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Serum Troponin in Patients with Acute Ischemic Stroke

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Abstract: Background and Purpose: Elevation of serum cardiac troponin is thought to be a particular indicator of acute coronary syndrome. Is shown to be elevated in acute ischemic stroke patients; nevertheless, its etiology and importance remain debatable. Our study's objective is to determine the connections between high blood troponin levels and the severity and outcome of strokes. **Patients and Method:** The study included 220 patients who were admitted to the Al-Sadder Medical City at Al-Najaf Al-Ashraf within 3 days of the onset of acute ischemic stroke (AIS), as confirmed clinically through a brain computed tomography scan, among June 2023 - June 2024. All patients had blood troponin assay, and they were divided in two categories: those with positive troponin (n = 33) as well as those with negative troponin (n = 187). The severity of the stroke was assessed using the National Institutes in Health Stroke Score, and the patient's survival and death within 14 days of the stroke's onset were recorded. **Results:** only 15% of patients had increased serum troponin, and higher troponin levels were linked to more severe strokes. The group that tested positive for troponin had a worse short-term prognosis than the group that tested negative. In the hospital, 17 patients passed away. Nine patients had negative troponin test results, whereas eight had positive results. **Conclusion:** those with normal (not increased) serum troponin levels and those with acute ischemic stroke who had high serum troponin levels experienced poorer outcomes (death within 2 weeks) and significant neurological sequelae at the outset of the stroke.

Keywords: Troponin and Ischemic stroke.

INTRODUCTION

A stroke is a sudden loss of regional neurological function brought on by a clogged or burst blood vessel that supplies the brain. Within a period of six months, a third of those suffering pass away from this common ailment, while another third develop a persistent dependence on others for support (Bath, P.M.W. *et al*., 2000). Ischemia was responsible for around 80–85% of strokes, whereas hemorrhage was responsible for 15–25% (Worp, H.B. *et al*., 2007). An inability to use one or more limbs on one side of the body, a failure to understand or produce speech, or visual impairment on one side in the visual field might arise from the injured brain region's inability to operate normally (Donnan, G.A. *et al*., 2008). Strokes account for 12% of all mortality, or 6.4 million deaths (Mortality and Causes of Death, Collaborators *et al*., 2014). Overall, two-thirds of strokes occurred in people over 65 (Feigin, V.L. *et al*., 2014). The contraction of skeletal and cardiac muscles (Troponin, 2009), but not smooth muscle, depends on the three regulatory proteins that comprise the complex known as troponin: troponin C, troponin I, and troponin T (Antman, E.M. *et al*., 1996). Elevated troponin levels are a sign of cardiac muscle cell death as well as can be used as a biomarker of heart disorders since the enzyme gets released into the circulation when the heart is wounded (Dous, G. *et al*., 2017; Melanson, S.E. *et al*., 2007).

METHODOLOGY

A cross-sectional observational research was conducted at the Middle Euphoarates Neuroscience Institute at the Al-Sadder Medical City of the Al-Najaf Al-Ashraf Governorate between June 2023 and June 2024. 220 acute ischemic stroke (AIS) individuals who were detected through CT scans along with clinical observation were included in this research. After receiving ethical committee permission, all patients were enrolled in this study. The inclusion criteria are met by any patient who experiences an acute ischemic stroke during six to 72 hours of hospital admission. A history of coronary angioplasty along with coronary artery bypass surgery, congestive heart failure, valvular heart disease, end-stage renal disease (ESRD), unstable angina before admission, newly developed pathological Q waves on the ECG, any recent ischemic heart disease, as well as additional causes of elevated troponin levels, such as intense exercise right before stroke presentation, are all exclusion criteria. A pre-tested questionnaire was developed to collect information on each patient's age, gender, history of heart disease, symptoms, and risk factors. The clinical examination is conducted by a qualified neurologist, and the severity of the stroke is assessed by the National Institute for Health Stroke Scale (NIHSS), which has 11 elements with values ranging from 0 to 4. An ECG, a brain CT scan, blood sugar, blood urea, as well as serum creatinin, were used to assess each patient in order to rule out ESRD. Until they

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were discharged from the hospital, the patients were observed. Between six and seventy-two hours after the strike began, blood samples were obtained for the troponin test at the point of admission. The patients were categorized as either positive or negative based on the results of the test. The patient's outcome with regard to of hospital death within two weeks for admission was related to the severity of the stroke as assessed by the NIHSS. For all comparisons, statistical analyses were conducted using Pearson's Chi-Square test and Fischer's exact test. P-values below 0.05 were considered significant.

