Original Research Paper

Volume - 14 | Issue - 02 | February - 2024 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Emergency Medicine

TO EVALUATE THE OUTCOME IN PATIENTS PRESENTING TO EMERGENCY DEPARTMENT WITH ISCHEMIC STROKE HAVING PREEXISTING HYPONATREMIA BY USING NATIONAL INSTITUTE OF HEALTH STROKE SCALE.

Dr Rohith Yogish — Associate Professor, Department Of Emergency Medicine, aj Institute Of Medical Science And Research Hospital, Mangalore

Dr Sonia Devidas Pawaskar — Assistant Professor, Department Of Emergency Medicine, Aj Institute Of Medical Science And Research Hospital, Mangalore

ABSTRACT Cerebro-Vascular Accident-CVA (Stroke) is an important cause of mortality and morbidity worldwide. The consequence of stroke can be severe, leading annually to 5 million deaths and another 5 million being left permanently disabled. This is a Prospective descriptive observational study. The study was conducted in AJ hospital and research hospital for a period of 6 months. In our study we compare the outcome of the patients of ischemic stroke with hyponatremia at presentation and outcome of the patients in ischemic stroke with normal sodium values at presentation to emergency department by using NIHSS scoring system at the time of discharge or 14th day, whichever is earlier. In our study we included 180 ischemic stroke patients of which 80.6% belongs to age of >51years and 56.1% are males. NIHSS score was used as a tool for measurement of outcome in ischemic stroke patients with hyponatremia.our study demonstrates that hyponatremia patients have poorer outcomes after the attack of ischemic stroke as demonstrated by higher admission, higher NIHSS scores in follow ups and higher NIHSS scores at discharge as compared to the NIHSS scores of patients with normal sodium values.

KEYWORDS : Hyponatremia, NIHSS score, ischemic stroke

INTRODUCTION

The brain is an amazing three-pound organ that controls all functions of the body, interprets information from the outside world, and embodies the essence of the mind and soul. Intelligence, creativity, emotion, and memory are a few of the many things governed by the brain. Protected within the skull, the brain is composed of the cerebrum, cerebellum, and brainstem. The brainstem acts as a relay centre connecting the cerebrum and cerebellum to the spinal cord.

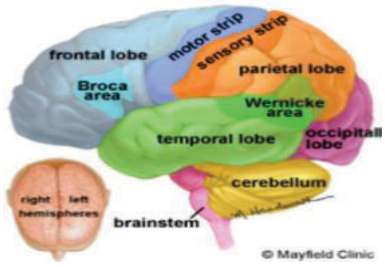


Figure 1: Anatomy of brain – lobes of brain

Blood Supply Of Brain

The intracranial circulation can be conveniently divided into anterior and posterior circulation, on the basis of internal carotid artery and vertebral artery supply respectively.

Anterior circulation

- Anterior choroidal artery
- Anterior cerebral artery (ACA)
- Medial lenticulostriate arteries
- Middle cerebral artery (MCA)
- Lateral lenticulostriate arteries

Posterior circulation

- Posterior cerebral artery (PCA)
- Basilar artery
- Superior cerebellar artery (SCA)
- Anterior inferior cerebellar artery (AICA)
- Posterior inferior cerebellar artery (PICA)

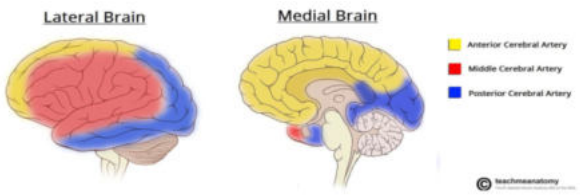


Figure 2: Blood supply of brain- areas supplied by 3 major arteries

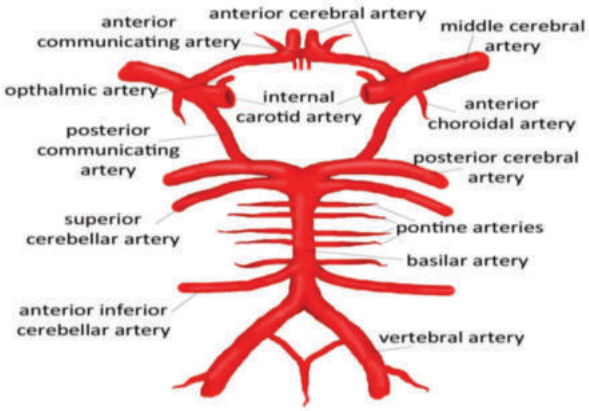


Figure 3: Circle of wills

Epidemiology

Cerebrovascular diseases include some of the most common and devastating disorders: ischemic stroke and hemorrhagic stroke. Stroke is the second leading cause of death worldwide, causing 6.2 million deaths in 2011, and is double the rate of heart disease in China. Strokes cause ~200,000 deaths each year in the United States and are a major cause of disability18,19. In addition to being a leading source of mortality, cerebrovascular disease is also a significant cause of morbidity. As many as 50 % of stroke survivors do not regain functional independence, and 20 % require institutional care 3 months after stroke onset20.

The incidence of cerebrovascular diseases increases with age, and the number of strokes is projected to increase as the elderly population grows, with a doubling in stroke deaths in the United States by 2030. A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause. Thus, the definition of stroke is clinical, and laboratory studies including brain imaging are used to support the diagnosis18.

Pathogenesis

Ischemic stroke

Acute occlusion of an intracranial vessel causes reduction in blood flow to the brain region it supplies. The magnitude of flow reduction is a function of collateral blood flow, and this depends on individual vascular anatomy (which may be altered by disease), the site of occlusion, and systemic blood pressure.

