ASSOCIATION OF SERUM FERRITIN LEVELS IN CASES OF ACUTE ISCHEMIC STROKE

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ABSTRACT:

Background: WHO defines an acute stroke as a series of rapidly developing clinical signs of localized or focally disruption of CNS function, lasting longer than 24hrs or resulting in mortality, with no clear etiology other than a vascular origin. Acute ischemic stroke is considered a neurological dysfunction event triggered by localized brain, spine, or retinal infarctions.**Material & Methods:** The present cross sectional, prospective study was carried out at department of General Medicine, at our tertiary care hospital. The study duration was of six months from July 2014 to December 2014. A sample size of 50 was calculated at 90% confidence interval at 10% acceptable margin of error. All patients who had presented with acute onset of stroke within 24 hours. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study.**Results:.** In the present study, out of total study participants, Based on the NIHSS stroke scale, 72% patients had moderate to severe disabilities, and 28% had minor disabilities. Out of total study participants, Based on the modified rankin scale (MRS), 30% had a mild disability but could walk, and 21% had a moderate disability but could walk, 20% had no significant disability, 20% had a walking disability, and only 9% had a severe disability. Based on serum ferritin and the severity of stroke based on the NIHSS scale it was found to statistically significant association (p value < 0.001) between severity of acute ischemic stroke and their serum ferritin levels. Modified Rankin scale (MRS) and serum ferritin.It was found to statistically significant association (p value < 0.001) between outcome of acute ischemic stroke and their serum ferritin levels.**Conclusion:** We concluded from the present study that the patients with higher serum ferritin levels at admission tend to deteriorate more as compared to those with lower levels. Thus, serum ferritin can be used as a prognostic marker of outcome and disability in acute ischemic stroke.

Keywords: Acute ischemic stroke, serum ferritin levels, NIHSS, MRS.

INTRODUCTION:

The WHO defines an acute stroke as a series of rapidly developing clinical signs of localized or focally disruption of CNS function, lasting longer than 24hrs or resulting in mortality, with no clear etiology other than a vascular origin **(1).** Acute ischemic stroke is considered a neurological dysfunction event triggered by localized brain, spine, or retinal infarctions.

Globally, the burden is more pronounced in the developing world, accounting for 70% of mortality and morbidity, with the number of cases doubling over the past few years **(2)**. The developed world has seen a 42% reduction in new stroke caseloads. WHO reports that fifteen million individuals experience a stroke annually, resulting in five million deaths and leaving the rest disabled, imposing a significant burden on families and society. In India, the incidence of stroke is currently 119-145 per 100,000 people **(3).**

In the pathophysiology of acute ischemic stroke, plaque in blood vessel linings obstructs blood flow to the brain. This artery blockage in the neck or brain can lead to a condition where the flow of oxygen and glucose within a portion of the brain is hindered, resulting in impaired brain function **(4).** Early identification of prognostic markers is crucial, as it is the most opportune time for successful intervention. Additionally, identifying predictors of mortality is essential to promptly implement treatment procedures to improve outcomes **(5).** Various research has established the prognostic significance of many laboratory measures **(6).** Serum ferritin, an iron-carrying protein vital for maintaining iron homeostasis, is used to identify and manage iron excess and deficiency **(7).**

Ferritin is associated with rare but life-threatening human disorders such as hemophagocytic syndrome, sideroblastic anemias, and neurological conditions. Elevated blood ferritin levels in patients are positively correlated with poor outcomes in acute ischemic stroke patients, suggesting a potential mechanism where an increase in the body's iron reserves before a stroke exacerbates the cytotoxicity associated with brain ischemia **(8).** Therefore, the present study was conducted to investigate the prognostic significance of serum ferritin in terms of stroke severity, correlating with other associated risk factors for stroke in our tertiary care center.

MATERIALS & METHODS

The present cross sectional, prospective study was carried out at department of General Medicine, at our tertiary care hospital. The study duration was of six months from July 2014 to December 2014.

A sample size of 50 was calculated at 90% confidence interval at 10% acceptable margin of error by epi info software version 7.3. In this prospective study patients of age of both the genders were enrolled for the study. All patients who had presented with acute onset of stroke within 24 hours. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. Strict confidentiality was maintained with patient identity and data and not revealed, at any point of time.

Patients above 80 years of age, patients with a history of malignancy, patients with chronic infection, connective tissue disorders, and rheumatic heart disease, coronary artery diseases, previous transient ischemic attacks or reversible ischemic neurological deficits, a history of cerebrovascular accidents, or subdural hemorrhage, patients with intracerebral hemorrhage, sub-arachnoid hemorrhage, recent surgery or trauma, and central nervous system

tumors were excluded from the study. All study participants were subjected to routine blood investigation, neurological examination, and CT scan.

All data were entered in the MS office 2010 spread sheet and Epi Info v7. Data analysis was carried out using SPSS v22. Qualitative data was expressed as percentage (%) and Pearson's chi square test was used to find out statistical differences between the study groups. If the expected cell count was < 5 in more than 20% of the cells then Fisher's exact test was used. All tests were done at alpha (level significance) of 5%; means a significant association present if p value was less than 0.05 and highly significant if p value less than 0.01.

RESULTS

In the present study, we enrolled 50 patients who had presented with acute onset of stroke within 24 hours attending emergency and outpatient department of general medicine of our tertiary care hospital during the study duration. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. Out of the total 76% were males and 24% were females.