RESULTS

• **Epidemiological Data:** Table 1 and Figure 1 display the age and gender distribution of the 220 patients in the research sample, of which 120 (55%) were male and 100 (45%) were female. The patients' mean age was 62 years old, with a range of 23 to 89 years.

Table 1: Age and gender distribution

Age	Male N. (%)	Female N. (%)
< 40	13 (10.83%)	5 (5%)
40-60	39 (32.5%)	37 (37%)
>60	68 (56.67%)	58 (58%)

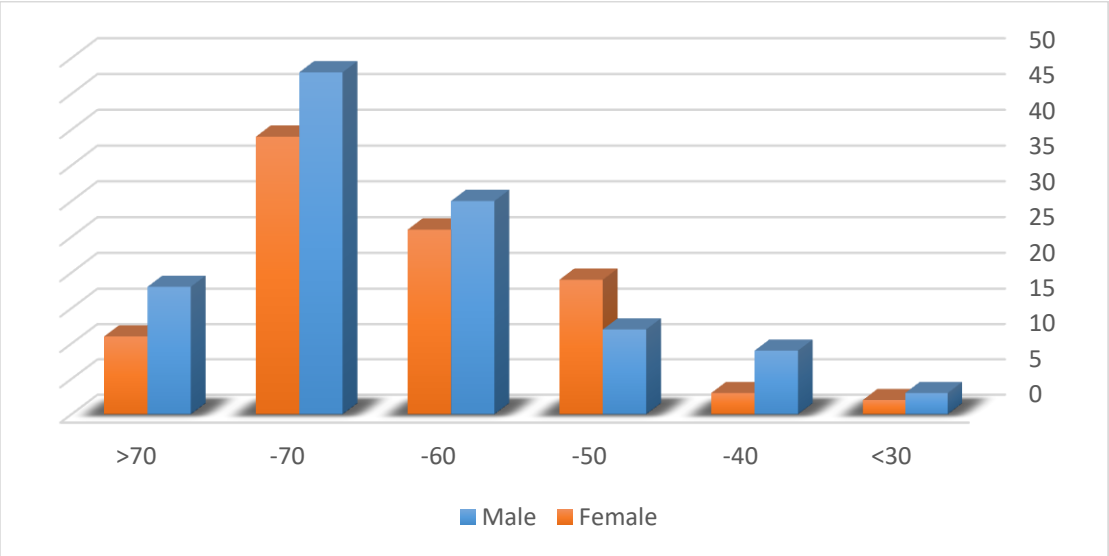

Figure 1: Age distribution of the study population.

According to this data, there are more male patients than female patients in every age group except the 40–50 age range. Additionally, the number of patients rises with age, irrespective of gender, until the age of 70, at which point it starts to fall.

• **Relation of Troponin Assay to Disease Severity, Survival, and Death:**

Only 33 individuals (15%) had a positive serum troponin level. Table 2 illustrates the relationship between the troponin test and stroke severity as well as its relationship to stroke death and survival. Twelve (70.6%) of the 17/220 (7.7%) patients who died within two weeks of the stroke's start had troponin-positive results, whereas only five (29.4%) had troponin-negative results. A statistically significant ($P < 0.05$) correlation was found in this study between the deaths of individuals with positive troponin test results. 18 (8.2%) patients had a small stroke at admission, 98 (44.5%) had a moderate stroke, 79 (35.7%) had a moderate to severe stroke, and 25 (11.4%) had a severe stroke, based on the NIHS stroke severity scale. The correlation between a positive troponin level and the severity of the stroke was statistically significant ($p < 0.05$).