A decrease in cerebral blood flow to zero causes death of brain tissue within 4–10 min; values <16–18 mL/100 g tissue per minute cause

infarction within an hour; and values <20 mL/100 g tissue per minute cause ischemia without infarction unless prolonged for several hours or days. If blood flow is restored to ischemic tissue before significant infarction develops, the patient may experience only transient symptoms.

Focal cerebral infarction occurs via two distinct pathways :

(1) A necrotic pathway in which cellular cytoskeletal breakdown is rapid, due principally to energy failure of the cell.

(2) An apoptotic pathway in which cells become programmed to die.18

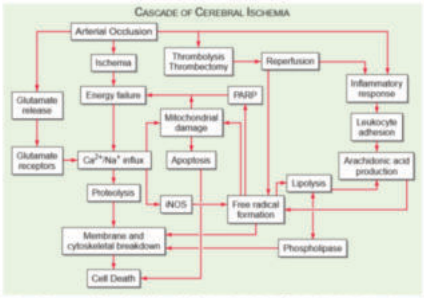


FIGURE 44&2 **Major steps in the cascade of cerebral ischemia.** See text for details. INOS, inducible nitric oxide synthase; PARP, poly-A ribose polymerase.

Figure 4: Major steps in cascade of cerebral ischemia

Diagnosis And Imaging

A number of clinical tests have been developed over the years to help determine the presence of stroke[21,22] Although these tests may aid in the initial triage of acute neurological patients, they cannot match the sensitivity and specificity of an imaging examination, nor is there any clinical test available that can accurately differentiate ischemic and hemorrhagic stroke[23].

Computed Tomography

One significant aspect in the evaluation of acute ischemic stroke patients is imaging. Currently in the United States, noncontrast computed tomography (CT) remains the primary imaging modality for the initial evaluation of patients with suspected stroke[24,25.]

Three main stages are used to describe the CT manifestations of stroke: acute (less than 24 hours), subacute (24 hours to 5 days) and chronic (weeks)26.

A non contrast head CT may identify the early signs of stroke, but most importantly will exclude intracerebral hemorrhage and lesions that might mimic acute ischemic stroke such as tumor or intracerebral hemorrhage. Occasionally, NCT can provide information that supports the diagnosis of hyperacute infarction[27,28,29,30] Noncontrast CT is also used in the evaluation of acute intracranial hemorrhage as it produces good contrast between the high attenuating ("bright") clot and the low attenuating ("dark") cerebrospinal fluid (CSF).This tool's availability and speed make it very useful in the initial evaluation of suspected stroke patients [31.]

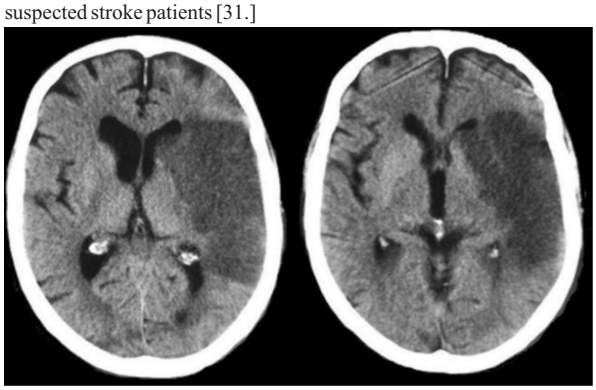


Figure 5: CT brain.

Magnetic Resonance Imaging

Conventional brain MRI studies can take up to one hour to complete. A typical stroke MRI protocol consists of T2/FLAIR-, T2, diffusion-(DWI) and perfusion- (PWI) images and MR angiography (MRA)32.

On T2-weighted and FLAIR images, ischemic infarction appears as a hyperintense lesion usually seen within the first 3–8 hours after stroke onset33,34,35. MR diffusion is a technique that is having a dramatic affect on the approach and management of acute ischemic stroke patients 36,37,38. MR diffusion is diffusion weighted images (DWI) and can be obtained within 10 minutes at some centers and dramatically alter care, so the clinical determination of ischemic stroke can be confirmed quickly. DWI is used to detect early ischemic changes (acute stroke; early ischemic change; cytotoxic edema) with greater conspicuity than standard MRI. MRI with diffusion is quickly becoming the gold standard in acute stroke imaging. Once a hemorrhagic stroke has been excluded by CT, MR diffusion improves stroke detection from 50% to more than 95%. Diffusion MR noninvasively detects ischemic changes within minutes of stroke onset.

Hyponatremia

Hyponatremia, the most common electrolyte disorder encountered, is associated with increased morbidity and mortality even in its milder forms40. Despite novel pathophysiologic insights, diagnostic approaches, and management options, hyponatremia remains a challenge for clinicians.41,42. The presence of hyponatremia has been demonstrated to be an independent risk factor for increased mortality in hospital inpatients43. Severe hyponatremia has long been recognised to be associated with adverse outcomes44 It is also increasingly being recognised that even mild hyponatremia can be associated with patient harm, with even relatively minor derangements having been shown to be associated with increased falls and fractures 45,46,47.

Hyponatremia, which is defined as a plasma Na+ concentration <135 mmol/l, is a very common disorder, occurring in up to 22% of hospitalized patients. Hyponatremia is thus subdivided diagnostically into three groups, depending on clinical history and volume status, i.e

1. Euvolemic hyponatremia
2. Hypovolemic hyponatremia
3. Hypervolemic hyponatremia 18

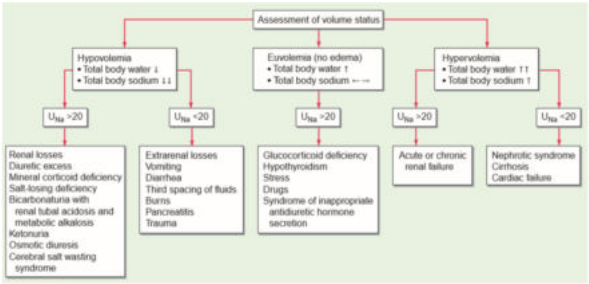


Figure 6 : The diagnostic approach to hyponatremia.

