



A CROSS SECTIONAL OBSERVATIONAL STUDY OF SERUM FERRITIN LEVEL IN PATIENTS OF ACUTE ISCHEMIC STROKE AS A PROGNOSTIC MARKER IN A TERTIARY CARE HOSPITAL

General Medicine

Dr. Saraswati Prajapati

Assistant Professor, Department of General Medicine, Dr M.K.Shah Medical College and Research Centre and Smt. SMS Multispeciality Hospital, Ahmedabad.

ABSTRACT

Background: Stroke is the second most common cause of mortality after coronary artery disease (CAD). Amongst all neurological diseases, stroke ranks first in frequency and importance. In India, the scenario is no different, its incidence and prevalence are on a steady rise. To evaluate the concentration of serum ferritin in patients of acute ischemic stroke as a prognostic marker. **Methods:** This was a observational and cross sectional study conducted on 60 cases of acute stroke as per seed article having minimum difference of mean (ferritin level) 365 and 145.43 for 80% power and 0.05 alpha error. **Results:** Out of 34 cases of haemorrhagic cases 13 cases mortality was observed while 14 cases had deteriorated outcome and 15 cases improved. Mean serum ferritin of dead, deteriorate and improved haemorrhagic cases was 1169, 723.07 and 107.43. Serum ferritin level was abnormal [raised] in all 22[36%] death cases and 24[40%] cases who had deteriorate. **Conclusion:** Elevated serum ferritin is strongly associated with early neurological deterioration in patients of stroke and is a definite poor prognostic marker of acute stroke [ischemic or haemorrhagic] an elevated serum ferritin (A marker of iron stores) herald more intensive management protocols and care for the patient as it can predict early neurological deterioration.

KEYWORDS

Stroke, Prognostic Marker, Elevated serum ferritin

INTRODUCTION

Stroke, also known as cerebrovascular accident (CVA), is the second leading cause of death after coronary artery disease (CAD) and the most common neurological disease. In India, stroke incidence and prevalence have been steadily increasing. However, surveys conducted in the 1980s and 1990s revealed that stroke prevalence had nearly doubled in ten years. Over the past two decades, stroke prevalence in India has ranged from 44.29 to 559 per 100,000 people, which is significantly higher than in Western countries.

A stroke is defined as the abrupt onset of a neurologic deficit that is due to a focal vascular cause⁵. Indian Collaborative Acute Stroke Study (ICASS); a multi-centric study conducted among 2,162 admitted stroke patients across southern, northern, and western India observed ischemic stroke in 77%, haemorrhagic stroke in 22%, and unspecified stroke in 1% cases; a statistics similar to the global trend

Diagnosis is typically based by physical exam and CT Scan or MRI scan. ICH is diagnosed by CT scan and, ischemic strokes is early diagnosed by MRI [DWI].

Ferritin is the cellular storage protein for iron. Ferritin is essentially located within cells and constitutes the main intracellular iron storage protein. Ferritin provides a means of storing the metal within cells in available safe manner. However, serum Ferritin has been used widely in clinical medicine chiefly as an indicator of body iron stores. It is an acute-phase reactant involved in cellular defence against oxidative stress and inflammation along with transferrin.

MATERIAL AND METHODS

Study Design: Hospital based cross-sectional observational study.

Study Area- The present study was conducted in the Department of General Medicine, Dr mk shah medical college and research centre & SMS multispeciality hospital, Ahmedabad.

Study Period- 6 months after the approval from ethics committee.

Sample Size-

Sample size is calculated 60 cases of acute stroke as per seed article having minimum difference of mean (ferritin level) 365 and 145.43 for 80% power and 0.05 alpha error.

Inclusion Criteria

1. Diagnosed cases of stroke confirmed by CT scan/MRI presented within 48 hrs of onset of symptoms.

Exclusion Criteria

1. Patient with associated infection or inflammation.
2. Patient with history of malignancy.
3. Patient with anaemia of chronic disease.

Methodology

Patients of stroke presenting within 48hrs of symptom onset were included in the study and diagnosis of stroke was confirmed by CT scan/MRI.

Neurological assessment was done by CANADIAN STROKE SCALE. Serum ferritin levels were performed within 48 hrs of onset of symptoms. Neurological assessment was repeated on 6th day of admission by Canadian stroke scale and Patients were classified into three categories namely clinical improvement, deterioration and death.

Statistical Analysis

Significance of difference in proportion was inferred by chi-square test. Significance of difference in means were inferred by unpaired 't' test on the basis of various independent predictor. The level of significance was kept at 95% for all statistical analysis.

RESULTS

Table 1: Distribution Of Cases According To Clinical Examination Of Respiratory And Cardiovascular System In Relation To Serum Ferritin

System	Findings	Normal Serum Ferritin	Abnormal (Raised) Serum Ferritin	Total Cases	P-value
Respiratory System	NVBS + B/L Crepitation	3 (13.6%)	21 (55.3%)	24 (40%)	0.002
	NVBS + No Added Sound	19 (86.4%)	36 (60%)		
Cardiovascular System	Mild Diastolic Murmur	8 (36.4%)	5 (13.2%)	13 (21.7%)	0.036
	S1 & S2 Heart, No Murmur	33 (86.8%)	47 (78.3%)		

Table 2: Distribution Of Cases According To ECG Findings In Relation To Serum Ferritin

ECG Findings	Serum Ferritin				TOTAL	
	Normal		Abnormal (RAISED)			
	NO.	%	NO	%	NO	%
LVH	8	36.4	33	86.8	41	68.3
TWNL	14	63.6	5	13.2	19	31.7
TOTAL	22		38		60	
P VALUE	<0.001					

