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Evaluation of Factors Affecting the Outcome of Acute Ischaemic Stroke in Elderly Patients: A Tertiary Care Center Study

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Abstract

Introduction: Stroke is a major cause of mortality and disability, with elderly patients at higher risk. Ischemic stroke, the most common type, results from embolic or thrombotic arterial occlusion. Prognostic assessment is essential for guiding management and rehabilitation. This study evaluates prognostic factors in elderly acute ischemic stroke patients, particularly the National Institutes of Health Stroke Scale (NIHSS) and Orpington Prognostic Scale (OPS). ***Materials and Methods:*** This prospective observational study included 50 patients aged ≥60 years diagnosed with acute ischemic stroke. Clinical history, neurological exams, NIHSS scoring, and radiological investigations were conducted. Follow-up at six months assessed functional recovery using OPS. Statistical analysis was performed using SPSS v20.0. ***Results:*** The mean age was 71 years, with a male predominance (66%). Hypertension (66%) and diabetes (48%) were key risk factors. Fever (>38°C) correlated with poor outcomes (55% mortality/worsening). NIHSS >21 and GCS <8 predicted worse prognosis. At follow-up, 60% improved, while 14% worsened or died. ***Conclusion:*** Strict blood pressure and glucose control, early rehabilitation, and stroke unit care improve prognosis. NIHSS and OPS are valuable for assessing stroke severity and outcomes.

Keywords: ***Stroke, Ischemic Stroke, Prognosis, National Institutes of Health Stroke Scale (NIHSS), Elderly.***

Introduction

Stroke, or cerebrovascular accident, is defined as the abrupt onset of a neurologic deficit due to a focal vascular cause. The clinical presentation varies widely due to the brain's complex anatomy and vasculature, with cerebral ischemia occurring when blood flow is reduced beyond a critical threshold. This can lead to neuronal energy failure within seconds and, if prolonged, result in infarction and irreversible brain tissue damage. Ischemic strokes, the most common type, can be categorized into embolic and thrombotic subtypes. Embolic strokes arise from blood clots or plaque fragments, often originating from the heart, while thrombotic strokes result from in situ clot formation within cerebral arteries, commonly associated with atherosclerosis and high cholesterol. Given the high morbidity and mortality associated with stroke ranking as the second leading cause of death globally, understanding prognostic factors is essential for improving outcomes, particularly in elderly patients who are at higher risk. Factors such as age, stroke severity, location, infarct size, comorbidities, and neurological deficits play a crucial role in determining prognosis. The National Institutes of Health Stroke

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Scale (NIHSS) is widely used to assess stroke severity, with its predictive value evolving over time due to dynamic stroke-related deficits and recovery patterns. Additionally, the Orpington Prognostic Scale (OPS) is valuable in assessing functional improvement by evaluating motor deficits, proprioception, balance, and cognition. Rehabilitation through physiotherapy, occupational therapy, and speech therapy is integral to recovery, highlighting the need for a comprehensive approach to stroke management. This study aims to evaluate the prognostic factors affecting the outcome of acute ischemic stroke in the elderly by assessing the association between NIHSS scores and patient outcomes, analyzing the investigative profile of stroke patients, identifying key prognostic factors, and measuring functional recovery using the OPS on follow-up. By incorporating various diagnostic modalities such as Carotid Doppler, CT, MRI, and interventional radiology, this study seeks to provide a holistic approach to stroke care, aiding clinicians in making informed prognostic assessments and guiding patients and families through the disease course.

