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'ASSESSMENT OF SERUM FERRITIN IN PATIENTS WITH ACUTE ISCHEMIC STROKE'

General Medicine

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ABSTRACT

Background: Stroke is one of the leading causes of death worldwide. It accounts for both morbidity and mortality. In the pathogenesis of ischemic stroke, the acute phase response proteins i.e., ferritin play important role. Serum ferritin damages the ischemic part of the brain by production of free radicals which is one of the risk factor. Severity of stroke is assessed by NIHSS (National institute of health stroke scale). **Objectives:** 1. To study the level of Serum Ferritin in acute ischemic stroke 2. To correlate the levels of Serum Ferritin with severity of stroke **Methods:** This cross-sectional study was conducted on 100 patients from February 2021 to July 2022 presenting with acute ischemic stroke in Department of General Medicine, KR hospital, MMCRI, Mysore. Severity of stroke assessed by NIHSS. Serum ferritin will be measured, correlating these levels with severity of stroke. **Results:** Among 100 cases 53 cases have normal level of ferritin and 47 cases have higher level. In NIHSS severity 9 minor cases,47 moderate cases,29 moderate to severe cases,15 severe cases. Statistical corelation was found with hypertension, hyperlipidaemia, diabetes with severity of stroke and not found with smoking and alcohol in our study. Serum ferritin levels were correlated with NIHSS severity the test showed p value <0.05, showing significant correlation with severity. **Interpretation And Conclusion:** Ferritin has an increasing trend as the severity advances. In this study as following up of patients was not possible. Assessing these markers for prognosis of disease was limited

KEYWORDS

FERRITIN; ACUTE ISCHEMIC STROKE; NIHSS

INTRODUCTION

Stroke is a 'rapidly developed clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than of vascular origin'.[1]

Ferritin is the primary iron-storage protein and is critical to iron homeostasis. In the absence of inflammation, the concentration of serum (or plasma) ferritin is positively correlated with the size of the total body iron stores[2]

Ferritin concentrations are raised in inflammation (with or without infection), liver disease, obesity, and some rare haematological conditions[2]

In the pathogenesis of ischemic stroke, the acute phase response proteins i.e. ferritin play important role, because acute cerebral ischemia triggers IL-6 release into cerebrospinal fluid and blood, which is a key mediator of acute phase reaction and induces synthesis of acute phase proteins during ischemia[3]

It is a Positive acute phase response protein. Serum ferritin found to be increased in acute ischemic stroke. Iron overload contributes to the development of vascular disease by promoting thrombosis after arterial injury. High serum ferritin at admission was reported to predict a poor prognosis in acute stroke patients (within 24–48 h after stroke onset), implicating that increase in the body iron stores before stroke onset can aggravate the cytotoxicity of brain ischemia. Thus, it has been suggested that high serum ferritin influences the prognosis of ischemic stroke and acts as a risk factor for ischemic episodes by enhancing atherogenesis[3]

Serum ferritin damages the ischemic part of the brain by production of free radicals. The generation of free radical hydroxyl is catalyzed by iron released from the intracellular stores like ferritin during ischemia. The inflammatory marker ferritin can be used as a prognostic marker in acute ischemic stroke.[3]

Severity of stroke is assessed by NIHSS (National institute of health stroke scale). The NIHSS is composed of 11 items, each of which scores a specific ability between a 0 and 4. For each item, a score of 0 typically indicates normal function in that specific ability, while a higher score is indicative of some level of impairment The individual scores from each item are summed to calculate a patient's total NIHSS score. The maximum possible score is 42, with the minimum score being a 0.[4]

The present study is undertaken to assess the level of serum ferritin and severity of stroke with the ferritin levels which is a risk factor in stroke.

Aims And Objective

- To assess the level of serum ferritin in acute ischemic stroke
- To correlate the level of serum ferritin with severity of stroke

MATERIALS AND METHODS

It is a cross-sectional study conducted on 100 patients presents with acute ischemic stroke to K. R hospital, Mysore during Feb 2021 to July 2022.

Secondary sources of information including published articles, journals, books and related website.