NIHSS

The National Institutes of Health Stroke Scale (NIHSS) is a valid, reproducible scale that measures neurological deficit9,10,11 and is one of the most frequently used scales in stroke intervention trials.12,13,14 In addition, the NIHSS is increasingly used clinically by physicians and nurses to evaluate stroke patients in emergency departments and hospital settings.

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 indicates typically normal function in that specific ability, while a higher score is indicative of some level of impairment 15 .The individual score from each item are summed in order to calculate a patients total NIHSS score. The maximum possible score is 42, with the minimum score being a 0,16,17.

MATERIALS AND METHODS

The study was conducted at AJ hospital and research HOSPITAL Mangalore FROM 1st December 2022 to 30th June 2023 after application of inclusion and exclusion criteria The study was conducted in AJ hospital and research hospital Mangalore. All the patients with signs and symptoms of stroke presenting to emergency department are evaluated with complete and focused history, clinical examination and neuroimaging modalities like CT brain and MRI. Mean time all patients serum collected for Sodium levels.

Patient characteristics recorded were age, gender, history of comorbidities, premorbid functioning ,and subtype of acute stroke. Patients who were provisionally diagnosed to have acute ischemic

stroke on the basis of history, examination and neuroimaging, patients/legal representatives willing to participate in the study were included. All patients with hemorrhagic stroke (subarachnoid, subdural, epidural, intraparenchymal, and intraventricular hemorrhages) and not willing to give consent for study were excluded from this study.

Initial serum sodium level on admission was recorded and hyponatremia was defined as serum sodium less than 135mmol/L. The ischemic stroke patients were evaluated in detail by using national institute of health stroke scale(NIHSS) in emergency department and respective scores were noted.

Irrespective of initial serum sodium levels at emergency department all the patients of ischemic stroke were followed up by using NIHSS score on 3rd day, 7th day, 14th day or at discharge. Patients who were referred to other hospitals and who were died during the period of follow up were excluded from the study population.

The NIHSS values which varies from 0 to 42, of which 0 refers to the patient with complete recovery and increase in score refers to poor outcome of ischemic stroke. The NIHSS are recorded on admission in emergency department followed by in ICU or wards, where the patient has been shifted on 3rd,7th and14th day were noted in study proforma.

In my study we compare the outcome of the patients in ischemic stroke with hyponatremia at presentation and outcome of the patients in ischemic stroke with normal sodium values at presentation to emergency department by using NIHSS scoring system at the time of discharge or 14th day, whichever is earlier.

Inclusion Criteria

1. Age group >18years to <80years.
2. Both sex
3. Established cases of ischemic stroke diagnosed on the basis of clinical history, examination and neuroimaging.

Exclusion Criteria

1. Pregnancy
2. Malignancy
3. Age <18years and >80years
4. Vomiting and diarrhoea
5. Traumatic and haemorrhagic stroke
6. Hyponatremia of secondary causes

- Chronic kidney disease
- Pulmonary tuberculosis
- Mannitol therapy
- Patients on diuretics
- Drugs causing hyponatremia
- Pseudo hyponatremia

7. Recent surgery
8. Not willing to give consent for study. exclusion criteria

Sample Size And Justification

$$N = \frac{z^2_{1-\frac{\alpha}{2}}\, p(1-p)}{\delta^2}$$

Formula for calculating sample size

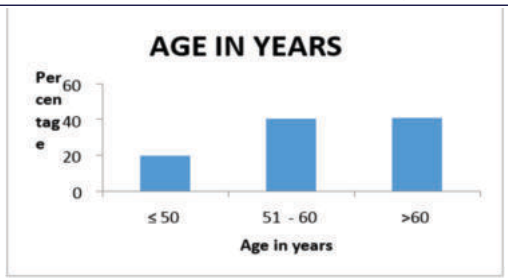
p : Expected proportion (35.3%)
δ : Relative precision (20% of p)
1- a/2 : Desired Confidence level = (95%) 71
N=176
Hence the sample size of 180 was considered to be adequate.

Statistical Analysis

Quantitative variables will be expressed in mean and standard deviation and the qualitative variables will be expressed as proportion. Comparison of quantitative variables between the two groups will be analysed by independent simple t test or Mann-Whitney U test according to the nature of distribution. Between group comparison of qualitative variables will be analysed by Chi-Square test, Fisher's exact test whenever necessary. A P value of <0.05 will be taken as level of significance. Change in score in successive follow up will be analysed using repeated measure ANNOVA or Friedman test. Data analysis will be performed using SPSS ver 17.0 and R software.

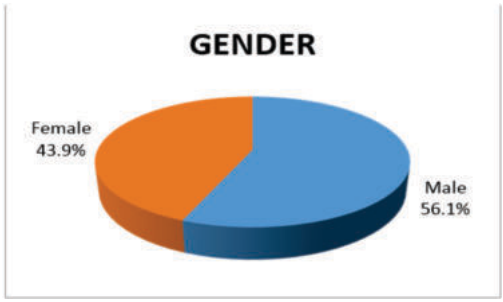
OBSERVATION AND ANALYSIS

Age Disrtibution



AGE IN YEARS	Frequency	Percent
≤ 50	35	19.4
51 – 60	72	40.0
>60	73	40.6
Total	180	100.0

