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A Study to Evaluate the Role of Serum Ferritin as a Prognostic Marker in Acute Hemorrhagic Stroke

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ABSTRACT

The World Health Organization defines stroke clinically as rapidly developing clinical signs of focal disturbance of cerebral function, lasting for more than twenty-four hours or leading to death. We can divide stroke into two broad categories namely, Ischemic stroke and haemorrhagic stroke. Ischemic strokes account for 50%-85% of all strokes worldwide. Haemorrhagic strokes are due to subarachnoid haemorrhage or intracerebral haemorrhage., they account for 1%-7% and 7%-27% respectively of all strokes worldwide. A recent study identified that 7% of medical and 45% of neurological admissions were due to stroke with a fatality rate of 9% at hospital discharge and 20% at 28 days. Hypertension, alcoholism, smoking and dyslipidaemia are commonest cause of stroke among the elderly and smoking, alcoholism, increased BMI, diabetes and hypertension are significantly associated with strokes among young people. Cases were selected from patients presenting to KIMS hospital, in General Medicine wards, with Acute Hemorrhagic Stroke considering the inclusion and exclusion criteria. After finalizing the patients to be included in our study, detailed clinical, laboratory, radiological and all relevant data including demographic data, age, sex, chief complaints, history, past medical history and vital signs were collected and recorded in a pre-designed proforma. The data was then subjected fore relevant statistical analysis. In our study, the data collected in pre-designed proforma, compiled in master chart was subjected to relevant statistical analysis and the following results were observed In our study, on day5 among the patients with Brainstem bleed (14), 7.1% of them had mRS score of 1, 7.1% of them had mRS score of 5, while majority of them deteriorated i.e. 85.7% of them had mRS score of Among the patients with Cerebellar bleed, 42.8% of them had mRS score of 1, 57.1% had mRS score of 2, while none of the patients had mRS score of more than. We conducted a randomised, observational, prospective investigation on 110 patients who presented with acute hemorrhagic stroke with the aim of evaluating the use of serum ferritin as a predictive factor in this scenario. Patients had a clinical evaluation that measured their impairment using a variety of markers, including the Glasgow Coma Scale and the Modified Rankin Scale (mRS). The patient's serum ferritin levels were measured at the time of admission. Based on the previously described features, our patients were divided into two groups: those with poor prognostic parameters comprised patients who did not survive, while the group with great prognostic attributes included patients who died. Data was collected using a pre-made proforma and added to a master chart.

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Key Words

Haemorrhagic, ischemic strokes, worldwide, hypertension

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INTRODUCTION

Stroke is defined clinically by the World Health Organisation as rapidly developing clinical signs of focal disturbance of cerebral function, lasting more than twenty-four hours or leading to death[1]. Ischaemic stroke and hemorrhagic stroke are the two main types of stroke. Between 50% and 85% of all strokes globally are ischaemic strokes[2]. Subarachnoid or intracerebral haemorrhages are the cause of hemorrhagic strokes, which make for 1%-7% and 7%-27% of all strokes globally, respectively[2]. According to a recent study, stroke was the cause of 7% of medical admissions and 45% of neurological hospitalisations. The death rate was 20% after 28 days and 9% upon hospital release[3]. The most prevalent causes of stroke in the elderly are hypertension, alcoholism, smoking and dyslipidaemia., among young individuals, smoking, drinking, elevated BMI, diabetes and hypertension are strongly linked to strokes[5]. Acute hemorrhagic stroke results from the rupture of a blood artery in a specific area of the brain and the accumulation of blood in the brain parenchyma due to hypertension or any other reason that impairs the endothelial lining of the vessel. Compression of the tissue from growing haematomas results in damage to the neuronal tissue in hemorrhagic strokes. Furthermore, pressure might result in loss of blood flow that results in an infarction. Six A collected haematoma or bleeding may result in a mass impact on the nearby structures and surrounding neurones, raise intracranial pressure, or possibly produce a brain herniation that might be fatal. Six Haemorrhagic stroke has a 40%-50% fatality rate[7]. Therefore, the most crucial strategy for lowering the morbidity and mortality of hemorrhagic stroke is still prevention. Increased understanding of all the potential risk factors that might contribute to the development of hemorrhagic stroke is necessary for the disease's successful prevention and treatment[8].