Sample Size

Sample size :100
The sample size was calculated using one sample mean formula
i.e., n =z2 J2/d2
where Z{1-a/2} =1.96 for 95% confidence interval
J =61.05[from reference article] (standard deviation)
D=12%precision
Power of the study =80%
n = (1.96)2(61.05)2/(12)2
= 99.43[approx. 100]

Inclusion Criteria:

1. Patients with acute ischemic stroke confirmed by CT scan or MRI brain.
2. Patients age more than 18 years

Exclusion Criteria:

1. Patients having evidence of renal disease, active hepatic disease, history of prior MI or surgery within preceding 3 months.
2. Patients with prior history of stroke or TIA's.
3. Patients with history of any infection in prior 4 weeks.

METHODS

After taking the institutional ethical clearance for the study purpose of the study will be explained to the patient and attainders. Written informed consent will be taken from the subjects. Relevant history and clinical examination will be done. Severity of the stroke is assessed by NIHSS, serum ferritin level is measured, correlating the levels with the severity of the stroke.

Statistical Analysis:

Data obtained from the study will be entered in excel sheets and it will be double checked. Data analyzed using SPSS software version 22.0 and it will be presented as descriptive statistics in form of frequency table, figures, and graphs. Association between variables will be done

using chi-square test and unpaired t test for qualitative and quantitative variables. Result will be expressed as mean+/-SD. Correlation of parameters is done by Pearson's correlation formula. A p value of <0.05 is considered statistically significant

RESULTS

In this study total of 100 people 27 cases in age group of 36yrs to 50yrs.Maximum number of cases i.e, 48 cases in age group of 51yrs to 65yrs and 25 cases in age group of more than 65yrs. 64 were males and 36 were females.

Among the 100 cases 63were hypertensives and 37 were non hypertensives, 41 were diabetic and 59 were non diabetic, 54 were smokers and 46 were nonsmokers,15 were alcoholic and 85 were non-alcoholic.

NIHSS severity score. Among 100 cases, 9 were minor cases,47 were moderate cases,29 were moderate to severe cases,15 were severe cases.

Normal serum ferritin level 20-250 ng/mL,53 cases have normal level of ferritin and 47 cases have higher level of ferritin. In minor group of 9 cases, 9 cases have normal level of serum ferritin and 0 cases have high level of serum ferritin. In moderate group of 47 cases, 33 cases have normal level of serum ferritin and 14 cases have high level of serum ferritin. In moderate to severe group of 29 cases, 9 cases have normal level of serum ferritin and 20 cases have high level. In severe group of 15 cases, 2 cases have normal level of serum ferritin and 13 cases have high level. In chi-square test p value being <0.05, test is statistically significant.

Table -1- Age Distribution

AGE IN YRS	FREQUENCY CASES
18 to 50	27
51 to 65	48
More than 65	25
Total	100

Table -2- Sex Distribution

SEX	CASES
MALE	64
FEMALE	36
TOTAL	100

Table-3- Diabetes Distribution

	CASES
DIBETES	41
NON- DIABETES	59
TOTAL	100

Table-4 – Hypertension Distribution

	CASES
HYPERTENSIVE	63
NON-HYPERTENSIVE	37
TOTAL	100

Table-5 Smoker's Distribution

	CASES
SMOKER	54
NON-SMOKER	46
TOTAL	100

Table-6 - Alcoholics Distribution

	CASES
ALCOHOLIC	15
NON-ALCOHOLIC	85
TOTAL	100

Table-7- NIHSS Severity

NIHSS severity	score
Minor	1-4
Moderate	5-15
Moderate -severe	16-20
Severe	21-42

Table -8- Serum Ferritin Distribution

SERUM FERRITIN	CASES
NORMAL	53
HIGH	47
TOTAL	100

SEVERITY	CASES
MINOR	9
MODERATE	47
MODERATE-SEVERE	29
SEVERE	15
TOTAL	100

Table-9- Serum Ferritin With NIHSS Severity

			Ferritin		Total
			Normal	High	
NIHSS SEVERITY	Minor	Count	9	0	9
		% within NIHSS Severity	100.0%	0.0%	100.0 %
	Moderate	Count	33	14	47
		% within NIHSS Severity	70.2%	29.8%	100.0 %
	Moderate to Severe	Count	9	20	29
		% within NIHSS Severity	31.0%	69.0%	100.0 %
	Severe	Count	2	13	15
		% within NIHSS Severity	13.3%	86.7%	100.0 %
Total		Count	53	47	100
		% within NIHSS Severity	53.0%	47.0%	100.0 %

