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ORIGINAL RESEARCH

Assessment of D-dimer levels in stroke patients

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Abstract

Background: Long term complications and adverse effects associated with stroke are one of the important leading causes of mortality and morbidity in the world as well as in India. The present study was conducted to assess D-dimer levels in stroke patients.

Materials & Methods:100 patients of stroke were selected. Detailed history regarding smoking, alcoholism etc. were taken.Venous sampling for quantitative measurement of D-dimer was taken at the time of admission. Values less than 500ng/ml was considered normal and values equal or more than 500ng/ml were taken as raised D-dimer level.Stroke severity was assessed on admission using the National Institutes of Health Stroke Scale.

Results: Out of 87 cases of raised D-dimer level, most of the patients were in age group of 51-60 years with 35.63% (35) followed by 41-50 years with 31.03% (27). There was a positive correlation between the age and D-dimer was seen (p=0.004). Out of 5 patients with normal D-dimer, 38.46% were smokers and with raised D- dimer level 73.5% were smokers. Out of 13 patients with normal D-dimer, 7.69% (1) were alcoholic and 92.3% (12) were non-alcoholic, and out of 87 patients with raised D-dimer, 19.54% (17) were alcoholic and 80.46% (70) were non-alcoholic. Out of the 87 patients who presented with raised levels of D-dimer 42.53% (37) reported with severe stroke with NIHSS score 21-42 followed by 29.88% (26) with moderate to severe stroke with NIHSS score 16-20, and 25.28% (22) had score in the range of 5-15 that is moderate score. In this study NIHSS score was higher with raised level of D-dimer. There was a significant correlation of NIHSS score with D-dimer level (p value<0.0001).

Conclusion: D-dimer values in stroke constitutes an important parameter in the evaluation of stroke specially its severity.

Key words:D-dimer, Stroke, severity

Introduction

The world health organisation defined stroke as a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal neurological deficit and at times global loss of cerebral function, lasting for more than 24 hour or leading to death with no apparent causes other than of vascular origin.[1]

Long term complications and adverse effects associated with stroke are one of the important leading causes of mortality and morbidity in the world as well as in India. A remarkable demographic and socioeconomic changes in the recent years in India, resulting in transition

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from a nutritional deficiency and poverty-related infectious diseases toward lifestyle-related cardiovascular and cerebrovascular diseases.[2]

High blood pressure, uncontrolled diabetes, dyslipidaemia, smoking and alcoholism are the most important and significant risk factor associated with occurrence of stroke.[3] All these risk factors are also related to poor prognosis after stroke.D-dimer is a soluble fibrin degradation final product and derived from the cross-linked fibrin network as it undergoes plasmin-mediated degradation.[4]The plasma D-dimer level increases during blood thrombosis and degradation of fibrin, therefore plasma D-dimer could be a biological marker of haemostatic abnormalities and thrombosis. Elevated plasma D-dimer levels are reportedly a determinant of stroke progression, infarction volume and the incidence of stroke in cases of acute ischemic stroke, while considered as not a risk factor in cases of haemorrhagic stroke.[5] Recently, many studies have investigated whether plasma D-dimer levels are determinant of poor functional outcomes after acute ischemic stroke, however, the conclusions of the studies were controversial.[6,7]The present study was conducted to assess D-dimer levels in stroke patients.

Materials & Methods

This study was carried out in the department of Medicine, in indoor patients of associated group of Hospitals attached to National Capital Region Institute of Medical Sciences, Meerut All the patients who were admitted within 72 hours of experiencing a new focal or global neurological event were considered for inclusion in the study.