In cerebral infarction, a number of prognostic markers have been discovered to be relevant, including the site of the infarction, the size of the infarct, the size of the artery involved, the Glasgow coma scale, the degree of cerebral oedema and intracranial tension. Similarly, CT-calculated volume of haematoma, GCS, haemorrhage location and other factors are significant in cases of cerebral haemorrhage. Future prognostic factors, such as hyperglycemia in stroke, infection in stroke, TNFa or interleukins, etc., are being studied. Serum ferritin level is one of the prognostic markers that has attracted a lot of clinical interest recently. Serum ferritin was once thought to be just a stress reaction following a stroke, but it is currently being studied as a predictive marker., potential causes are covered below[9-16]. Additionally, this has improved studies on the therapeutic role. improvement in stroke prognosis with iron chelation. For stroke patients, most hospitals have few options beyond cautious care. Establishing the iron chelation therapy's therapeutic potential will be a significant step forward in the field of stroke treatment. Therefore, the purpose of this study is to assess serum ferritin's potential as a predictive indicator for acute hemorrhagic stroke.

MATERIALS AND METHODS

Source of Data: Cases were selected from patients presenting to KIMS hospital, in General Medicine wards, with Acute Hemorrhagic Stroke considering the inclusion and exclusion criteria.

Methods of Collection of Data:

Cases: Ethical committee approval was taken and 110 patients presenting with Acute Hemorrhagic Stroke, to IPD, KIMS Hospital, were taken for the study after availing informed consent.

Data Collection: After finalizing the patients to be included in our study, detailed clinical, laboratory, radiological and all relevant data including demographic data, age, sex, chief complaints, history, past medical history and vital signs were collected and recorded in a pre-designed proforma. The data was then subjected fore relevant statistical analysis.

Type of Study: Randomized Prospective Correlational observational study.

Period of Study: 2 year (October 2020-October 2022)

Inclusion Criteria:

- Patients admitted in General Medicine wards and Intensive Care Unit met the criteria of Acute Primary Hemorrhagic Stroke.

Exclusion Criteria:

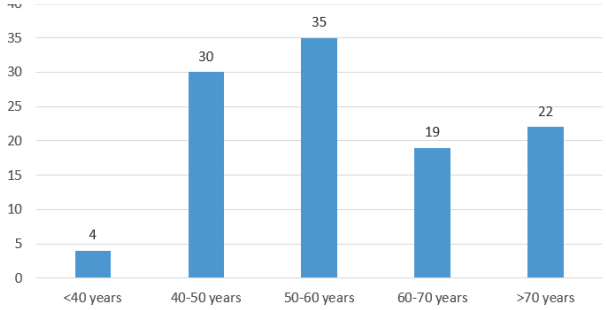
- Cases of Secondary Intracranial Haemorrhage.
- Cases of Ischemic Stroke.
- Cases of Acute Cardiovascular Accidents.
- Cases of Anaemia.
- Cases of Chronic Kidney Diseases.
- Cases of Haematological Malignancies.
- Cases of Metabolic Syndrome.
- Cases of Acute Inflammatory conditions.
- Patients on long term Iron therapy.
- Patients with Malabsorption syndromes.
- Pregnancy.
- Patients who stay in High altitudes.
- Patients with Acute or Chronic gastritis or h/o Helicobacter pylori infection.
- Patients with Hepato-Biliary dysfunction.
- Patients who do not give consent for the study.

RESULTS AND DISCUSSIONS

In our study, the data collected in pre-designed proforma, compiled in master chart was subjected to relevant statistical analysis and the following results were observed

Table 1: Age wise Distribution of Subjects.

Age wise distribution	Number	Percentage
<40 years	4	3.6%
40-50 years	30	27.3%
50-60 years	35	31.8%
60-70 years	19	17.3%
>70 years	22	20.0%
Total	110	100.0%

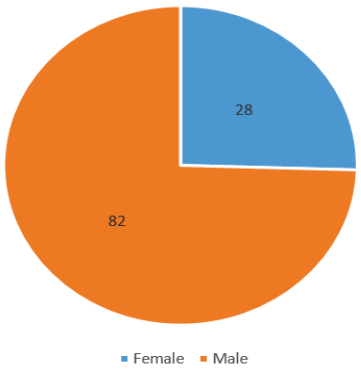


Graph 1: Age wise Distribution of subjects

Among our study population, majority of the patients (35) belonged to age group of 50-60 years, followed by, 40-50 years (30), >70 years (22), 60-70 years (19) while least belonged to age group of <40 years (4).

