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Research Paper

Assessment of Plasma D-Dimer Level in Patients with Acute Ischemic Stroke

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ABSTRACT:

BACKGROUND:

Stroke is defined as "rapidly clinical symptoms of focal (or global) impairment of brain function, lasting longer than 24 hours or leading to death, with vascular origin " according to the World Health Organization. It has been suggested that elevated circulating D-dimer molecule is formed when plasmin digests the fibrin clot. Values may be associated with acute ischemic stroke (AIS).

OBJECTIVE:

To estimate the level of plasma D-dimer in acute ischemic stroke patients and to study the effect of sociodemographic data on the level of D-dimer.

METHOD:

It's a cross-sectional study of 300 participants of whom 200 were with acute ischemic stroke AIS (patients) and the rest were disease free (control), blood samples were taken in sodium citrate tubes from each participant, and a suitable appropriate kit was used to assess plasma levels of D-dimer after 24 hours after insult. On admission, the National Institutes of Health Stroke Scale (NIHSS) score was assessed without regard to D-dimer levels.

RESULTS:

Age, Diabetes, hypertension, ischemic Heart disease and score of NIHSS (National Institutes of Health Stroke Scale) were statistically significant with D-dimer levels ($p>0.05$)

CONCLUSION:

Older in age, diabetic, Hypertensive, had ischemic heart disease with total anterior cerebral infarction or sever NIHSS was positively associated with higher level of D-dimer.

KEYWORDS: D-dimer, Ischemic Stroke, NIHSS, Ischemic Heart Disease and hypertension

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INTRODUCTION:

Definition

The World Health Organization defines a stroke as "rapidly clinical symptoms of focal (or global) impairment of brain function, lasting longer than 24 hours or leading to death, with vascular origin"[(1)]. Stroke was the second most common cause of death (11.8% of all deaths) and the third most common cause of disability (4.5%) of disability-adjusted life years (DALY) from all causes in 2013, after ischemic heart disease (14.8% of all deaths). The estimated costs of stroke are similar to those of other chronic illnesses with significant consequences, like cancer and cardiovascular disease[(2,3)].

The method that doctors most frequently use to categorize ischemic stroke was developed in the multicenter study known as TOAST (Trial of ORG10172 in Acute Stroke Treatment).

The TOAST categorization system consists of five categories: large artery atherosclerosis, cardiac embolism, lacunose, or obstruction of a minor artery, stroke with unclear etiology, and stroke with unclear etiology are the first five conditions[(4)].

Diagnosis of acute ischemic stroke

A medical history and examination

The primary methods for diagnosing strokes remain to be the history and physical examination. The most typical history of an ischemic stroke is

one of acute onset, and the most common physical symptoms are speech impairment and localized weakness[5,7].

Imaging and Diagnostic Tests

Neuroimaging is used to rule out other types of abnormalities of the central nervous system and to distinguish between hemorrhagic and ischemic stroke in a patient with a suspected ischemic stroke. Contrarily, a CT scan (contrast topography) might not be sensitive enough to detect an ischemic stroke, particularly if it is small, sudden, or happens in the posterior fossa (the region containing the brainstem and cerebellum) [8].

A particular byproduct of fibrin clot breakdown, D-dimer is produced by three enzymes: plasmin, activated factor XIII, and thrombin[9]. One very useful test for identifying conditions linked to blood clots is the measurement of plasma or whole-blood D-dimer. Numerous studies have revealed that during the acute phase of a stroke, D-dimer levels are elevated[10,11]. Therefore, the goal of the current investigation was to assess the diagnostic utility of serum D-dimer in AIS diagnosis in a subset of our patients.

PATIENT AND METHOD:

It's a cross-sectional research in which two hundred patients with acute ischemic stroke had their plasma D-dimer level tested who had symptoms longer than 24 hours after beginning of symptoms and 100 matched controls from Baghdad Medical City and Neuroscience hospital. The research took place between January 2021 and February 2022. During this time, a total of (300) people were recognized.

Data collection:

The questionnaire was based on the WHO procedure for the identification of acute ischemic stroke, which was evaluated and modified to match the demands of this investigation. The questionnaire was created to collect information on demographics such as age, gender and the medical condition of the patient (hypertension, diabetic and cardiac disease). Clinical diagnoses are confirmed by laboratory and radiographic studies.