Materials and Methods

This prospective observational study was conducted on 50 patients admitted to the medical ward of a major public tertiary referral hospital from March 2016 to June 2017 (18 months). Patients aged above 60 years diagnosed with acute ischemic stroke, with or without other types of strokes, were included, while those with only chronic ischemic strokes or hemorrhagic strokes were excluded. All patients presenting with clinical features of stroke confirmed by CT scan as acute ischemic stroke and admitted to the General Medical Ward, ICU, MICU, or ICCU were screened. Consenting patients meeting the inclusion criteria were selected through random sampling. A detailed history was taken, including demographic details, addiction history, comorbidities, and clinical profile. General examination included assessment of temperature, pulse, blood pressure, pallor, icterus, pedal edema, lymphadenopathy, cyanosis, clubbing, and BMI calculation. Systemic examination focused on neurological assessment to document focal neurological deficits and cranial nerve palsies, along with respiratory, cardiovascular, and gastrointestinal examinations. Stroke severity was graded using the National Institutes of Health Stroke Scale (NIHSS), evaluating parameters such as consciousness, gaze, visual fields, facial movement, motor function of extremities, coordination, attention, sensory loss, language difficulties, speech clarity, and verbal fluency. Radiological investigations, including CT and MRI brain studies, were conducted to document key prognostic factors such as infarct size and location to analyze their correlation with outcomes. Patients were monitored throughout their hospital stay, and in-hospital mortality was documented. Follow-up assessments were conducted for six months or until death, categorizing clinical outcomes as improved, worsening of symptoms, or death. Functional assessment during follow-up was carried out with the assistance of a physiotherapist using the Orpington Prognostic Scale (OPS), which evaluates motor deficits (arm), proprioception, balance, and cognition. The data collected at admission, including NIHSS scores and radiological findings, along with follow-up information such as the Orpington score, were analyzed to determine their relationship with patient outcomes, which were classified as improved and discharged (based on Orpington Score), worsening of symptoms, or death. Statistical analysis was performed using SPSS version 20.0, with data entry in Microsoft Excel 2010. Qualitative variables were represented as frequency tables, percentages, bar diagrams, and pie charts, while quantitative data were expressed as mean and standard deviation. The association between two qualitative variables was assessed using the chi-square test or Fisher's exact test, with a p-value of less than 0.05 considered statistically significant.

Results

This study analyzed the clinical profile of 50 patients aged 60 years and above with acute ischemic stroke, evaluating the influence of risk factors, clinical and radiological parameters, and their impact on disease outcomes during hospital stay and follow-up. The mean age of participants was 71 years, with a male predominance (66%). Among men, smoking and alcohol addiction were more common, whereas women were more likely to chew tobacco, a pattern seen in the Indian population. Hypertension (66%) and diabetes (48%) emerged as significant risk factors, with 50% of diabetic patients having uncontrolled blood sugar levels. Additionally, metabolic syndrome was present in 26% of cases, primarily in individuals with hypertension, diabetes, and dyslipidemia.

All 50 patients had normal findings under the Special and Dermatomal categories when examined with regard to chief complaints. However, motor function deficits were common, with left hemiparesis (28%) and left hemiparesis with facial involvement (42%) being the most frequent. Right-sided weakness was less common, with right hemiparesis (6%) and right hemiparesis with facial involvement (16%). Brachial involvement was observed in a few cases, affecting 4% on the left and 2% on the right, while only one patient (2%) had normal motor function.

Motor weakness was a key clinical feature, with left-sided hemiparesis (74%) being more common than right-sided (24%), and 2% of patients exhibiting no motor weakness. Fever (>38°C) was noted in 18% of patients, and this group had a significantly worse prognosis, with a 55% mortality or worsening rate compared to just 4% in those with lower temperatures. High systolic blood pressure (>160 mmHg) was observed in 66% of cases, while diastolic blood pressure exceeded 100 mmHg in 36%. General examination findings included pallor in 8%, lymphadenopathy in 6%, and pedal edema in 10% of patients.

Neurological assessments revealed that 14% of patients had a Glasgow Coma Scale (GCS) score below 8, with a poor prognosis and 85% mortality whereas no deaths were recorded among those with higher GCS scores. Psychiatric symptoms (anxiety) were noted in 2% of patients. Speech disturbances were observed in 64% of patients, with 34% having slurring and 30% presenting with aphasia. Facial nerve involvement was seen in 46% of cases. Cerebellar symptoms, such as nystagmus and ataxia, were rare, each occurring in a single patient. Convulsions were also reported in one case. Internal carotid artery (ICA) atherosclerosis was detected in six patients, two with left ICA involvement and four with right ICA involvement.

Cardiac assessments using 2D echocardiography found hypertensive heart disease in 24%, regional wall motion abnormalities in 30%, and normal findings in 46% of patients. Half of the study population had random blood sugar levels above 250 mg/dL, while 50% had levels below this threshold. Similarly, serum cholesterol levels exceeded 200 mg/dL in 50% of patients. Serum triglyceride levels remained below 150 mg/dL in 90% of cases, while 10% had higher levels.

Stroke severity was assessed using the NIHSS, with 16% of patients classified as having very severe strokes, 30% as moderate-severe, and 54% as mild-to-moderate. Functional assessment using the Orpington Prognostic Scale showed that 66% of patients had moderate scores, 22% had mild scores, and 12% had severe scores. On admission, one patient died, five worsened, 33 remained stable,

and 11 improved. During treatment, 66% received aspirin and atorvastatin, while 34% were given additional clopidogrel.