Table 2: Gender wise Distribution of Subjects.

Gender	Number	Percentage
Male	82	74.5%
Female	28	25.5%
Total	110	100.0%

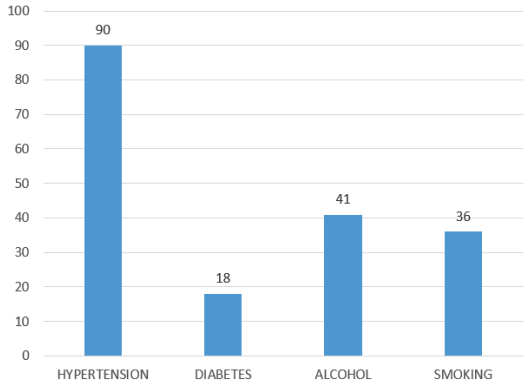


Graph 2: Gender wise Distribution of subjects.

Male dominance (74.5%) was observed, as compared to female population (25.5%) in our study group

Table 3: Distribution of Risk Factors among Study Population.

	Present	
Risk Factors	Number	Percentage
Hypertension	90	81.8%
Diabetes	18	16.4%
Alcohol	41	37.3%
Smoking	36	32.7%

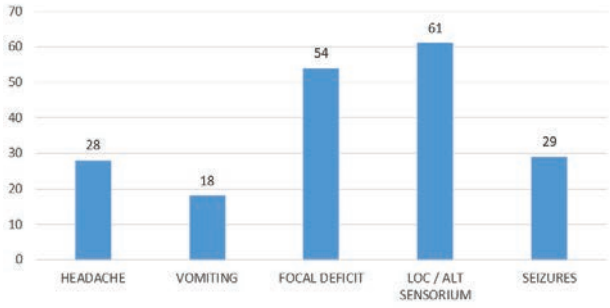


Graph 3: Distribution of Risk Factors among Study Population

In our study, among the 110 patients, Hypertension was the major risk factor (81.8%) followed by Alcohol consumption (37.3%), Smoking (32.7%) and least was Diabetes (16.4%).

Table 4: Distribution of Clinical Features among Study Population.

	Present	
Clinical features	Number	Percentage
Headache	28	25.5%
Vomiting	18	16.4%
Focal deficit	54	49.1%
Altered sensorium	61	55.5%
Seizures	29	26.4%



Graph 4: Distribution of Clinical Features among Study Population

While analysing the clinical features among our study population, Altered sensorium was found to be the major clinical presentations (55.5%), followed by Focal Neurological deficit in the form of monoparesis or hemiparesis or paraparesis or quadriparesis or any isolated cranial nerve defects (49.1%), Seizures (26.4%), Headache (25.5%), while Vomiting (16.4%) being the least[17,18].

Table 5: Distribution of Mean Vital Parameters among Study Population.

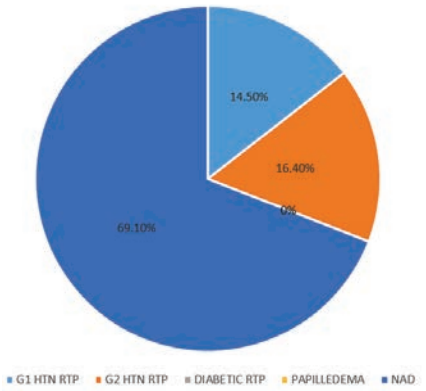
Vital parameters	Minimum	Maximum	Mean
PR (bpm)	53.0	98.0	79.0
SBP (mmHg)	110.0	246.0	185.9
DBP (mmHG)	8.0	124.0	93.9
RR (cpm)	16	24	17

Among our study population, the mean pulse rate was 79 bpm. The mean SBP was 185.9, DBP was 93.9 mmHg The mean RR was 17 cpm[19-20].

Table 6: Distribution of Fundoscopy Findings among Study Population.

Fundoscopy	Number	Percentage
G I Hypertensive Retinopathy	16	14.5%
G II Hypertensive Retinopathy	18	16.4%
Diabetic RTP	0	0%
Papilledema	0	0%
NAD	76	69.1%
Total	110	100.0%

Among our study population of 110 patients, 14.5% patients had Grade I Hypertensive Retinopathy and 16.4% patients had grade II Hypertensive Retinopathy, while none of the patients in our study population had Diabetic Retinopathy or Papilledema.