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided) P value
Pearson Chi-Square	28.663[a]	3	.000

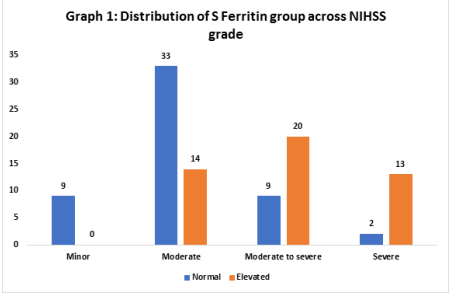
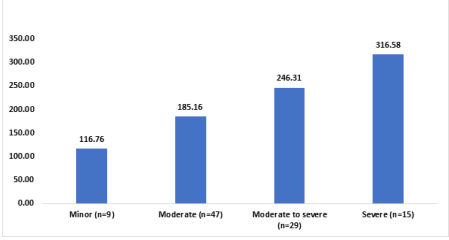


Table -10 Mean Serum Ferritin With NIHSS Severity

		N	Mean	Std. Deviation	Std. Error
SERUM_FERRITIN	Minor	9	116.7556	30.93692	10.31231
	Moderate	47	185.1553	81.98644	11.95895
	Moderate to Severe	29	246.3166	32.46731	64.70876
	Severe	15	316.5800	71.08011	18.35280
	Total	100	235.4970	208.45643	20.84564

Table showing mean level of serum ferritin in each group. In minor group mean is 116.75±30.93. In moderate group mean is 185.15±81.9In moderate to severe group mean is 246.31±32.46. In severe group mean is 316.58±71.08.



Graph -2- Mean serum ferritin with severity of NIHSS

DISCUSSION

A cross-sectional study containing 100 patients with acute ischemic stroke. The objective was to study the level serum ferritin in acute ischemic stroke and to correlate its value with severity of the stroke. Youngest age was 36yrs and oldest was 88yrs.Mean age was 57.34yrs.

Female have higher risk of stroke due to long life expectancy and hormonal risk. In my and other studies males were higher predominance due early risk factor exposure. Hypertension and diabetes were co-morbidities taken into present study, which are one of the risk factors of stroke. Hypertension was present to people with more severity of stroke than non- hypertensives. Mean RBS level was found to high with more severity of stroke, increasing the chances of severity of stroke.

		Mean serum ferritin levels(ng/ml)	P value
Present study	Minor Moderate Moderate to severe Severe	116.76 185.16 246.31 316.58	0.00
Thanikachalam R et al[9]	Minor Moderate Severe	337.41 285.56 197.91	0.001
Ravindra garg et al[8]		245.50±121.3	0.585
Sk mandal study[5]	Cases 50 Controls 50	83.1 41.3	0.001
Mohan N et al [10]	Improved (56) Deteriorated (31)	144.48±134.65 362.45±153.41	0.01

A study conducted by Thanikachalam R et al in 2020[9]. In 60 patients with AIS serum ferritin levels were assessed on day of admission and on 7th day and compared with NIHSS on admission and after one week found that mean serum ferritin levels at admission in patients with severe stroke, moderate stroke and mild stroke were 337.41, 285.56, 197.91ng/ml respectively. Serum ferritin has positive correlation with severity of AIS. In study conducted by SK mandal[5] and Mohan N et al [9]. showed higher ferritin levels in stroke group than controls with statistical significance.

CONCLUSION

- In our study majority fall under NIHSS moderate severity group with normal level of ferritin when compared to other groups. This value which will be affected with other confounding factors like in serum ferritin depends on body iron levels, nutritional factors, iron deficiency and iron metabolism. In our study higher levels of serum ferritin was found with more severity group of strokes, indicating positive correlation with severity of stroke. Hypertension and diabetes and dyslipidemia have significant risk factor for stroke. In this study as following up of patients was not possible. Assessing these markers for prognosis of disease was limited.

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