Gender Distribution

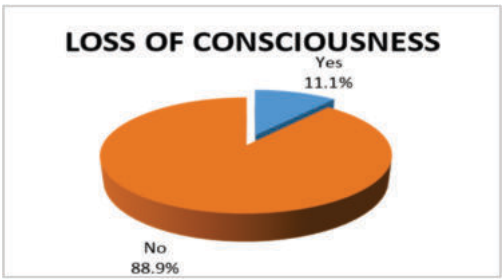


GENDER	Frequency	Percent
Male	101	56.1
Female	79	43.9
Total	180	100.0

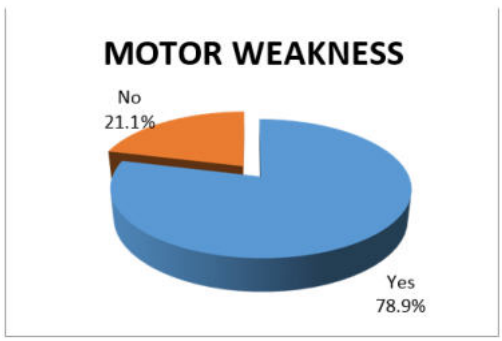
Symptoms Distribution

Loss Of Consciousness

Loss of consciousness	Frequency	Percent
Yes	20	11.1
No	160	88.9
Total	180	100.0



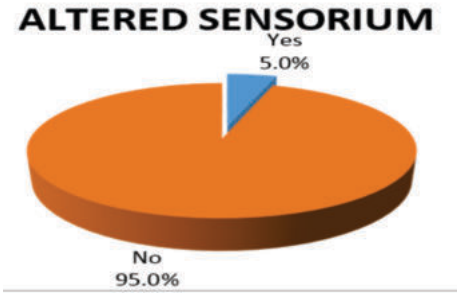
Motor Weakness



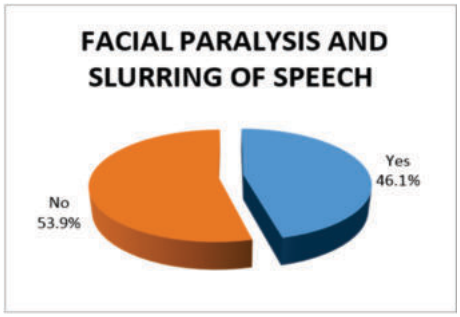
Motor weakness	Frequency	Percent
Yes	142	78.9
No	38	21.1
Total	180	100.0

Altered Sensorium

Altered sensorium	Frequency	Percent
Yes	9	5.0
No	171	95.0
Total	180	100.0



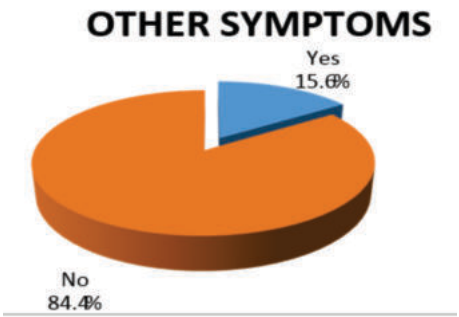
Facial Paralysis And Slurring Of Speech



Facial paralysis and slurring of speech	Frequency	Percent
Yes	83	46.1
No	97	53.9
Total	180	100.0

Other Symptoms

Other symptoms	Frequency	Percent
Yes	28	15.6
No	152	84.4
Total	180	100.0

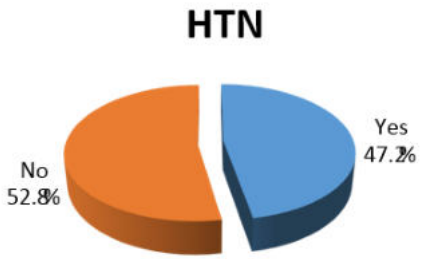


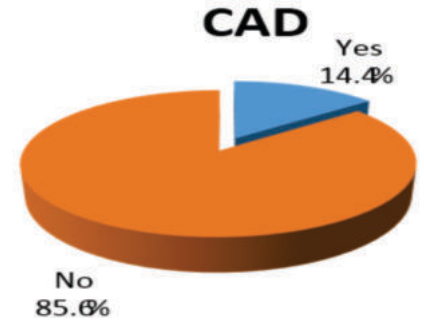
Co Morbidities Distribution

DM	Frequency	Percent
Yes	96	53.3
No	84	46.7
Total	180	100.0

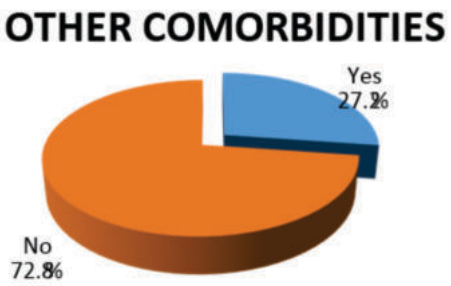
HYPERTENSION

HTN	Frequency	Percent
Yes	85	47.2
No	95	52.8
Total	180	100.0





CAD	Frequency	Percent
Yes	26	14.4
No	154	85.6
Total	180	100.0



Other co morbidities	Frequency	Percent
Yes	49	27.2
No	131	72.8
Total	180	100.0

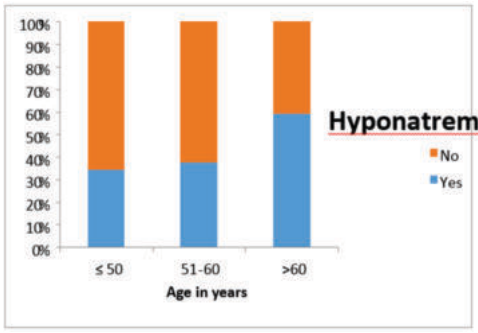
Frequency Of Hyponatremia

Hyponatremia	Frequency	Percent
Yes	82	45.6
No	98	54.4
Total	180	100.0

	Hyponatremia								
	Yes		No		Total		χ^2	df	p
Age	N	%	N	%	N	%			
≤ 50	12	34.3	23	65.7	35	100	8.920	2	0.012
51 - 60	27	37.5	45	62.5	72	100			
>60	43	58.9	30	41.1	73	100			
Total	82	45.6	98	54.4	180	100			