Complications observed included contractures (20%), bedsores (14%), aspiration pneumonia (14%), and deep vein thrombosis (14%). CT scan findings indicated that the basal ganglia were the most commonly affected region (68%), followed by the parietal (38%) and temporal (34%) regions. The frontal lobe was involved in 8% of cases, while the occipital and cerebellar regions were each affected in 2%.

At follow-up, 60% of patients showed improvement, 26% remained the same, six died, and one worsened. Mortality rates did not differ significantly between genders, with male mortality at 12.1% and female mortality at 11.8% (p-value calculated using Fisher's exact test). BMI was not strongly associated with worse outcomes, as 14.3% of normal-weight patients and 9.1% of overweight/obese patients experienced death or worsening conditions. However, addiction played a role, with a 21.1% mortality rate among addicts compared to 6.5% among non-addicts. Metabolic syndrome also influenced outcomes, with 23% of affected individuals experiencing death or worsening compared to 8% in those without the condition.

Temperature above 38°C was associated with significantly higher mortality and worsening outcomes (55%) compared to 5% in those with lower temperatures. Among patients with GCS scores below 8, 85% experienced death or worsening, whereas no worsening occurred in those with higher GCS scores.

The Outcome Trends During Follow-Up table shows that among 50 patients, the number of deaths increased from 1 at admission to 6 at follow-up, indicating that 5 additional patients passed away. Meanwhile, 19 patients showed improvement, with the count rising from 11 at admission to 30 at follow-up. The number of patients with unchanged conditions decreased from 33 to 13, while those who worsened dropped from 5 to 1, suggesting an overall positive trend in recovery.

Table 1: Distribution of patients according to various characteristics, symptoms, treatment received, and complications

Characteristic	Frequency (out of 50)	Percentage of patients
Side of hemiparesis		
Left	37	74.0
Right	12	24.0
Normal	1	2.0
Temperature		
<38	41	82.0
>38	9	18.0
Systolic BP (mm of Hg)		
<160	17	34.0
>160	33	66.0
Diastolic BP(mm of Hg)		
<100	32	64.0
>100	18	36.0
Symptoms		
Pallor	4	8.0
Lymphadenopathy	3	6.0
Pedal Oedema	5	10.0
Nystagmus	1	2.0
Ataxia	1	2.0
Convulsion	1	2.0
Abnormal coordination	1	2.0
Higher functions		
GCS score ≤8	7	14.0
Anxiety	1	2.0
Aphasia	15	30.0
Slurring	17	34.0
facial nerve involvement	23	46.0
Treatment		
Aspirin/Atorvas	33	66.0
Aspirin/Atorvas/Clopidogrel	17	34.0
Complications		
Contracture	10	20.0
Bedsore	7	14.0
Aspiration	7	14.0
Deep venous thrombosis	7	14.0

Table 2: Frequency and percentage of patients according to various categories made by results of investigations

Category according to investigation	Frequency	Percentage
Carotid Doppler		
Lt Carotid 90%	1	2.0
Lt, I Carotid 85%	1	2.0
Rt Carotid 80%	1	2.0

Rt Carotid 90%	2	4.0
Rt I Carotid 80%	1	2.0
None	44	88.0
2D Echo		
Hypertensive Heart Disease	12	24.0
Regional Wall Motion Abnormalities	15	30.0
Normal	23	46.0
location according to CT Scan		
Frontal	4	8.0
Parietal	19	38.0
Occipital	1	2.0
Temporal	17	34.0
Basal ganglia	34	68.0
Cerebellar	1	2.0

Table 3: Distribution of patient outcome with respect to various characteristics and markers

