocysteine level in patients of cerebrovascular accident.

Materials and methods: This study comprised of 100 patients of cerebrovascular accident admitted with acute onset of neurological deficit which are radiologically diagnosed. The diagnosis of cerebrovascular accident was made on the basis of history and clinical examination. We did CBC with ESR, renal function test, liver function test, serum homocysteine level, RBS, Fasting lipid profile, vitamin B12, urine routine analysis, HIV, CT scan Brain/ MRI Brain, ECG, 2D ECHO, Carotid Doppler if required, ANA / RA factor and any specific investigation if indicated.

Results: Highest no of patients were in 5th and 6th decades of life with highest mean serum homocysteine level. Males were more affected with CVA than females and the mean serum homocysteine level was also higher in males. Urban population has higher homocysteine level than rural. Most common presenting symptom of CVA in the present study was hemiplegia. Convulsion was more associated with hemorrhagic CVA rather than ischemic CVA. Hypertension is one of the major risk factors for CVA. The mean homocysteine was higher in vegetarian population. Out of 72 patients having raised S. homocysteine level, 38 patients had vitamin B12 deficiency.

Conclusion: Hyperhomocysteinemia is an independent risk factor for CVA. Urban lifestyle is associated with higher incidence of CVA and higher homocysteine level. Homocysteine estimation should be included as a routine laboratory test for persons with cerebrovascular risk factors. Plasma vitamin B12 concentration is inversely associated with s. homocysteine concentration. Treatment of hyperhomocysteinemia with vitamin B12 supplements will reduce homocysteine level and ultimately reduce risk of CVA.

Key words

Homocysteine, Cerebrovascular accident, Hemiplegia, Dyslipidemia, Hypertension, Urban and rural population.

Introduction

Cerebrovascular accident is defined as an abrupt onset of a neurological deficit that is attributable to a focal vascular cause [1, 2]. Cerebrovascular accident remains a major cause of morbidity and mortality worldwide [3]. Cerebrovascular disease includes ischemic stroke and hemorrhagic stroke. Risk factors for CVA are divided into modifiable and non-modifiable risk factors. Non modifiable risk factors include age, sex, ethnicity and geography, family history of stroke [4]. Modifiable risk factors are smoking, alcohol consumption, drug abuse, arterial hypertension, diabetes mellitus, dyslipidemia, heart disease and hyperhomocysteinemia [5, 6]. Effective risk factor reduction offers a real hope of reducing stroke morbidity and mortality. There is growing evidence that high homocysteine level contribute to the pathogenesis of ischemic stroke [6]. Homocysteine is believed to cause atherogenesis and thrombogenesis via endothelial damage, vascular smooth muscle proliferation, and coagulation abnormalities. High homocysteine levels are associated with increased risk of cardiovascular and cerebrovascular disease, although there are few studies that show no increase in risk, and there is still debate as to the strength and validity of the association [7]. Various studies are currently assessing the role of homocysteine as an independent risk factor in cerebrovascular accident patients and its possible implication in prevention. This study has been undertaken to correlate the serum homocysteine level in patients of cerebrovascular accident.

Materials and methods

This study comprised of 100 patients of cerebrovascular accident admitted at Civil Hospital, Asarwa, Ahmedabad from September 2017 to November 2018.

Inclusion criteria
- Patients admitted in medical ward with acute onset of neurological deficit.
- Patient's age >15 years.
- Radiologically diagnosed cases of cerebrovascular accident, referred from other health care center.

Exclusion criteria
- Patients with history of head injury.
- Patients with evidence of tumor or infection of brain and meninges.
- Patients with neurological deficit solely due to postictal state.
- Pregnant patients.

The diagnosis of cerebrovascular accident was made on the basis of history and clinical examination. A detailed history was taken in form of age, sex, onset of symptoms, co-morbidities like hypertension, diabetes, family history, drug history and history of addiction like tobacco, smoking and alcohol. Clinical evaluation was done with special emphasis on the following points.
- Vitals: temperature, pulse, blood pressure in both arms.
- All the peripheral vessels of the patients were examined for the evidence of atherosclerosis: Weak pulses or Peripheral bruits.

- For evidence of hyperlipidemia, patients were examined for the presence of xanthoma, corneal arcus, xanthelesma.
- A thorough clinical examination (general and systemic) with special attention to central nervous system.
- Fundus examination for evidence of hypertension and diabetic retinopathy.
- Glasgow coma scale with other parameter for day to day clinical evaluation.

We did Complete hemogram with ESR, renal function test, liver function test, serum homocysteine level, RBS, Fasting lipid profile, vitamin B12, urine routine analysis, HIV, CT scan Brain/ MRI Brain, ECG, 2D ECHO, Carotid Doppler if required, ANA/ RA factor and any specific investigation if indicated.