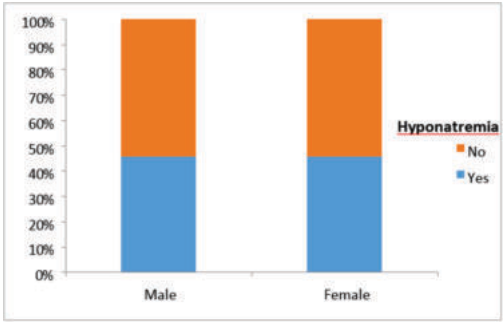
Incidence Of Hyponatremia

34.3% of the patients in the age group <50 years, 37.5% of the patients in 51-60 years and 58.9% of patients in the >60 years have hyponatremia. The observed difference was statistically significant ($p<0.05$). Patients in the elder age group were more prone to hyponatremia than the younger age group.



	Hyponatremia								
Sex	Yes		No		Total		χ2	df	p
	N	%	N	%	N	%			
Male	46	45.5	55	54.5	101	100	0.000	1	0.997
Female	36	45.6	43	54.4	79	100			
Total	82	45.6	98	54.4	180	100			

45.5% of the males and 45.6 % of the females have hyponatremia. There was no significant association between gender and hyponatremia (p>0.05).



Association Of Hyponatremia With Symptoms
Loss Of Consciousness

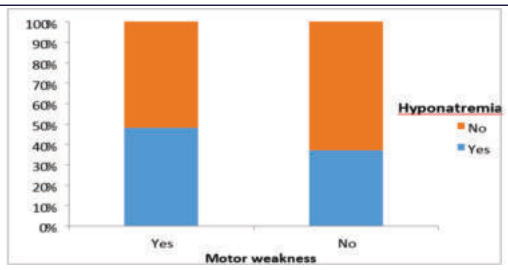
	Hyponat Yes		remia No		Total		χ2	df	p
Loss of consciousness	N	%	N	%	N	%			
Yes	8	40	12	60	20	100	0.280	1	0.597
No	74	46.3	86	53.8	160	100			
Total	82	45.6	98	54.4	180	100			

40.0% of the subjects with loss of consciousness and 46.3% of those without loss of consciousness have hyponatremia. There was no significant association between loss of consciousness and hyponatremia (p>0.05).

Motor Weakness

		Hyponatremia							
Motor weakness		Yes	No		Total		χ2	df	p
	N	%	N	%	N	%			
Yes	68	47.9	74	52.1	142	100	1.475	1	0.225
No	14	36.8	24	63.2	38	100			
Total	82	45.6	98	54.4	180	100			

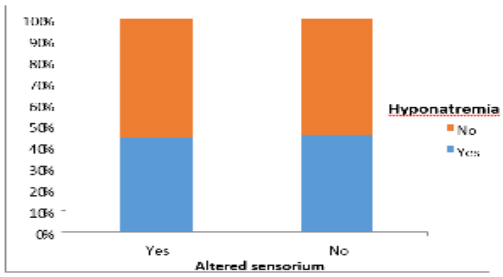
47.9%of patients with hyponatremia has motor weakness and 36.8% of patients without hyponatremia has motor weakness. There was no significant association between motor weakness and hyponatremia (p>0.05).



Altered Sensorium

	Hyponat Yes		remia No		Total		χ2	df	p
Altered sensorium	N	%	N	%	N	%			
Yes	4	44.4	5	55.6	9	100	0.005	1	0.945
No	78	45.6	93	54.4	171	100			
Total	82	45.6	98	54.4	180	100			

44.4%of patients with hyponatremia had altered sensorium and 45.6% of patients without hyponatremia had altered sensorium. There was no significant association between altered sensorium and hyponatremia (p>0.05).



Facial Paralysis And Slurring Of Speech

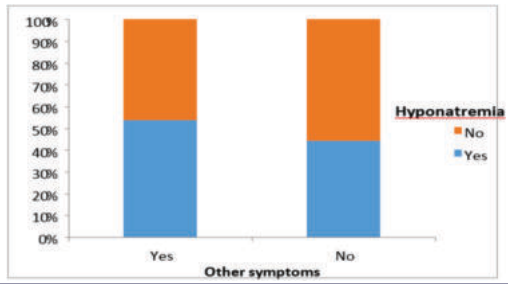
		Hyponatremia							
Facial paralysis and slurring of speech		Yes		No		Total		χ2	df	p
	N	%	N	%	N	%			
Yes	33	39.8	50	60.2	83	100	2.087	1	0.149
No	49	50.5	48	49.5	97	100			
Total	82	45.6	98	54.4	180	100			

39.8%of patients with hyponatremia had facial paralysis and slurring of speech and 50.5% of patients without hyponatremia had facial paralysis and slurring of speech. There was no significant association between facial paralysis, slurring of speech and hyponatremia (p>0.05).