Detailed history regarding smoking, alcoholism etc. were taken.Venous sampling for quantitative measurement of D-dimer was taken at the time of admission. Values less than 500ng/ml was considered normal and values equal or more than 500ng/ml were taken as raised D-dimer level.Stroke severity was assessed on admission using the National Institutes of Health Stroke Scale (NIHSS, the NIHSS score with higher values reflect more severe neurological damage). On day one, power was calculated.Size of lesion was provided by NCCT-HEAD in mm.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I: Distribution of patients

Stroke	Male		Female		Total	
	N	%	N	%	N	%
ACI	59	71.95	23	28.05	82	82.00
ICH	6	100.00	0	0.00	6	6.00
PCI	7	58.33	5	41.67	12	12.00
Total	72	72.00	28	28.00	100	100.00

Table I shows that out of 100 patients, males were 72 and females were 28. There were 59 males and 23 females of anterior circulation ischemia (ACI), 6 males of intracerebral haemorrhage (ICH) and 7 males and 5 females of posterior circulation ischemia (PCI).

TableII: D-Dimer levels in different age groups

Age groups	Normal D-Dimer	(%)	Raised D-Dimer	(%)	P-Value
<40 years	3	23.07%	7	8.04%	0.004
41-50 years	1	7.69%	27	31.03%	
51- 60 years	3	23.07%	31	35.63%	
61- 70 years	6	46.15%	9	10.34%	
71- 80 years	0	0%	11	12.64%	

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> 80 years	0	0%	2	2.29%	
Total	13	100%	87	100%	

Table II shows that out of 87 cases of raised D-dimer level, most of the patients were in age group of 51-60 years with 35.63% (35) followed by 41-50 years with 31.03% (27). There was a positive correlation between the age and D-dimer was seen (p=0.004).

TableIII: Association between D-Dimer and smoking

Smoking	Normal D-Dimer	%	Raised D-Dimer	%	P Value
Yes	5	38.46%	64	73.56%	0.020
No	8	61.53%	23	26.43%	
Total	13	100%	87	100%	

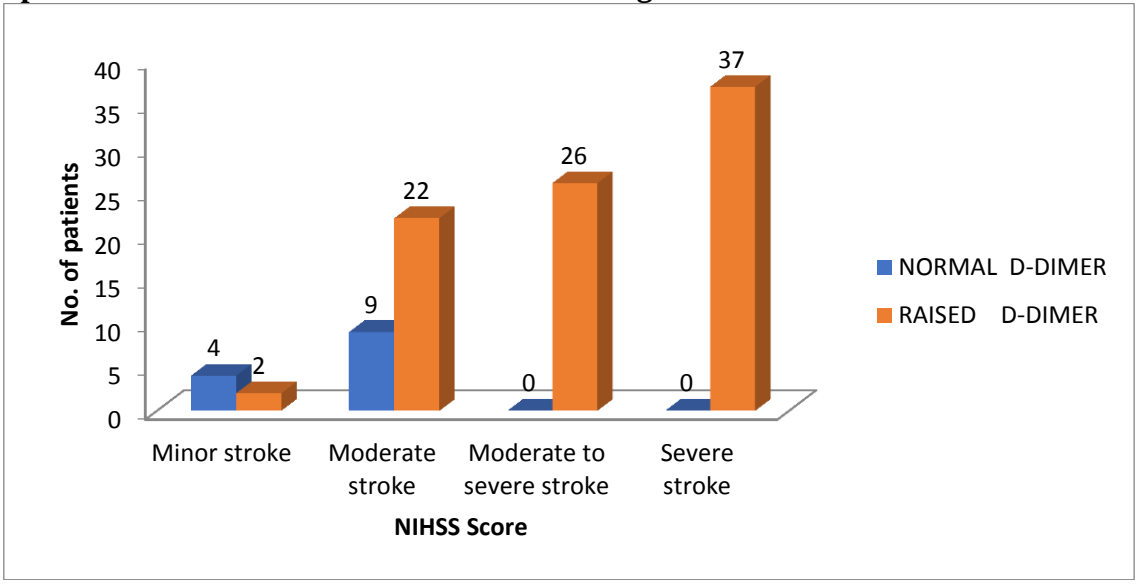
Table III shows that out of 5 patients with normal D-dimer, 38.46% were smokers and with raised D- dimer level 73.5% were smokers.