Results

This study comprised of 100 patients of cerebrovascular accident admitted at Civil Hospital, Asarwa, Ahmedabad from September 2017 to November 2018. Results were depicted as per **Table – 1 to 16** and compare with various studies [8-15].

Table - 1: Distribution of CVA patients according to age.

Age(year)	No. of patients (n=100)	Percentage of patients (%)
<40	19	19%
41-50	15	15%
51-60	21	21%
61-70	27	27%
>70	18	18%
Total	100	100%

Table - 2: Comparison of age group with other studies.

Age (year)	Present study Percentage of patients (%) (n=100)	Seema Mahant, et al. [8] Percentage of patients (%) (n=101)	A.P.S. Tomar, et al. [9] Patients (%) (n=100)
<40	19%	18.75%	13%
41-50	15%	9.9%	20%
51-60	21%	27.72%	27%
61-70	27%	28.71%	28%
>70	18%	18.81%	12%

Table - 3: Correlation between age and homocysteine level in CVA patients.

Age (year)	S. Homocysteine level (µmol/L)				
	<15 Normal	16-30 Mildly elevated	31-100 Moderately elevated	>100 Severely elevated	Total
<40	5	9	5	0	19
41-50	2	8	5	0	15
51-60	9	8	4	0	21
61-70	8	7	11	1	27
>70	4	7	6	1	18
Total	28	39	31	2	100

Table - 4: Sex wise distribution of cases.

Sex	No. of cases (n=100)	Percentage
Male	58	58%
Female	42	42%

Table - 5: Relation between sex and serum homocysteine level.

Sex	Percentage of patient (%)	Mean S. homocysteine (µmol/L)
Male	58	29.08
Female	42	28.04

Table - 6: Comparison of sex distribution with other studies.

Sex	Present study		Seema Mahant, et al. [8]		Zolianthanga, et al. [10]	
	No. of cases (n = 100) (%)	Mean S. homocysteine level (µmol/L)	No. of cases (n = 101) (%)	Mean S. homocysteine level (µmol/L)	No. of cases (n = 93) (%)	Mean s. homocysteine level (µmol/L)
Male	58(58%)	29.08	56(55.44%)	30.44	64(68.81%)	15.64
Female	42(42%)	28.04	45(44.55%)	28.14	29(31.18%)	14.62

Table - 7: Case distribution according to area of residence.

Area of residence	Percentage of cases (%)	Mean S. homocysteine (µmol/L)	Mean S. homocysteine (µmol/L) Yagnik, et al. study [11]
Urban	61%	34.18	23.7µmol/L
Rural	39%	19.99	14.6µmol/L

Table - 8: Symptoms wise distribution of cases.

Symptoms	No. of cases (n=100)	Percentage (%)
Hemiplegia	90	90%
Headache	30	30%
Altered sensorium	23	23%
Slurring of speech	22	22%
Convulsion	21	21%
Facial weakness	18	18%
Vomiting	17	17%
Aphasia	6	6%
Unconsciousness	5	5%
Difficulty in swallowing	5	5%

Table - 9: Comparison of symptoms with other study.

Symptoms	Present study. No. of cases (n=100)	Dr. Praveen Kumar, et al. [12] percentage of cases (n=200)
Hemiplegia	90%	47%
Headache	30%	5%
Altered sensorium	23%	14%
Slurring of speech	22%	17%
Convulsion	21%	5%
Vomiting	17%	6%

Discussion

This study comprised of 100 patients of cerebrovascular accident admitted at civil hospital, Asarva, Ahmedabad from September 2017 to October 2018. Highest no of patients were in 5th and 6th decades of life. This indicates that with increasing age, risk of CVA also increases. Young stroke (<40 years) comprised of 19%. Highest mean serum homocysteine level was seen in the age group 61-70 years. Higher S. homocysteine (>100 µmol/L) level was reported in patients above 60 year of age, which suggests that homocysteine level increases with advancing age. Males (58%) were more affected with CVA than females (42%), with male to female ratio

1.38:1. Male preponderance of male sex may be due to associated risk factors in male like smoking and alcoholism. The mean serum homocysteine level was also higher in males (29.08 µmol/L) than in females (28.04 µmol/L), but this difference was insignificant. Out of 100 patients, 72 patients had raised S. homocysteine level, which shows that serum homocysteine is one of the major risk factors for CVA. 61% patients were from urban area and 39% patients were from rural area, which shows that urban lifestyle has major impact on incidence of CVA and there was significant difference in mean homocysteine levels of urban (34.18 µmol/L) and rural (19.99 µmol/L) population.

Table - 10: Comparison of frequency of risk factor with other studies.

Risk factors	Present study percentage of patients (n=100)	Lakshmikumar MT, et al. [13] percentage of patients (n=100)	Mukesh babu, et al. [14] percentage of patients (n=50)
Hypertension	76%	70%	60%
Dyslipidemia	46%	31%	20%
Smoking	27%	35%	60%
Diabetes	21%	39%	32%
Alcohol addiction	16%	27%	40%
Ischemic heart disease	13%	17%	16%
Old CVA	8%	6%	-
Valvular heart disease	3%	-	-

Table - 11: Association of risk factors with mean S. homocysteine level.