Other Symptoms

1.	Hyponat Yes		remia No		Total		χ2	df	p
Other symptoms	N	%	N	%	N	%			
Yes	15	53.6	13	46.4	28	100	0.859	1	0.354
No	67	44.1	85	55.9	152	100			
Total	82	45.6	98	54.4	180	100			

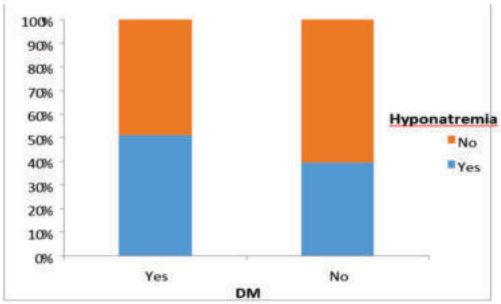
53.6%of patients with hyponatremia had other symptoms and 44.1% of patients without hyponatremia had other symptoms. There was no significant association between other symptoms and hyponatremia (p>0.05).



Association Of Hyponatremia With Co Morbidities
Diabetes Mellitus

	Hyponatremia								
DM	Yes		No		Total		χ2	df	p
	N	%	N	%	N	%			
Yes	49	51	47	49	96	100	2.496	1	0.114
No	33	39.3	51	60.7	84	100			
Total	82	45.6	98	54.4	180	100			

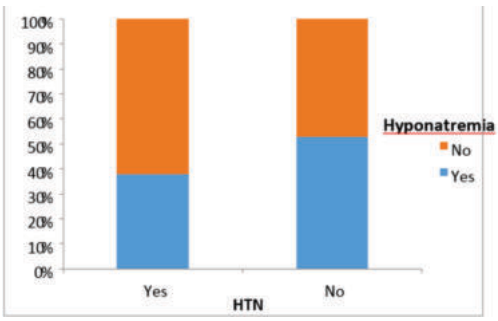
51.0%of patients with hyponatremia had diabetes and 39.3% of patients without hyponatremia had diabetes. There was no significant association between diabetes and hyponatremia (p>0.05).



Hypertension

	Hyponatremia								
HTN	Yes		No		Total		χ2	df	p
	N	%	N	%	N	%			
Yes	32	37.6	53	62.4	85	100	4.061	1	0.044
No	50	52.6	45	47.4	95	100			
Total	82	45.6	98	54.4	180	100			

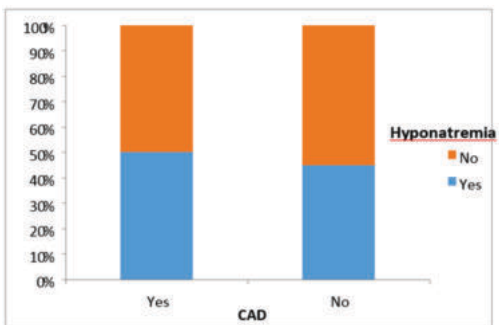
37.6%of patients with hyponatremia had hypertension and 52.6% of patients without hyponatremia had hypertension. There was a significant association between hypertension and hyponatremia (p>0.05). patients without hypertension had more incidence of hyponatremia.



Coronary Artery Disease

	Hyponat Yes		remia No		Total		χ2	df	p
CAD	N	%	N	%	N	%			
Yes	13	50	13	50	26	100	0.242	1	0.623
No	69	44.8	85	55.2	154	100			
Total	82	45.6	98	54.4	180	100			

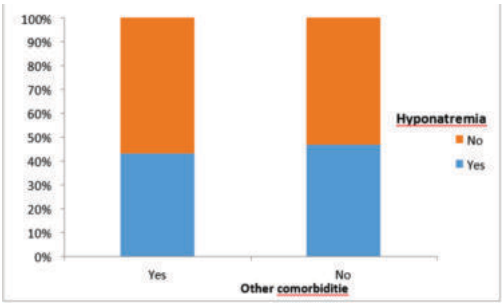
50.0%of patients with hyponatremia had CAD and 44.8% of patients without hyponatremia had CAD. There was no significant association between CAD and hyponatremia (p>0.05).



Other Co Morbidities

	Hyponat Yes		remia No		Total		χ2	df	p
Other co morbidities	N	%	N	%	N	%			
Yes	21	42.9	28	57.1	49	100	0.198	1	0.657
No	61	46.6	70	53.4	131	100			
Total	82	45.6	98	54.4	180	100			

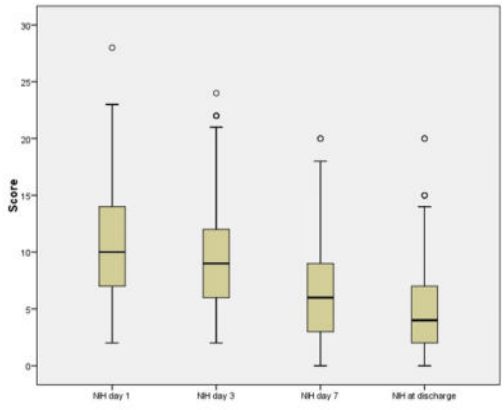
42.9%of patients with hyponatremia had other co morbidities and 46.6% of patients without hyponatremia had other co morbidities. There was no significant association between other co morbidities and hyponatremia (p>0.05).



Nihss Association With Ischemic Stroke

NIHSS	Day 1	Day 3	Day 7	At discharge
N	180	180	180	180
Mean	10.48	9.26	6.32	4.82
sd	4.68	4.53	4.22	3.69
Minimum	2	2	0	0
Maximum	28	24	20	20
25th percentile	7.0	6.0	3.0	2.0
Median	10.0	9.0	6.0	4.0
75th median	14.0	12.0	9.0	7.0

Average NIHSS score at the time of admission was 10.48±4.68 and the median NIHSS score was 10 with interquartile range 7-14. Average NIH score at the time of discharge was 4.82±3.69 and the median score was 4 with interquartile range 2-7. There was a significant reduction in NIHSS score after the treatment (p<0.05)



The "box and whiskers plot" (the bottom and top of the box are the 25th and 75th centile, the middle of the box is the 50thcentile, i.e., the median, the ends of the whiskers represent the 5th and the 95th centile). diagram describing the NIHSS score at day 1, day3, day 7 and at the time of discharge.