TableIV: Association between D-Dimerand consumption of alcohol

Alcohol Consumption	Normal D-Dimer	%	Raised D-Dimer	%	P value
Yes	1	7.69%	17	19.54%	0.453
No	12	92.30%	70	80.46%	
Total	13	100%	87	100%	

Table IV shows that out of 13 patients with normal D-dimer, 7.69% (1) were alcoholic and 92.3% (12) were non-alcoholic, and out of 87 patients with raised D-dimer, 19.54% (17) were alcoholic and 80.46% (70) were non-alcoholic.

Graph I: Distribution of D-Dimer levels according to NIHSS- Score



Graph I shows that out of the 87 patients who presented with raised levels of D-dimer 42.53% (37) reported with severe stroke with NIHSS score 21-42 followed by 29.88% (26) with moderate to severe stroke with NIHSS score 16-20, and 25.28% (22) had score in the range of 5-15 that is moderate score. In this study NIHSS score was higher with raised level of D-dimer. There was a significant correlation of NIHSS score with D-dimer level (p value<0.0001).

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Discussion

Stroke is the world's third leading cause of mortality, with high incidence of severe morbidity in surviving victims.[8,9] Rapid evaluation of stroke becomes necessary as to plan early thrombolysis as soon as possible within golden hours of evolution, use of specific brain biomarkers may play a crucial role in the management of stroke.[10,11]This study was conducted on 100 patients admitted in department of medicine at associated group of hospitals attached to National Capital Region Institute of Medical Sciences, Meerut, which were randomly selected over a period of 1 year after applying inclusion and exclusion criteria. This study was planned to see the role of D-dimer and its association with severity and prognostic outcome in acute stroke by using NIHSS score. Clinical history was taken in detail, complete general physical and systemic examination was done, taking comorbidities and risk factors into consideration. D-dimer and NCCT-head were done in all such patients.

In our study we found that maximum number of cases of stroke were of anterior circulation (82), followed by posterior circulation (12) and few cases were of intracranial hemorrhage. We found that out of 87 cases of raised D-dimer level, most of the patients were in age group of 51-60 years with 35.63% (35) followed by 41-50 years with 31.03% (27). There was a positive correlation between the age and D-dimer was seen (p=0.004). Zhang et al[12]showed that elevated D-dimer levels were associated with recurrence on 5-day diffusion-weighted imaging (OR = 2.28, 95% CI = 1.32–3.95), 30-day mRS≥3 (OR = 1.59, 95% CI = 1.37–1.85), 30-day mortality (OR = 1.92, 95% CI = 1.27–2.90) and 90-day mRS≥3 (OR = 1.61, 95% CI = 1.05–2.46). They concluded, for patients with AIS, higher D-dimer level within 24 hours from stroke onset was associated with recurrence on 5-day diffusion-weighted imaging, mortality at 30 days, and poor functional outcome at both 30 days and 90 days. However, more studies are warranted to clarify this issue

We found that out of 5 patients with normal D-dimer, 38.46% were smokers and with raised D- dimer level 73.5% were smokers. We observed that out of 13 patients with normal D-dimer, 7.69% (1) were alcoholic and 92.3% (12) were non-alcoholic, and out of 87 patients with raised D-dimer, 19.54% (17) were alcoholic and 80.46% (70) were non-alcoholic.Park YW et al[13] evaluated that mean D-dimer level at admission was 626.6 µg/L (range, 77-4,752 µg/L) and the mean level measured after seven days of treatment was 238.3 µg/L (range, 50-924 µg/L). Mean D-dimer level at admission was 215.3 µg/L in patients with focal infarctions, 385.7 µg/L in patients with multiple embolic infarctions, 566.2 µg/L in those with 1-19 cc infarctions, 668.8 µg/L in 20-49 cc infarctions, 702.5 µg/L in 50-199 cc infarctions, and 844.0 µg/L in >200 cc infarctions. On the 7th day of treatment, the D-dimer levels had fallen to 201.0 µg/L, 293.2 µg/L, 272.0 µg/L, 232.8 µg/L, 336.6 µg/L, and 180.0 µg/L, respectively. They had shown D-dimer level significantly increases after the onset of an acute ischemic stroke and that the D-dimer level correlates positively with acute ischemic volume. D-dimer can be considered as a valuable marker for predicting infarction volume in acute ischemic strokes and treatment response.