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Table 2: Relation between the severity of stroke, survival, and death with troponin level

Severity of stroke	Troponin positive		Troponin negative		P-value
	survive	died	survive	died	
Minor n=18	0	0	18	0	**0.00057**
Moderate n=98	7	2	88	1	
Moderate to sever n=79	9	5	64	1	
Sever n=25	5	5	12	3	
Total n=220	21	12	182	5	

- **Troponin Level In Relation to Different Variables:**

As seen in Table 3. The troponin level and the severity of the stroke were significantly correlated, which was deemed highly statistically significant (p-value 0.00034). The proportion of patients who tested positive for troponin increased as the severity of the stroke increased. There was a noticeable rise in mortality among patients who tested positive for troponin (47.06%), and there was a statistically significant correlation between the death group and survival and the troponin assay (p-value 0.00001). The increase in troponin levels was statistically not significant (p-value > 0.05) when compared to the patient's age and gender.

Table 3: The Association between troponin and different categorical variables in the study

Variables	Troponin positive N. (%)	assay negative N. (%)	P-value
Severity			
Minor stroke	0 (0)	18 (100)	
Moderate stroke	9 (9.18)	89 (90.82)	0.00034
Moderate-severe stroke	14 (17.72)	65 (82.27)	
Severe stroke	10 (40)	15 (60)	
Survival during hospitalization			
Survived	24 (11.82)	179 (88.17)	
Died	9 (52.94)	8 (47.06)	0.0001
Gender			
Male	20 (60.6)	100 (53.47)	0.57
Female	13 (39.39)	87 (46.53)	
Age			
< 40	3 (9.09)	15 (8.02)	
40-60	18 (54.54)	58 (31.01)	0.07408
>60	12 (36.36)	107 (60.96)	
Total	33 (15)	187 (85)	

DISCUSSION

Stroke is the third most common cause of death in Western countries (1) and a major contributor to long-term morbidity (2). After a stroke, patients are more prone to have cardiac arrhythmias, myocardial cell damage, and aberrant ECG

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readings (Coussens, L.M. *et al*., 2003). Thirty-three individuals (15%) and 5–34% (Batal, O. *et al*., 2016) of the 220 acute stroke patients at our study exhibited increased blood troponin levels. Other investigations showed that raised troponin in AIS was linked to greater mortality rates despite the hypothesis that a higher blood troponin concentration may be an independent predictor of early death in acute stroke patients (Qiu, X. *et al*., 2023; Nageeb, R.S. *et al*., 2021; Edyta, D. *et al*., 2018; Yoon, M. *et al*., 2018). Only 29.4% among the 17 patients who passed away within two weeks of the stroke's start were troponin negative, compared to 70.6% who were. The mortality rate was 7.7% overall. According to the NIHSS stroke severity scale, our findings demonstrated a substantial correlation between troponin increase and stroke severity. Similar findings were also found in other studies, including a Spanish study that found higher troponin levels were related to the severity of the stroke instead of its location; a German study that found elevated troponin associated with the degree of disability and indicated the size of the lesion; and a Chinese study that found elevated serum troponin levels have been proportional alongside the severity of the stroke (Abdi, S. *et al*., 2015; Edyta, D. *et al*., 2018; Nam, K.-W. *et al*., 2020). Age or sex did not connect with troponin levels during this study. Other studies, including Iranian and Bakestanian, found no association between troponin and either sex or age (Edyta, D. *et al*., 2018; Budincevic, H. *et al*., 2017; Hadi, G.A. *et al*., 2023). An association between aging and higher troponin levels was found by the Thialand research (Thalin, C. *et al*., 2015).

CONCLUSION

Elevated blood troponin levels are linked to poorer outcomes and the severity of the stroke. Given that a high blood troponin level seems to be substantially associated with worse outcomes, it has been proposed that the serum troponin assay be considered a crucial diagnostic in patients suffering from acute stroke.

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