Table 3: Distribution Of Cases According To Serum Ferritin Level

In Relation To Outcome

Serum Ferritin	Outcome						TOTAL	
	Death		Deteriorate		Improved			
	NO	%	NO	%	NO	%	NO	%
NORMAL	0	-	0	0	22	100	22	36.7
ABNORMAL (RAISED)	14	100	24	100	0		38	63.3
TOTAL	14		24		22		60	
MEAN FERRITIN	1157		687		91.32			
SD	119		105		29			
P <0.001								

Table 4: Distribution Of Cases According CT-Scan/MRI Findings In Relation To Outcome

CT/MRI Findings	OUTCOME						TOTAL	
	Death		Deteriora		Improved			
	NO	%	NO	%	NO	%	NO	%
HEMORRHAGIC	13	92.9	14	58.3	7	31.8	34	56.7
ISCHEMIC	1	7.1	10	41.7	15	68.2	26	43.3
TOTAL	14		24		22		60	
P	<0.001							

Table 5: Distribution Of Cases According To CT Scan/MRI Findings In Relation To Serum Ferritin

Serum Ferritin	CT/MRI Finding				Total	
	Hemorrhagic		Ischemic			
	NO	%	NO	%	NO	%
NORMAL	7	20.6	15	57.7	22	36.7
ABNORMAL(RAISED)	27	79.4	11	42.3	38	63.3
TOTAL	34		26		60	
MEAN FERRITIN	767.18		332.04			
P	<0.001					

DISCUSSION

A Stroke is defined as an abrupt onset neurological deficit due to a focal vascular cause. There are two main types of stroke: ischemic due to decrease in blood flow, and haemorrhagic due to bleeding due to hypertension. Patients of stroke presenting within 48hrs of symptom onset were included in the study and diagnosis of stroke was confirmed by CT scan/MRI scan.

Neurological assessment was done by CANADIAN STROKE SCALE at the time admission. Serum ferritin level was performed within 48 hrs of onset of symptoms. Neurological assessment was repeated on 6th day of admission by Canadian stroke scale and patients were classified into three categories namely clinical improvement, deterioration and death on basic CANADIAN STROKE SCLAE score.

In our study, distribution of cases according to respiratory infection in relation to serum ferritin, NVBS+B/L Crepitation [aspiration pneumonia] was present in 24 cases and out of them 21 had abnormal [raised] serum ferritin level. Aspiration pneumonia was presented in 40 % of total cases while NVBS+No added sound [normal respiratory finding] was present in 36 cases[60%] and this difference was also found statistically significant ($p<0.01$).

In our study, mild diastolic murmur was presented in 13 cases [21% of total stroke cases] which are associated with cardio-embolic stroke. Normal heart sound was presented in 47 cases [79%]. On applying chi square test, the difference was found statistically significant ($p<0.05$).

In our study, total number of cases was 60 out of them. 48 cases had moderate to severe anaemia. Out of 48 cases 32 have raised serum ferritin level and those who were raised serum ferritin had poor clinical outcome .In cases of strokes who have raised serum ferritin and anaemia [moderate and severe] had associated with poor prognostic outcome [in form of clinical deterioration and death] .

This observation was similar with the study of Khan et al¹¹. Their study showed that anaemia is a frequent finding in patients with acute stroke. Moderate to severe anaemia with raised serum ferritin had associated with poor prognosis in acute stroke patients.

In our study total number of cases was 60, out of them 14 mortality was observed while 24 cases had deteriorated outcome and 22 cases were improved. Serum ferritin level was abnormal [raised] in all 14 death cases, while all 24 cases who had deteriorated also have abnormal

[raised] serum ferritin level and this difference was found statistically highly significant ($p<0.001$). In our study mean serum ferritin in dead patients was 1157.64, in deteriorated cases mean serum ferritin was 687.54 and in improved cases, mean serum ferritin level was 91.32. On applying ANOVA test, the difference was found statistically highly significant ($p<0.001$).

This observation was similar with study of Narayan and Singh¹². Their study shows that mean serum ferritin level was 96.44 in those cases who were improved and those cases who were deteriorated mean serum ferritin was 463.91. Mean serum ferritin in deteriorated patients is significantly higher than those who improved.

CONCLUSION

In this cross sectional observational study performed in tertiary care centre it is found that elevated serum ferritin has strong association with early neurological deterioration in patients of stroke and is a definite poor prognostic marker of acute stroke [ischemic or haemorrhagic] an elevated serum ferritin (A marker of iron stores) herald more intensive management protocols and care for the patient as it can predict early neurological deterioration. Iron chelation therapy in acute stroke seems to be a strong theoretical possibility and further studies are required to investigate its role in treatment of stroke.

REFERENCES

1. Cerebrovascular disease. Adams & Victor's Principles of Neurology 10th ed.
2. Abraham J, Rao PS, Inbaraj sG, Shetty G, Jose CJ. An epidemiological study of hemiplegia due to stroke in India. Stroke 1970; 1:477-81.
3. Bansal BC, Parkash C, Jain AL, Brahmamandan KR. Cerebrovascular disease in young individuals below the age of 40 years. Neurol India 1973; 21:11-8.
4. Kamalakannan S, Gudlavalleti ASV, Gudlavalleti VSM. Incidence and prevalence of stroke in India. A systematic review. Ind J Med Res 2017; 146(2):175-85.
5. Smith WS, English JD, Johnston SC. Cerebrovascular disease. In : Harrison's principles of Internal Medicine 19th ed.
6. Dalal PM. Burden of stroke: Indian perspective. Int J Stroke 2006; 1:164.