Qualifications for inclusion:

1. Acute ischemic stroke diagnosis made more than 24 hours by neurological examination under neurologist supervision and neuroimaging (CT/ MRI (magnetic resonance image)) of brain.
2. Age between (18-65 years) and gender (male and female)

Exclusion criteria:

1. Drugs (anticoagulant)
2. Venous thrombosis
3. Severe hepatic diseases and renal disease
4. Malignancy
5. Pregnancy
6. Epileptic seizure activity before admission
7. Collagen disease
8. Infection
9. Rheumatoid disease
10. Anemia or polycythemia

Measurement of plasma D dimer level

In a sodium citrate tube, blood samples were taken from each participant. According to the manufacturer's instructions. A ready-to-use appropriate kit (D-dimer-check-1/Veda) was used to assess plasma d dimer levels. With detection range of 250 to 5000 ng/ml, this assay is a quick quantitative screening test for detecting d dimer in whole blood or plasma. The assay's cut-off value was 360 ng/mL. The result was read using a special device included in the kit[12].

Statistical Analysis:

All data were coded after it was entered by the researcher using SPSS version 26 (Statistical Package for Social Sciences). The following plan was used:

1. The qualitative data were expressed as numbers and percentages.
2. The quantitative data were expressed as mean ±Standard deviation.
2. Chi square test was used to assess the statistical significance among the studied categories.
4. The level of P value equal or less than 0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION:

Stroke is a disease caused by long-term exposure to lifestyle risk factors. The incidence of stroke and even fatality rates should be significantly reduced if such risk factors are changed [13].

Higher D- dimer levels were shown to be associated with ischemic cerebral stroke ($p<0.001$). Ameta-analysis of 22 prospective cohort studies found that high D-dimer levels, in particular, greatly raised the risk by 55%. Another study published in the United States by Zakai et al found a link between D-dimer levels and the risk of stroke[14,15]. Another cohort study in Italy. A centre-stratified sample of 832 patients was compared with 289 strokes in a mean follow-up of nine years using a nested casecohort strategy. Individuals with high D-dimer levels had a much increased chance of having a stroke[16]. The action of coagulase (factor IIa), issue XIIIa, and fibrinolysin is ascribed to the formation of D-

dimer, which is a hallmark of intravascular protein breakdown[17].

The D-dimer assay is one of the most widely used clinical assays for active coagulation and in vivo fibrin production and lysis.

The Presence of ischemic heart disease in favor of higher D-dimer (p =<o.oo1 each), having DM (Diabetes Mellitus) or hypertension were associated with higher D-dimer (p=0.001, 0.046 respectively) as revealed by table 1

Table 1: D-dimer levels Distribution among ischemic patients according to study variables.

Study variables		D dimer				P value
		High		Low		
		No.	%	No.	%	
Ischemic Heart Disease	Yes	77	70.6	39	42.9	<0.001
	No	32	29.4	52	57.1	
Diabetic	Yes	73	67	40	44	0.001
	No	36	33	51	56	
Hypertension	Yes	68	62.4	44	48.4	0.046
	No	41	37.6	47	61.6	
NIHSS Level	Mild-moderate	27	24.8	56	61.5	<0.001
	Moderate-sever	28	25.7	21	23.1	
	Sever	54	49.5	14	15.4	

This research discovered a strong link between older age groups and greater D-dimer levels (p<0.001). This finding is similar to that of a 776 -person American longitudinal rolling cohort study conducted by the National Institute on Aging, which indicated that D-dimer levels rose with age (p<0.0001)[18].

One of our study results was the strong association between higher D-dimer levels with participant having ischemic heart disease (p <0.001), this finding was consistent with several UK studies[19].

NIHSS Level and D-dimer levels were significantly associated in this study (p<0.001) same finding was observed in a Chinese prospective observational study where 240 Chinese patients with AIS, had shown that plasma D-dimer levels increased with increasing severity of stroke as defined by the NIHSS score and infarct volume[20] another study from Japan[21] also in accordance with our finding.

CONCLUSION:

Older in age, diabetic, Hypertensive, had ischemic heart disease with total anterior cerebral infaction or sever NIHSS was positively associated with higher level of D-dimer.

Ethical Clearance:

This study was proved by Institutional Review Board (IRB) by the Iraqi Board for Medical Specializations

Conflict of Interest

The author declares that they have no competing interests.

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