Nihss Association With Hyponatremia

	Hyponatremia	N		NIH			
			Minimum	Maximum	25th percentile	Median	75th median
day 1	Present	82	3	28	9	12	16
	Absent	98	2	18	6	8	12
day 3	Present	82	3	24	9	11	14
	Absent	98	2	16	4	7	9.5
day 7	Present	82	1	20	6	8.5	11
	Absent	98	0	11	2	3	6

at dis charge	Present	82	1	20	6	7	9
	Absent	98	0	9	1	3	3

Median NIHSS score among the patients with hyponatremia at the time of admission, at day3 , day 7 and at the time of discharge were 12,11,8.5 and 7 respectively and Median NIHSS score among the patients those have no hyponatremia at the time of admission, at day3 , day 7 and at the time of discharge were 8, 7, 3 and 3 respectively

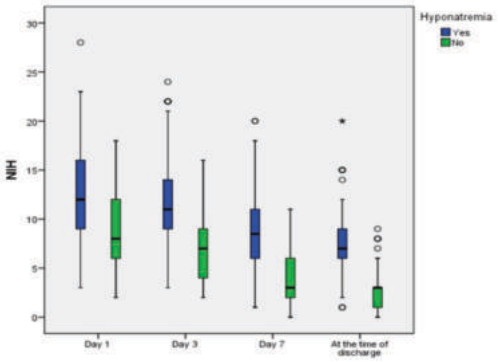


Figure: The "box and whiskers plot" (the bottom and top of the box are the 25th and 75th centile, the middle of the box is the 50thcentile, i.e., the median, the ends of the whiskers represent the 5th and the 95th centile). The diagram representing the comparison between NIHSS scores of hyponatremia patients and patients with no hyponatremia

	Hyponatremia			
	Present (N=82)		Absent (N=98)	
	mean	sd	mean	sd
Day 1	12.6	5	8.7	3.6
Day 3	11.6	4.5	7.3	3.5
Day 7	8.9	4.3	4.1	2.7
At discharge	7.5	3.6	2.6	2

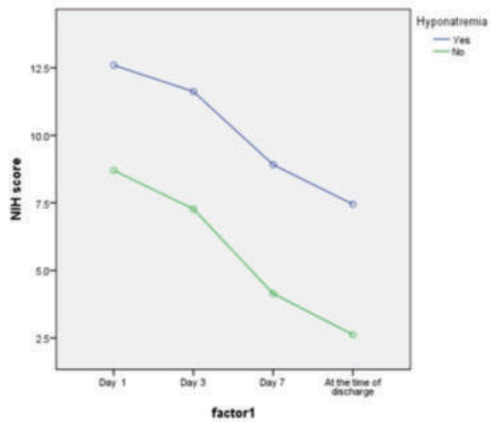


Figure: the graphical representation of mean NIHSS score between two groups of patients.

Repeated measure ANOVA
Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	p
Intercept	44764.117	1	44764.117	946.980	<0.001
Hyponatremia	3552.384	1	3552.384	75.150	<0.001
Error	8414.131	178	47.270		

Test of between subjects effects of Repeated Measure ANOVA reveals that there was a significant difference in average overall NIHSS score between the Hyponatremia patients and the Non hyponatremia patients(P<0.05).

Tests of Within-Subjects Effects						
Source		Type III Sum of Squares	df	Mean Square	F	p
Followup	Sphericity Assumed	3579.160	3	1193.053	517.713	<0.001
Followup * Hyponatremia	Sphericity Assumed	25.315	3	8.438	3.662	.012
Error(factor1)	Sphericity Assumed	1230.586	534	2.304		

Test of within subjects effects of Repeated Measure ANOVA reveals that the difference in average NIHSS score in successive follow up were statistically significant. That is the average NIHSS score was significantly reduced at the time of discharge. The interaction of Hyponatremia with the follow up score was statistically significant (P<0.05). That is the pattern of variation in NIHSS score of the hyponatremia patients and the non hyponatremia patient was significantly different.

DISCUSSION

The present prospective observational study aimed at comparison of outcome in ischemic stroke patients with hyponatremia at presentation to emergency department by using NIHSS scoring system. The score were recorded by resident emergency post graduates and well trained nurses in the emergency department at the arrival and the patients are followed up in ICU or wards and outcome noted.

180 patients who are diagnosed with ischemic stroke were included in the study, all patients neurological status were assessed by using NIHSS scoring system at presentation to emergency department, day 3 , day 7 and day 14 or discharge. The average age of patients in our study was 58.4±10.45 years and age ranges from 31 to 78. 40.6% of the patients were in the age group of >60 years. 56.1% patients were males, this can be comparable with Vinod V et.al 2016 55. Out of 180 patients in the study 82 patients were having hyponatremia(serum sodium<135mEq/L) representing 45.6% this can be comparable with Kalita J et.al 201758. Out of 82 patients 34.3% of the patients were in the age group of <50 years , 37.5%were in age group of 51-60 years and 58.9% were >60years. The observed difference is statistically significant(p<0.05). patients in the elder age group are more affected with hyponatremia, this can be comparable with Sushrut S et.al 200962, Gill G et.al 200665.

11.1%of the patients presented with loss of consciousness,78.9%of the patients were presented with motor weakness , 9% of them presented with altered sensorium 46.1% of them with facial paralysis and slurring of speech and 15.6% of them with other symptoms like seizures, sensory loss ,visual disturbances etc., making motor weakness as the most common presenting symptom of the ischemic stroke.