Risk factor	Percentage of cases	Mean S. homocysteine (µmol/L)
Hypertension	76%	28.94
Dyslipidemia	46%	34.25
Smoking	27%	35.00
Diabetes mellitus type 2	21%	29.18
Alcohol addiction	16%	32.08
Ischemic heart disease	13%	26.48
Old CVA	8%	30.6
Valvular heart disease	3%	18.9

Table - 12: Level of S. Homocysteine in vegetarian and non-vegetarian.

Diet	No of patients (n=100)	Mean S. homocysteine level (µmol/L)
Vegetarian	62	35.9
Mixed diet	38	16.78

Table - 13: Association of vitamin B12 level and serum Homocysteine level.

S. homocysteine (µmol/L) (normal: <15 µmol/L)	S. vitamin B12 (pg/dl) (normal: 187- 996 pg/dl)		
	<83 (severe deficiency)	83-187	>187 (normal)
<15	0	5	23
16-30	1	16	22
30-100	6	13	12
>100	1	1	0
Total	8	35	57

Most common presenting symptom of CVA in the present study was hemiplegia, followed by headache, altered sensorium, slurring of speech, convulsion, facial weakness, vomiting. Convulsion was more associated with hemorrhagic CVA rather than ischemic CVA.

Hypertension is one of the major risk factors for CVA, second most common risk factor was dyslipidemia followed by smoking, diabetes mellitus type 2, alcohol addiction, ischemic heart disease, old CVA, valvular heart disease. In this study, S. homocysteine level was highest in smokers, followed by patients having dyslipidemia, alcohol addiction, old CVA, diabetic patients, hypertensive patients, ischemic heart disease patients. The mean homocysteine was higher in vegetarian population.

Table - 14: Comparison of association of vitamin B12 and S. homocysteine level with other study.

Vitamin B12 level (pg/dl)	Present study		Wadia R, et al. study [15]	
	serum homocysteine (µmol/L) >15 (n=72)	Percentage of patients	Serum homocysteine (µmol/L) >15 (n=370)	Percentage of patients
<187	38	52.7%	213	57.56%

Table - 15: Distribution of cases according to etiology of CVA and comparison with other studies.

Etiology	Male (present study)	Female (present study)	Total (n=100) Patients (%) (present study)	A.P.S. Tomar, et al. [9] (n=100) patients (%)	Dr. Praveen Kumar, et al. [12] (n=100) patients (%)
Ischemic CVA	42	27	69%	68%	77%
Hemorrhagic CVA	16	15	31%	32%	23%

Table - 16: Comparison of mean serum homocysteine level in patient with other study.

Etiology	Present study			Seema Mahant, et al. study [8]		
	Total no of patients (n=100)	Percentage of patients	Mean s. homocysteine level (µmol/L)	Total no of patients (n=25)	Percentage of patients	Mean s. homocysteine level (µmol/L)
Ischemic stroke	69	69%	26.29	16	64%	48.60
Hemorrhagic stroke	31	31%	33.87	9	36%	58.92

Out of 72 patients having raised S. homocysteine level, 38 patients had vitamin B12 deficiency. This result suggests that low vitamin B12 level may be one of the cause of high S. homocysteine level. Supplementation of vitamin B12 in patients having risk factor for CVA will reduce the level of homocysteine and ultimately reduce the risk of CVA. 69 patients had ischemic stroke, 31 patients had hemorrhagic stroke. Out of the different types of CVA, hemorrhagic stroke patients had higher S. homocysteine than ischemic stroke patients.

Conclusion

Cerebrovascular accidents are major cause of morbidity and mortality. Ischemic CVA is more common than hemorrhagic CVA. Advancing age and male sex are non-modifiable risk factors for CVA and are associated with higher serum homocysteine level. Hypertension, dyslipidemia and diabetes mellitus 2, smoking are major risk factors for CVA. Hyperhomocysteinemia is an independent risk factor for CVA. Urban lifestyle is associated with higher incidence of CVA and higher homocysteine level. So, urban population with risk factors for CVA should be screened for homocysteine level. Most common presenting symptom in cases of CVA is hemiplegia followed by headache. Convulsion is more common in hemorrhagic CVA. Homocysteine estimation should be included as a routine laboratory test for persons with cerebrovascular risk factors. Strict control of hyperhomocysteinemia, blood pressure, blood glucose, hyperlipidemia and cessation of smoking are recommended for prevention of CVA. Plasma vitamin B12 concentration is inversely associated with s. homocysteine

concentration. Treatment of hyperhomocysteinemia with vitamin B12 supplements will reduce homocysteine level and ultimately reduce risk of CVA. Public awareness of risk factors and their management may lead to primary prevention of CVA.

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