Study participants were aged from 47 years to 78 years of age with the mean age of the Study participants was 59.2 ± 7.4 years. Out of the total study participants majority of them (44%) were in the age group of 50-60 years, which was followed by (32%) patients in the age group of 60-70 years, (18%) patients were in the age group of more than 70 years and (6%) patients were in the age group of less than 50 years of the age. (Table 1)

Table 1: Distribution of study participants according to study parameters.

Parameters	No. of patients
Male	76%
Female	24%
Mean age	59.2 ± 7.4 years
Age group (years)	
<50	6%
50-60	44%
60-70	32%
>70	18%

Table 2: Distribution of study participants according to NIHSS and MRS scale.

Study parameters		N (%)
NIHSS severity	No to mild diability	28%
	Moderate to severe disability	72%
MRS scale	Good outcome	71%
	Poor outcome	29%

In the present study, out of total study participants, Based on the NIHSS stroke scale, 72% patients had moderate to severe disabilities,

and 28% had minor disabilities. Out of total study participants, Based on the modified rankin scale (MRS), 30% had a mild disability but could walk, and 21% had a moderate disability but could walk, 20% had no significant disability, 20% had a walking disability, and only 9% had a severe disability (Table 2).In the present study, out of total study participants, Based on serum ferritin and the severity of stroke based on the NIHSS scale it was found to statistically significant association (p value < 0.001) between severity of acute ischemic stroke and their serum ferritin levels.

Table 3: Association of serum ferritin levels and NIHSS severity and MRS scale.

Study parameters		Serum ferritin levels (mean ± SD)		P value
NIHSS severity	No to mild diability	110.8	± 11.6	**<0.001**
	Moderate to severe disability	368.2	± 19.7	
MRS scale	Good outcome	121.1	± 10.5	**<0.001**
	Poor outcome	342.3	± 16.4	

Based on the modified Rankin scale (MRS) and serum ferritin a it was found to statistically significant association (p value < 0.001) between

outcome of acute ischemic stroke and their serum ferritin levels. (Table 3)

DISCUSSION

In the present study, we enrolled 50 patients who had presented with acute onset of stroke within 24 hours attending emergency and outpatient department of general medicine of our tertiary care hospital during the study duration. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. Out of the total 76% were males and 24% were females. Study participants were aged from 47 years to 78 years of age with the mean age of the Study participants was 59.2 ± 7.4 years. Out of the total study participants majority of them (44%) were in the age group of 50-60 years, which was followed by (32%) patients in the age group of 60-70 years, (18%) patients were in the age group of more than 70 years and (6%) patients were in the age group of less than 50 years of the age. Similar findings were reported in a study conducted by Pankaj P al among 50 patients of cerebrovascular accident presenting within 48 hrs of symptom onset were included in the study and diagnosis of stroke was confirmed by CT scan. They found the level of serum ferritin has direct correlation with worse prognosis in patients of stroke **(9).**

In the present study, out of total study participants, Based on the NIHSS stroke scale, 72% patients had moderate to severe disabilities, and 28% had minor disabilities. Out of total study participants, Based on the modified rankin scale (MRS), 30% had a mild disability but could walk, and 21% had a moderate disability but could walk, 20% had no significant disability, 20% had a walking

disability, and only 9% had a severe disability. Similar findings were reported in a study conducted by Kusvuran Ozkan A et al The study assessed the predictive value of hs-CRP and ferritin levels for functional disability in acute ischemic stroke patients at 3 months. Sixty-two patients were studied, but neither hs-CRP nor ferritin levels could predict disability. Functional Independence Measure (FIM), Functional Ambulation Scale (FAS), and NIHSS scores were more useful predictors. **(10).**

In the present study, out of total study participants, Based on serum ferritin and the severity of stroke based on the NIHSS scale it was found to statistically significant association (p value < 0.001) between severity of acute ischemic stroke and their serum ferritin levels.

The study explored the impact of high serum ferritin levels on brain damage in acute ischemic stroke patients receiving thrombolytic treatment. Elevated ferritin correlated with glutamate and interleukin-6 levels, indicating potential excitotoxic damage. The association persisted after adjusting for factors. The findings suggest that increased iron stores may contribute to brain damage, emphasizing the need for further research on inflammation and oxidative stress in this context. **(11).**

Similar findings were reported in a study conducted by Erdemoglu AK et al assess the role of serum ferritin in estimating the severity and prognosis of acute stroke. Involving 51 patients within 24 hours of symptom onset, ferritin levels were measured at admission, along with cortisol. Higher ferritin levels were associated with larger lesion size, deteriorated neurological status, and

increased mortality. Ferritin correlated with neurological deficit. No correlation was found between cortisol and ferritin. Increased ferritin levels independently associated with stroke severity (P = 0.007;) and larger lesion size, (P = 0.021,) suggesting its potential as a prognostic marker for stroke outcomes.**(12).**

CONCLUSION

We concluded from the present study that the patients with higher serum ferritin levels at admission tend to deteriorate more as compared to those with lower levels. Thus, serum ferritin can be used as a prognostic marker of outcome and disability in acute ischemic stroke. The results of present study cannot be generalized on general population because of small sample size. Further elaborative studies needed to explore the topic.

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