International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Correlation of Plasma D Dimer Level with Severity of Acute Ischemic Stroke

Saurabh Sethi[1], Vijay Kumar[2], Sunil Pawar[3], Gurpal Singh Sachdeva[4]

[1]Junior Resident, Department of Medicine, Government medical college Patiala
[2]Professor, Department of Medicine, Government medical college Patiala
[3]Assistant Professor Department of Medicine, Government Medical college Patiala
[4]Associate professor, Department of Medicine, Government Medical college

Abstract:
Plasma d dimer are terminal product of fibrin degradation . It is useful biomarker with high sensitivity in detection of stroke as its level is elevated in intravascular clot formation Can be used as biomarker besides radiological imaging in place where radiological intervention are not easily available

Introduction:
Acute stroke is defined as the acute onset of focal neurological findings in a vascular territory as a result of underlying cerebrovascular disease[1]. In india , there are 105-152/100000 new strokes every year[2]. Stroke is the 4th leading cause of death and the fifth leading cause of disability[3]. There are two main types of strokes. The commoner type is an ischemic stroke, caused by interruption of blood flow to a certain area of the brain. Ischemic stroke accounts for 85% of all acute strokes. Rapid diagnosis in patients with suspected acute ischemic stroke is critical for the patient's treatment and prognosis. Radiological confirmation of the diagnosis of acute ischemic stroke is often delayed because computed tomography (CT) results may appear normal in the early stages or in patients with minor symptoms and magnetic resonance imaging (MRI) is not always available in the golden time of treatment. Thus, many eligible cases are delayed in receiving intravenous thrombolysis treatment.
Studies in the past have explored the role of D-Dimer as a helpful indicator in evaluating stroke patients. D-Dimer is considered one of the strongest markers of intravascular protein degradation, ascribed to the action of factor IIa, issue XIIIa, and fibrinolysin.
Fibrin degradation products are produced in a wide variety of molecular weights, including the terminal degradation products of crosslinked fibrin containing D-dimer and fragment E complex .[4] It is uncommon to detect circulating terminal fibrin degradation products (D-dimer–E complex) in human plasma, whereas soluble high-molecular-weight fragments that contain the "D-dimer antigen" are present in patients with DIC and other thrombotic disorders.[5] These fragments may be derived from soluble fibrin before it has been incorporated into a fibrin gel, or alternatively may be derived from high-molecular-weight complexes released from an insoluble clot.
In clinical practice, abnormal D-Dimer plasma levels are used as important predictors of disseminated intravascular clotting, and low levels are often used to rule out critical events such as pulmonary embolism and deep venous thrombosis. The present study assess the role of D-Dimer in acute ischemic stroke and its correlation with severity studies had reported that patients with the various strokes and

stroke-related diseases have acutely increased plasma D-Dimer levels.[6.] The level of D dimer can be used as tool to predict severity of stroke and prognosis

MATERIAL AND METHODS

STUDY TYPE: The study was cross sectional observational study. The study was conducted on 50 diagnosed patients of acute ischemic stroke within 24 hours of onset of symptoms admitted in Rajindra hospital Patiala between September 2020 to January 2023

STUDY POPULATION: Patient with the diagnosis of acute ischemic stroke between age of 40 -80 years.

INCLUSION CRITERIA

All patients in age group of 40 to 80 presenting in first 24 hours of acute ischemic stroke

EXCLUSION CRITERIA

- Sepsis
- Concomitant use of anticoagulants
- Malignancy
- Acute venous thromboembolism
- Recent surgery
- Acute myocardial infarction in preceding 10 days
- Patient with severe hepatic disease (Child Pugh B and C)and renal disease (CKD 3A onwards)
- Patients presenting to hospital after 24 hours of onset of symptoms or with unknown duration of symptoms.

EQUIPMENT METHOD

D-Dimer Assay is based on a latex enhanced immunoturbidimetric assay. D-Dimer proteins in the sample bind to the specific anti-D-Dimer antibody, which is coated on latex particles, and causes agglutination. The degree of the turbidity caused by agglutination can be measured optically and is proportional to the amount of D-Dimer in the sample. D-Dimer Assay is for the quantitative determination of fibrinogen/fibrin degradation products (D-Dimer) in human plasma. Measurement of D-Dimer is used as an aid in detecting the presence of intravascular coagulation and fibrinolysis.