Graph 5: Distribution of Study Population with Fundus Findings

In our research population, all of the patients' risk variables were examined. Systemic hypertension was determined to be the primary risk factor in our research group, affecting 81.8% of the population. Smoking, alcohol intake and diabetes mellitus were reported to affect 37.2%, 37% and 16.4% of the population, respectively. This was similar to previous parallel investigations conducted by Sowri Rajan[21] Iraj Aghaei[22] and S. C. Singh[23] where systemic hypertension was identified as the primary risk factor. Capsuloganglionic, which was observed in 49.1% of the patients in our research of patients with Acute Hemorrhagic Stroke (AHS), was the most often occurring site of the intracranial haemorrhage[24,25,26]. This was followed by The most common bleeding patterns are temporo-parietal (15.5%), brainstem (12.7%), B/L IVH alone (7.3%), cerebellar (6.4%), occipital (4.5%), frontal (3.6%) and least common, thalamic (0.9%). The following shows the distribution of AHS locations in other concurrent investigations. Sowri Rajan *et al.,* out of fifty individuals 35 patients (70%) had gangliocapsular site, 7 patients (14%), thalamic location and 8 patients (16%) had lobar bleeding. AHS distribution in a research by S. C. Singh and al. revealed supratentorial position (82%) and infratentorial location (18%)[27,28]. The internal capsule and basal ganglia account for the greatest number of instances in the supratentorial region (50%) and are followed by the thalamus (20%), cortex (10%), and midbrain (2%). The cerebellum is where the majority of the patient's haemorrhages are localised at the infratentorial location. (10%), the medulla (2%), and the pons (6%) came next. The most frequent site of AHS throughout all the research was shown to be in the capsuloganglionic area, despite variations in how the distribution of AHS was carried out in other investigations[29].

A commonly used disability indicator assessment for stroke patients is the Modified Rankin assessment. Some research worldwide have found that the Canadian Stroke Scale (CSS), which covers parameters including GCS, Speech, Pupillary size and Motor component, is a regularly used scale as a handicap indicator in stroke patients. With very few exceptions, the two scoring systems have one thing in common: they both forecast the prognosis of stroke patients. The Modified Rankin Scale (mRS) was employed in our study as a means of rating the degree of impairment resulting from an acute hemorrhagic stroke. Patients with an mRS value of two or less were categorised as being in the excellent prognosis category, whereas those with a score of three to five were into the group whose prognosis was expected to be poor. Individuals with an mRS score of six passed away. Taking into account the aforementioned factors, we found that 32.7% of the study population fell into the good prognosis group, 43.6% into the bad prognostic group, and 23.6% of the study population passed away. Our findings aligned with those of previous comparable investigations[30].

Thirty percent of the patients in a study by Sowri Rajan *et al.* died and sixteen percent of the patients were in the bad prognosis group and the good prognostic group. Because the majority of the patients in this research group had bigger volumes of bleeding and their sample size was also modest (N=50), fewer patients in this study belonged to the excellent prognostic group. Only mean mRS score and maximum and minimum mRS score statistics were reported in a research by Rakesh Kumar Koul *et al.* The research's mean mean mRS was 3.02±1.84, with a minimum score of 1 and a maximum score of 6, which was similar to our study.

CONCLUSION

The objective of our study was to assess the relevance of serum ferritin as a prognostic marker in Acute Hemorrhagic Stroke, and we did this by conducting a randomised, observational, prospective analysis on 110

patients who presented with the condition. Patients underwent clinical assessment utilising many indicators, such as the Glasgow Coma Scale and the Modified Rankin Scale (mRS) to measure their impairment. At the time of admission, the patient's serum ferritin levels were also tested. Our patients were categorised into two groups based on the aforementioned factors: the group with excellent prognosis characteristics included patients who died, while the other group with terrible prognostic parameters included patients who did not survive. Data was gathered and put into a master chart using a pre-made proforma. The study found a significant correlation between the prognosis of the patient based on the serum ferritin measurement taken at admission and the modified Rankin scale. Serum ferritin levels were found to be higher in patients in the poor/bad prognosis group-that is, in patients whose mRS score was also high-while lower levels were found in patients in the good prognostic group who had lower mRS scores. Therefore, in patients who present with an acute hemorrhagic stroke, serum ferritin can be employed as a predictive predictor. But larger-scale research on the topic could be able to prove the following, allowing serum ferritin to be used widely.

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