We observed that out of the 87 patients who presented with raised levels of D-dimer 42.53% (37) reported with severe stroke with NIHSS score 21-42 followed by 29.88% (26) with moderate to severe stroke with NIHSS score 16-20, and 25.28% (22) had score in the range of 5-15 that is moderate score. In this study NIHSS score was higher with raised level of D-dimer. There was a significant correlation of NIHSS score with D-dimer level (p value<0.0001). Our results are in agreement with Osman Moussa AL et al.[14]

Conclusion

Authors found that D-dimer values in stroke constitutes an important parameter in the evaluation of stroke specially its severity.

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References

1. Haapaniemi E, Tatlisumak T, Is D-dimer helpful in evaluating stroke patients? A systematic review. ActaNeurolScand 2009, 119(3):141-150.
2. Yao T, Bo-Lin Tian, Gang Li, Qin Cui, Cui-fang Wang, Qi Zhang, Bo Peng, Yan Gao, Yan-QiangZhan, Dan Hu, Lu Xu and Gao-Hua Wang: Elevated plasma D-dimer levels are associated with short-term poor outcome in patients with acute ischemic stroke: a prospective, observational study. BMC Neurology (2019) 19:175.
3. Montaner J, Perea-Gainza, Delgado P, et al (2008): Etiological diagnosis of ischemic stroke subtypes with plasma biomarkers. Stroke, 39:2280 -87.
4. Hinkle J and Guanci M. (2007): Acute ischemic stroke review. J Neuro sciNurs, 39(5):285-93.
5. Rigini M, Goehring C, Bounameaux H, et al., (2000): Effects of age on the performance of common diagnostic tests for pulmonary embolism. Am J Med, 109:357-61.
6. Kataoka S, Hirose G, Hori A, et al., (2000): Activation of thrombosis and fibrinolysis following brain infarction. J NeurolSci, 181:82-8.
7. Li F, Zhang G, Zhao W. (2003): Coagulation and fibrinolytic activity in patients with acute cerebral infarction. Chin Med J (Engl), 116:475-7.
8. Tombul T, Atbas C, Anlar O, (2005): Hemostatic markers and platelet aggregation factors as predictive markers for type of stroke and neurological disability following cerebral infarction. J ClinNeurosci, 12:429-34.
9. Berge E, Friis P and Sandset P. (2001): Hemostatic activation in acute ischemic stroke. Thomb Res; 101:13-21.
10. Ageno W, Finazzi S, Steidl S, et al., 2002. Plasma measurement of D-dimer levels for early diagnosis of ischemic stroke subtypes. Arch Intern Med 162:2589-93.
11. Zi W-J, Shuai J (2014): Plasma D-dimer levels are associated with stroke subtypes and infarction size in patients with acute ischemic stroke. PLoS 86465. doi:10.1371/journal.pone.0086465.
12. Zhang J, Liu L, Tao J, Song Y, Fan Y, et al. (2019) Prognostic role of early D-dimer level in patients with acute ischemic stroke. PLOS ONE 14(2): 0211458.
13. Park YW, Koh EJ, Choi HY. Correlation between Serum D-Dimer Level and Volume in Acute Ischemic Stroke. J Korean Neurosurg Soc. 2011; 50(2):89-94.
14. Osman Moussa AL, Gad Kawasthi H, Fathy Mohammad S, Sobh Mohammed K, Imam Mohammad Loai.: Assessment of ischemic stroke subtypes using D-dimer. AAMJ. 2013; 10(4):295-312.