OBSERVATIONS AND RESULTS

The present study was conducted with the objective to correlate the level of plasma d dimer with severity of acute ischemic stroke as defined by NIHSS score. The study is observational study done on 50 patients who were admitted in medicine department Rajendra hospital Patiala within 24 hours of onset of diagnosed acute ischemic stroke .Informed written consent was taken from all the patients and attendants .Patients plasma d dimer was done in biochemistry lab of Rajendra hospital Patiala by latex enhanced immunoturbidimetric assay. The results of observation of individual patient were pooled statistical analysis was performed using SPSS software version 20 Chicago, Illinois, U.S.A .Following observations were seen.

Table 1: Age distributions of patients.

Age group	N=50	%
≤40 years	3	6
41-50 years	6	12
51-60 years	16	32
≥61 years	25	50
Mean±±SD	61.5±11.32	

Table 2: Distribution of cases based on clinical presentation.

Clinical Presentations	N=50	%
Ataxia	6	12
Aphasia	26	52
Dysarthria	31	62
Sensory Loss	35	70
Hemiplegia	46	92

At time of presentation following clinical features were observed .46 patients (92%) had hemiplegia,35 patients (70%) had sensory loss, 31 patients (62%) had dysarthria 26 patients (52%) had aphasia 6 patients (12%) had ataxia.

Table 3: Distribution of cases based on risk factors.

Risk Factors	N=50	%
Hypertension	37	74
Diabetes Mellitus	18	36
Smoking	9	18
Atrial fibrillation	1	2
Alcohol	17	34
Obesity	11	22

Following associated risk factors were seen hypertension in 37 patients (74%), diabetes mellitus in 18 (36%), alcohol in 17 patients (34%), obesity in 11 patients (22%), smoking in 9 patients (18%) an atrial fibrillation in 1 patient (2%).

Table 4: Distribution of cases according to severity of NIHSS score

NIHSS	N=50	%
Mild (0-6)	14	28
Moderate (7-15)	21	42
Severe (≥16)	15	30

Out of 50 patients 21 patients (42%) had moderate NIHSS score ,15 patients (30%) had severe NIHSS score, and 14 patients (28%) has mild NIHSS score.

Table 5: Correlation of mean plasma D -Dimer level with severity of stroke with NIHSS score.

NIHSS	D-dimer	
	Mean	SD
Mild (0-6)	763.50	560.05
Moderate (7-15)	1713.76	1205.72
Severe (≥16)	4336.53	2692.39

The mean value of d dimer in acute stroke with mild NIHSS score (0-6) is 763.5 with SD 560.05 in moderate NIHSS score (7-15) 1713.76 with SD ±1205.72 and with severe NIHSS score 4336.53 with SD±2692.39.

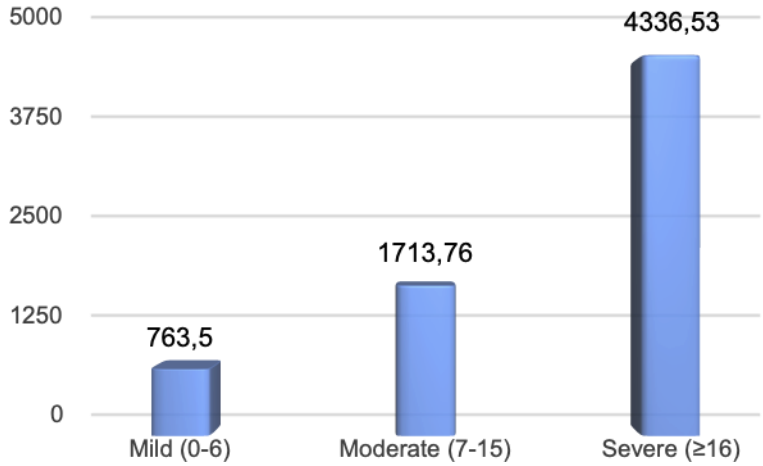


Table 6: Correlation statistics between plasma d dimer level ,NIHSS score and age

	D-dimer	
	R	P
NIHSS	0.735	<0.001
Age	0.310	0.002

The correlation statistics, between plasma d dimer level and NIHSS score revealed significant correlation (r =0.735; p=<0.001)

The correlation plasma d dimer with age revealed (r= 0.310; p=0.002)