Characteristics		**Outcome**		**Total frequency**
		Death/worsened	**Improved/Same**	
Gender	Female	11.8%(N=2)	88.2%(N=15)	17
	Male	12.1%(N=4)	87.9%(N=29)	33
Body Mass Index	Normal	14.3%(N=4)	85.7%(N=24)	28
	Overweight/Obesity	9.1%(N=2)	90.9%(N=20)	22
Addiction	yes	21.1%(N=4)	78.9%(N=15)	19
	No	6.5%(N=2)	93.5%(N=29)	31
Metabolic Syndrome	YES	23.1%(N=3)	76.9%(N=10)	13
	NO	8.1%(N=3)	91.9%(N=34)	37
Temperature	<38	4.9%(N=2)	95.1%(N=39)	41
	>38	55.6%(N=5)	44.4%(N=4)	9
Glasgow Coma Scale score	≤8	85.7%(N=6)	14.3%(N=1)	7
	>8	0.0%(N=0)	100.0%(N=43)	43
Random Blood Sugar	<250	12.0%(N=3)	88.0%(N=22)	25
	>250	12.0%(N=3)	88.0%(N=22)	25
Serum Cholesterol	<200	16.0%(N=4)	84.0%(N=21)	25
	>200	8.0%(N=2)	92.0%(N=23)	25
Serum Triglycerides	<150	4.4%(N=2)	95.6%(N=43)	45
	>150	80.0%(N=4)	20.0%(N=1)	5
Fronto-temporo parietal infarct	Except front parietotemporal	8.3%(N=4)	91.7%(N=44)	48
	Front parietotemporal	100.0%(N=2)	0.0%(N=0)	2

Table 4: Distribution of patient outcome with respect to NIHSS score and orpington score at admission and follow

Scores		**Outcome**		**Total**
		Death/worsened	**Same/Improved**	
NIHSS Score	Moderate/Moderate-severe	0.0%(N=0)	100.0%(N=42)	42
	Severe	87.5%(N=7)	12.5%(N=1)	8
Orpington Score at admission	Mild/Moderate	0.0%(N=0)	100.0%(N=44)	44
	Severe	100.0%(N=6)	0.0%(N=0)	6
Orpington Score during follow up	Mild/moderate	0.0%(N=0)	100.0%(N=43)	43
	Severe	100.0%(N=7)	0.0%(N=0)	7

Table 5: Distribution of patients according to the outcome at admission and follow up

Category of outcome	**Frequency**	**Percentage**
Outcome at admission		
Death	1	2.0
Improved	11	22.0
Same	33	66.0
Worsened	5	10.0
Outcome at follow up		
Death	6	12.0
Improved	30	60.0
Same	13	26.0
Worsened	1	2.0

Discussion

In this study conducted at a tertiary care institute, we analyzed the clinical profile of acute ischemic stroke cases in patients aged 60 years and above. All cases were confirmed by CT or MRI brain imaging, and the study included 50 patients who were followed for 6 months from diagnosis. During this period, one patient died during hospitalization, while an additional six died during follow-up. Notably, patients who demonstrated clinical improvement tended to return for follow-up more than once.

The mean age of the study population was 71 years, with a clear male predominance. This observation is consistent with previous findings, as Ingall *et al.* [1] concluded that age is the principal nonmodifiable risk factor for stroke, with half of all strokes occurring in individuals older than 75 years and one-third in those over 85 years. Other studies have demonstrated that the incidence of stroke is significantly higher in the older age groups, particularly above 75 years, with males having higher age-specific rates. Truelsen *et al.* [2] and Adams *et al.* [3] reported that while men have a higher incidence up to age 75, the rates become similar between genders in the 75–84 age group, and women exceed men beyond 85 years.

Analysis of risk factors in our study revealed that lifestyle addictions varied by gender. The majority of male patients reported smoking and alcohol consumption, whereas female patients more frequently used tobacco chewing, a trend that mirrors findings in the Indian population. Kumar Banerjee *et al.* [4] noted that females are generally less likely to smoke or drink heavily compared to males. Hypertension emerged as a critical risk factor in our cohort, with 66% of patients exhibiting a systolic blood pressure exceeding 160 mm Hg, and 66% being known hypertensives. The importance of blood pressure control is supported by evidence showing that antihypertensive drugs administered in stepped doses reduced strokes by 36% in elderly patients with isolated systolic hypertension (1991 ACP Journal Club Archives) [5]. Furthermore, Shekelle *et al.* [6] emphasized that over 25% of stroke incidence in persons aged 65 to 74 years may be attributable to hypertension.

Uncontrolled diabetes also contributed significantly to stroke risk in our cohort. 50% of cases exhibited random blood sugar levels above 250 mg/dL, and 48% of patients were known diabetics with poor glycemic control. Chronic hyperglycemia not only exacerbates the atherogenic profile but also increases infarct size, with Tuttolomondo *et al.* [7] reporting that diabetics have twice the risk of stroke compared to non-diabetics. The presence of metabolic syndrome, observed in 26% of our cases, further compounds this risk. The clinical presentation of stroke in our study was predominantly characterized by motor weakness, with left-sided weakness being more common. Interestingly, our data indicated a predominance of right hemispheric involvement, which contrasts with other studies that have reported a higher frequency of left hemisphere involvement; Hedna *et al.* [8] have previously highlighted these hemispheric differences in stroke presentation.