There was no significant association between hyponatremia and the presenting complaints of the patients in our study(p>0.05). But there was significant association between hypertension and hyponatremia, 37.6%of patients with hyponatremia had hypertension 52.6%of the patients without hyponatremia had hypertension, patients without hypertension had more incidence of hypertension(p<0.05).

The average NIHSS score at the time of admission was 10.48±4.68 and the median NIHSS score was 10 with interquartile range 7-14. The average NIHSS score at the time of discharge was 4.82±3.69 and the median score was 4 with interquartile range 2-7.

This was observed in all 180 patients of the ischemic stroke in our study, this shows there was a significant reduction in the NIHSS score in all the patients after the treatment(p<0.05).The average NIHSS score at the time of admission shows the stroke severity as moderate to severe stroke but the average NIHSS score shows the severity of minor to no stroke symptoms. Hence by using NIHSS score we can measure the outcome of the patients with ischemic stroke by stroke severity grading.

Rodrigues B et.al 201451 did a prospective observational study of total 3585 patients of which hyponatremia was observed in 565 patients. Baseline clinical features and the risk factors for stroke were similar between groups except for higher prevalence of congestive heart failure (P =015), history of cancer (P = 038), diabetes (P<.001), and dementia (P=.015) in the hyponatremic cohort . Patients with hyponatremia had worse NIHSS scores at admission. The comparison of ranked scores shows a trend for this effect (P=.056) with significant differences found when the scores are classified into 4 severity groups (P=032). Worse NIHSS score at discharge was observed in 12.1% of the hyponatremia group patients compared with 7.7% in the patients with normal sodium levels (P=.02).

This study also uses the most common predictors for disability after stroke (NIHSS and mBI) as measurements. This allowed us to establish an association between hyponatremia and poorer prognosis after AIS and to ensure that patients had similar functional status compared with controls before injury. By using NIHSS score they classified the severity of stroke and the outcome of the patient after regular follow up in 3 months, 6 months and 1 year duration from the stroke attack. They concluded that hyponatremia(Na,136mmol/L)was an independent factor of poor prognosis and was significantly associated with both higher mortality and poorer disposition status. This study demonstrates that hyponatremic patients have poorer outcomes after an AIS as demonstrated by higher admission NIHSS values, lower admission mBI values, worse disposition at discharge, and higher short- and long-term mortality.

In our study out of 180 patients 82 patients (45.6%) had hyponatremia. Of which 58.9% of the patients were in age group of >60years ($p<0.05$). the median NIHSS score among the patients of hyponatremia at the time of admission is 12.6 with minimum score of 3 and maximum of 28, indicating a poor NIHSS score at the time of admission as compared to median NIHSS score of 8.7 with minimum of 2 and maximum of 18 in patients with normal serum sodium values which is statistically significant($p<0.05$). The maximum score of NIHSS at the time of admission for hyponatremic patients indicates severe stroke and that of the normal patient indicates the moderate stroke according to stroke severity grading of NIHSS score.

(stroke severity grading, 0-no stroke, 1to4- minor stroke, 5to15- moderate stroke, 16to20- moderate to severe stroke, 21to42- severe stroke).

The median NIHSS score among the patients with hyponatremia on day 3 and day 7 are 11.6 and 8.9 respectively as compared to median NIHSS score of 7.3 and 4.1 in non hyponatremic patients. At day 3 and day 7 also the NIHSS score indicates the severity as moderate stroke in patients with hyponatremia but the NIHSS score indicates the severity as minor stoke in non hyponatremic patients. The NIHSS score is significantly reduced on day 3 and day 7 in the non hyponatremic patients compared to patients with hyponatremia which is statistically significant ($p<0.05$), measured by repeated measure ANNOVA.

The median NIHSS score among the patients with hyponatremia at the time of discharge or day 14 is 7.5 and that of the patients with normal sodium value is 2.6, which indicates the stroke severity as moderate stroke in hyponatremia patients and minor stroke in non hyponatremic patients according to NIHSS severity grading which is statistically significant($p<0.05$).

The successive follow up NIHSS scores among the patients reveals that the recovery from the ischemic stroke symptoms are better in the patients of normal serum sodium values compared with that of the hyponatremia affected patients. The successive follow up NIHSS scores were statistically compared with repeated measure ANNOVA which reveals that the difference in average score were statistically significant the pattern of variation in NIHSS score of hyponatremia patients and the non hyponatremia patients was significantly different.

SUMMARY AND CONCLUSION

180 ischemic stroke patients were included in this prospective observational study of which 80.6% belongs to age of >51years and 56.1% are males.

Incidence of hyponatremia among the ischemic stroke patients is 45.6% (n=82). Of which 58.9% belongs to the age group of >60 years making elderly age as a risk factor for hyponatremia.

The average NIHSS score at the time of admission of ischemic stroke patients (n=180) is 10.48±4.68 and NIHSS score at the time of discharge or day 14 is 4.82±3.69.

Which shows significant improvement in symptoms of the patient after admission.

NIHSS score is used as a tool for measurement of outcome in ischemic stroke patients with hyponatremia which showed that hyponatremia patients presented with poor NIHSS score to the emergency department(median=12.6) compared to that of patients with normal serum values(median=8.7). The regular follow up scores of the hyponatremia patients were poor(11.6,8.9) as compared to patients with normal sodium levels(7.3,4.1). At the time of discharge or day 14 the value of NIHSS score of a hyponatremia patients was 7.5 as compared to 2.6 of patients with normal sodium levels, making hyponatremia a poor prognostic factor in the outcome of ischemic stroke.

To conclude, this study demonstrates that hyponatremia patients have poorer outcomes after the attack of ischemic stroke as demonstrated by higher admission NIHSS scores, higher NIHSS scores in follow ups and higher NIHSS scores at discharge as compared to the NIHSS scores of patients with normal sodium values.

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