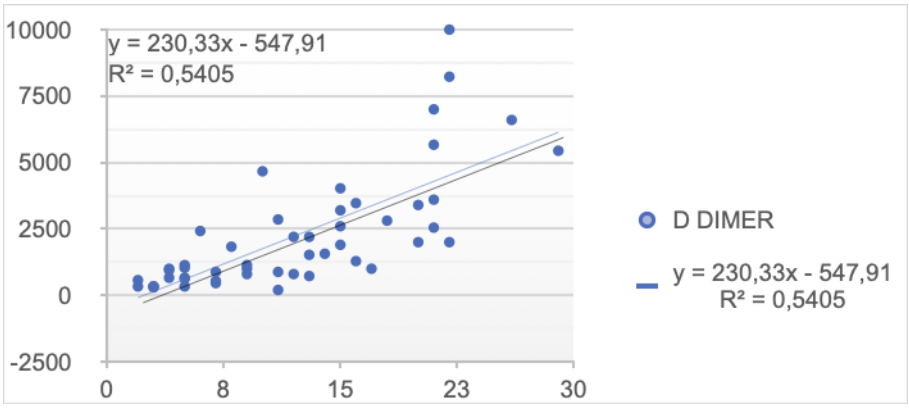


Fig: a

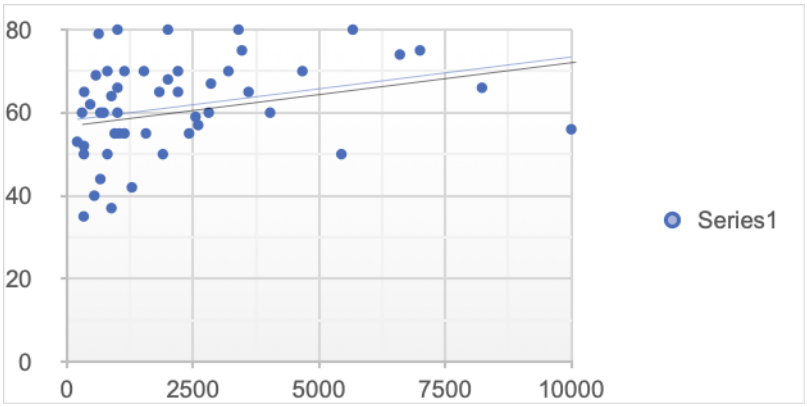
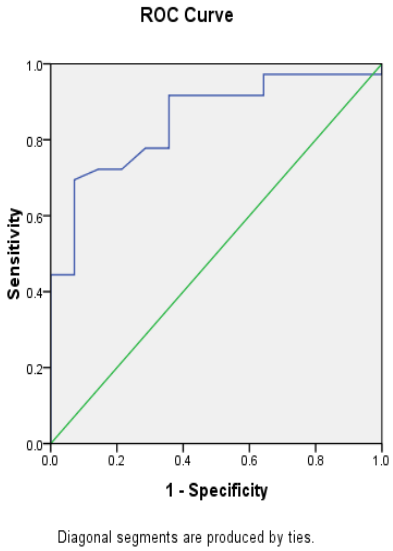


Fig: b

Table 7: Receiver curve operating analysis to find the sensitivity and specificity d-dimer for predicting stroke

AUC	0.852
95 Confidence Interval	0.743-0.962
P-value	<0.0001
cut off	692.5
Sensitivity	91.7
Specificity	64.3



The sensitivity of d dimer level to predict severity of stroke is 91.7 % and specificity of 64.3% respectively.

SUMMARY AND CONCLUSION

A cross sectional observational study was conducted on 50 diagnosed cases of acute ischemic stroke admitted in Rajindra hospital Patiala. The study was aimed to determine level of d dimer in acute ischemic stroke and to study correlation of the plasma d dimer level with severity of acute ischemic stroke. The observations of present study are summarized as follows:

1. The mean age (±SD) of patients was 61.5 ±11.32. The patients were in age group of 40-80 years. The majority of patients 50% belonged to age group of 60-80 years.
2. There were 27 males and 23 female patients indicating a male preponderance of disease. Hence prevalence of ischemic stroke was more in males (54%) as compared to females (44%).
3. The commonest clinical presentation was hemiplegia in 46 patients (92%), 35 patients (70%) had sensory loss, 31 patients (62%) had dysarthria.26 patients (52%) had aphasia and 6 patients (12%) had ataxia.
4. The most common implicated risk factors were hypertension in 37 patients (74%) diabetes mellitus in 18 patients (36%) alcohol in 17 patients (34%), obesity in 11 patients (22%) smoking in 9 patients (18%) atrial fibrillation in 1 patient (2%).
5. The maximum patients of acute ischemic stroke admitted were having moderate NIHSS score(7-15) 21 patients (42%) 15 patients had severe NIHSS score (>16) 30% and 14 patients (28%)had mild NIHSS score.
6. The median of d dimer level of patients admitted with acute ischemic stroke were mild stroke NIHSS (0-6) was 643ng/ml, moderate stroke NIHSS (7-15) was 1524 ng/ml and severe stroke NIHSS score (>16) was 3467ng/ml.
7. The mean d dimer in acute ischemic stroke with mild NIHSS score (0-6) is 763.5 ng/ml with SD± 560.05, in moderate NIHSS (7-15) 1713.76 ng/ml with SD±1205.72 and with severe stroke NIHSS (>16) 4336.5 ng/ml with SD±2692.39.
8. The correlation statistics between plasma D- DIMER level with NIHSS score revealed significant correlation.

9. The sensitivity of d dimer to predict severity of acute ischemic stroke is 91.7% and specificity of 64.3% respectively.

Discussion

The present study showed that plasma d dimer values are significantly elevated with the severity of stroke as per NIHSS score. A similarly significant positive correlation was found between plasma D-dimer and lesion volume in acute ischemic stroke in study conducted by Amina Noor et al .A similar study was conducted by Wen Jie- Zi et al 2014 which showed plasma D-dimer levels increased with increasing severity of stroke as defined by the NIHSS score and infarct volume.[8]

Abd elhamid yousary A et al 2016 shown that plasma D-dimer levels were statistically significantly higher in patients with acute ischemic stroke than in controls. D-dimer level increased with increasing severity of stroke as defined by the NIHSS score and infarct volume, and might be helpful marker in selecting patients for intravenous thrombectomy. In addition, cardioembolic strokes can be distinguished from other stroke etiologies by measuring plasma D-dimer levels very early (within the first 24 h from stroke symptom onset). Moreover, D-dimer circulating level could predict unfavorable outcome when measured early in acute stroke.[9]

Conclusion

There is positive correlation between plasma d dimer level with severity of acute ischemic stroke as defined by NIHSS score.

The sensitivity of predicting severity of stroke is 91% and specificity of 64.3 %. Serum d dimer can be used as a simple biochemistry test a valuable marker to predict severity of stroke .

References

1. Shakir R. The struggle for stroke reclassification. *Nat. Rev. Neurol.* 2018;14:447–448. doi: 10.1038/s41582-018-0036-5
2. Roger V.L., Go A.S., Lloyd-Jones D.M., Adams R.J., Berry J.D. et al. Heart disease and stroke statistics--2011 update: A report from the American Heart Association. *Circulation.* 2011;123: e18–e209.

a. doi: 10.1161/CIR.0b013e3182009701.

3. Collaborators G.S. Global, regional, and national burden of stroke, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet Neurol.* 2019;18:439–458.
4. Ageno W, Finazzi S, Steidl L, et al. Plasma measurement of D-dimer levels for the early diagnosis of ischemic stroke subtypes. *Arch Intern Med.* 2002; **162**(22): 2589- 2593
5. Gaffney PJ. Distinction between fibrinogen and fibrin degradation products in plasma. Clin Chim Acta. 1975 Nov 15;65(1):109-15. doi: 10.1016/0009-8981(75)90341-1. PMID: 1192601.
6. Lane DA, Preston FE, VanRoss ME, Kakkar VV. Characterization of serum fibrinogen and fibrin fragments produced during disseminated intravascular coagulation. Br J Haematol. 1978 Dec;40(4):609-15. doi: 10.1111/j.1365-2141.1978.tb05837.x. PMID: 365218.
7. Noor A, Mustafa H, Ali SA, Noor N, Malik S. THE CORRELATION BETWEEN PLASMA D-DIMER LEVEL AND LESION VOLUME IN ACUTE ISCHEMIC STROKE. Journal of Postgraduate Medical Institute. 2020 Oct 22;34(2).

8. Zi WJ, Shuai J. Plasma D-dimer levels are associated with stroke subtypes and infarction volume in patients with acute ischemic stroke. PloS one. 2014 Jan 20;9(1):e86465
9. Abd-Elhamid YA, Tork MA, Abdulghani MO. Prognostic value of D-dimer measurement in patients with acute ischemic stroke. The Egyptian Journal of Neurology, Psychiatry and Neurosurgery. 2016 Jul 1;53(3):146.