A subset of patients (18%) presented with fever (temperature >38°C), likely secondary to microaspiration, aspiration pneumonia, or other infections. The prognosis in these patients was poor, with a 55% rate of death or clinical worsening compared to only 4% in patients with lower temperatures. Georgilis *et al.* [9] reported that fever in acute stroke is associated with older age, greater stroke severity, and poorer outcomes, while Wrotek *et al.*[10] found that high body temperature correlates significantly with increased lesion size, higher mortality, and worse neurologic outcomes.

Prognostication using the Glasgow Coma Scale (GCS) demonstrated that patients with a GCS score of less than 8 had a markedly poor outcome, with an observed mortality rate of approximately 85%, whereas patients with higher scores fared much better. Weir *et al.*[11] confirmed that the GCS provides valuable predictive information for stroke outcomes, with the verbal score offering additional prognostic significance even in the presence of dysphasia. Additionally, our investigation examined the National Institute of Health Stroke Scale (NIHSS) on admission. Patients with an NIHSS score greater than 21 (representing 16% of cases) experienced significantly worse outcomes, including death or clinical deterioration in seven cases. Sacco *et al.*[12] demonstrated that an elevated NIHSS score and high initial systolic blood pressure were independent predictors of poor outcome at 6 months, with nearly half of elderly stroke patients being either dependent or deceased.

All patients received physiotherapy and occupational therapy, and functional status was evaluated using the Orpington Prognostic Scale. Fourteen percent of cases had a severe Orpington score, which correlated with a poor prognosis. Mohapatra *et al.*[13] showed that a low Orpington score (<3.2) is highly predictive of discharge home, whereas a high score (>3.2) is strongly associated with the need for further inpatient management. An additional study using the Orpington score for prognostic stratification in elderly stroke patients further supported its utility in identifying those who may benefit most from early rehabilitation interventions.

In a broader context, short-term mortality predictors in acute stroke were also explored using decision tree analysis. Das *et al.*[14] identified key variables such as delayed recovery of consciousness, new onset acute myocardial infarction/congestive cardiac failure, and aspiration pneumonia as significant predictors of mortality. Other important factors included age above 60 years, severe neuro deficits (GCS <7, grade I/V motor weakness), and extensive lesions (infarcts involving more than one lobe).

Conclusion

This study analyzed the clinical profile, risk factors, and prognostic indicators in elderly patients (≥60 years) with acute ischemic stroke in a tertiary care setting. The mean age was 71 years, with a male predominance. Hypertension (66%) and diabetes (48%) were the most significant risk factors, with uncontrolled diabetes and metabolic syndrome (26%) contributing to stroke incidence. Motor weakness, particularly left-sided, was the most common clinical presentation. Fever (>38°C) was associated with worse outcomes, primarily due to aspiration pneumonia. Prognostic assessment showed that a Glasgow Coma Scale (GCS) score <8 had 85% mortality, and an NIHSS score >21 was linked to poor prognosis. Functional recovery was better in patients with mild-to-moderate Orpington scores.

Effective stroke management requires strict blood pressure and glucose control, early initiation of antiplatelets and statins, and lifestyle modifications to reduce risk. Comprehensive rehabilitation, including physiotherapy and occupational therapy, plays a crucial role in recovery. Triage using GCS, NIHSS, and Orpington scales can help predict outcomes and optimize care. A dedicated stroke unit with a multidisciplinary team can significantly improve patient recovery and long-term prognosis.

Declarations

Human subjects

Consent for treatment and open access publication was obtained or waived by all participants in this study. Lokmanya Tilak Municipal Medical College and General Hospital issued approval

IEC/DISS/118/19. The IEC-II hereby approves the proposal entitled Protocol version no. 1.2 "ACUTE CONFUSIONAL STATE IN ELDERLY: PROGNOSTIC FACTORS AND OUTCOME".

Animal subjects

All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest

None

Payment/services info

All authors have declared that no financial support was received from any organization for the submitted work.

Financial relationships

All authors have declared that they have no financial relationships at present or within the previous three years 9 of 10 with any organizations that might have an interest in the submitted work.

Other relationships

All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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