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Original Article

One-Month Mortality in Patients with Ischemic Stroke Using Score for Early Ischemic Stroke Mortality

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ABSTRACT

Objective: To determine one-month mortality in patients with ischemic stroke using Score for Early Ischemic Stroke Mortality.
Study Design: Prospective longitudinal study.
Place and Duration of Study: Combined Military Hospital, Jhelum Pakistan, from Jan 2020 to May 2021.
Methodology: All patients with acute ischemic stroke, aged more than 18 years, of either gender, were consecutively enrolled. Mortality at 1 month in patients with ischemic stroke was noted along with the demographic and clinical characteristics (comorbidities, smoking status, clinical stroke at admission, and cause of the stroke). Mortality at 1 month was predicted by using Predicting Early Mortality of Ischemic Stroke score. Additionally, National Institutes of Health Stroke Scale, Glasgow Coma Scale, and previous Modified Ranking Scale at admission was also recorded.
Results: Among 160 patients, the Mean age was 66.07±9.92 years. 121(75.6%) patients were males and 39(24.4%) were females. Mortality at 1 month was observed in 26(16.3%) patients. A significant association of mortality at 1 month was observed with age (p<0.001), dyslipidemia (p<0.001), hypertension (p=0.006), carotid stenosis (p<0.001), and atrial fibrillation (p<0.001). A significantly higher mean Predicting Early Mortality of Ischemic Stroke score (p<0.001), National Institutes of Health Stroke Scale score (p<0.001), previous Modified Ranking Scale (p<0.001) was noted among patients in whom mortality was observed at 1 month whereas Glasgow Coma Scale level (p<0.001) was found significantly lower in deceased patients. The Area Under the Curve of the Predicting Early Mortality of Ischemic Stroke score was 91.6% (95% CI 87.0%-96.1%).
Conclusion: The Predicting Early Mortality of Ischemic Stroke scoring system accurately predicted one-month mortality in patients with ischemic stroke.

Keywords: Ischemic stroke, Mortality, Predicting Early Mortality of Ischemic Stroke (PREMISE).

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INTRODUCTION

Stroke is a major health problem, in which 1 in every 4 adults over the age of 25 will suffer a stroke during their lives, with presently over 80 million people living in the world who have had a stroke. In terms of mortality, 5.5 million individuals die each year as a result of a stroke.[1,2] While several studies from developed countries have reported decline in the incidence and mortality of stroke[3,4] its risk factors are increasing alarmingly in developing counties.[5] People living in South Asian countries, such as Pakistan, are more at risk of stroke mortality compared to people living in other regions.[6,7] Many studies, conducted in Pakistan on the burden of stroke, have reported variations in the burden of the disease and its associated risk factors.[8,9] At present, no authorized registry exists that highlights the exact burden of the disease and its associated risk factors. Therefore, continuous monitoring and assessment is required, particularly among patients admitted in stroke units, to assess the true morbidity and mortality. Researchers have developed predictive scoring systems to assess the severity and risk of mortality in severe cases, with the efficacy of these scoring systems also reported in published studies. Predicting Early Mortality of Ischemic Stroke (PREMISE) is also a mortality predicting tool that has shown significant value in management of ischemic stroke patients. As a result, this study was planned to predict 1-month mortality in patients with ischemic stroke using PREMISE scoring tool.

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METHODOLOGY

The prospective longitudinal study was carried out at Combined Military Hospital, Jhelum Pakistan, from January 2020 to May 2021. Approval from the Ethics Committee of the institute was obtained prior to conducting the study (IERB Approval number 150). The Epi Info sample size calculator was used to calculate, using a reported mortality rate in patients with ischemic stroke 11.8%.[10]

Inclusion Criteria: Patients with acute ischemic stroke, aged >18 years, of either gender were included.

Exclusion Criteria: Any patients with renal failure and malignancy were excluded.

After outlining the benefits and drawbacks of the study, all study participants provided informed consent. Mortality at 1-month in patients with ischemic stroke was noted along with the demographic and clinical characteristics like comorbidities (dyslipidemia, hypertension, diabetes mellitus, carotid stenosis, and atrial fibrillation), smoking status, clinical stroke at admission, and cause of stroke. Mortality at 1-month was predicted by using PREMISE score (Table-I). In addition, National Institutes of Health Stroke Scale (NIHSS), Glasgow Coma Scale (GCS), and previous modified ranking scale (mRS) at admission was also noted.

Table-I: Predicting Early Mortality of Ischemic Stroke (PREMISE) Score

Risk Factors for Stroke Unit Mortality	Points
Age, years	
60-69	+1
≥70	+2
Preexisting Disability	
Modified Rankin Scale scores 1–5	+1
Stroke Severity	
NIHSS 5–11	+2
NIHSS 12–23	+4
NIHSS ≥24	+5
Vascular Diseases	
Diabetes Mellitus/HTN/ Dyslipidemia	+1
Heart disease*	+1
Clinical Stroke Syndrome	
Posterior circulation stroke syndrome	+1
Stroke Cause	
Non-lacunar	+1
Maximal Score Points	12

*NIHSS indicates National Institutes of Health Stroke Scale. *Defined as coronary artery disease, heart failure, cardiomyopathy, or valve disease.*

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21. Mean and standard deviation was calculated for quantitative variables. Frequency and %ages were calculated for qualitative. The mean difference of age, and predictive scores such as PREMISE, NIHSS score, GCS, and previous mRS among patients with and without mortality were explored using independent t-test while association of mortality with predictive factors were computed using chi-square test where the *p*-value of ≤0.05 considered as significant. Area under the curve (AUC) of the PREMISE score was also observed taking mortality at 1-month as reference category.

RESULTS

Of 160 patients, the mean age was 66.07±9.92 years. There were 121(75.6%) males and 39(24.4%) females. Dyslipidemia was observed in 101(63.1%), hypertension in 129(80.6%), diabetes mellitus in 133 (83.1%), carotid stenosis in 97(60.6%), whereas atrial fibrillation in 52(32.5%) patients. Current smoking status was observed in 60(37.5%) patients, 66(41.3%) were former smokers, while 34(21.3%) never smoke. Clinical stroke at admission showed that most of the patients 53(33.1%) were presented with middle cerebral artery (MCA), 43(26.9%) with anterior cerebral artery, 38(23.8%) with Lacunar infarcts, whereas 26(16.3%) had posterior circulation infarction at admission. Microangiopathy was observed in 61(38.1%), macroangiopathy in 40(25%), cardiogenic embolism in 38(23.8%), whereas 21(13.1%) had unknown cause of stroke. Mortality at 1-month was observed in 26(16.3%). A significant association of mortality at 1-month was observed with age (p<0.001), dyslipidemia (p<0.001), hypertension (p=0.006), carotid stenosis (p<0.001), and atrial fibrillation (p<0.001) (Table-II).

The overall mean NIHSS score was found to be 21.21±4.66, GCS score was found to be 9.37±2.90, while previous mRS was found to be 2.83±1.02. The mean difference of predictive score for in-hospital mortality in causes of ischemic stroke with respect to mortality at 1-month showed a significantly higher mean PREMISE score (p<0.001), NIHSS score (p<0.001), previous mRS (p<0.001) among patients in whom mortality was observed at 1-month whereas GCS level (p<0.001) was found significantly lower in deceased patients (Table-III). The AUC of the PREMISE score was 91.6% (95% CI 87.0%-96.1%) (Figure).

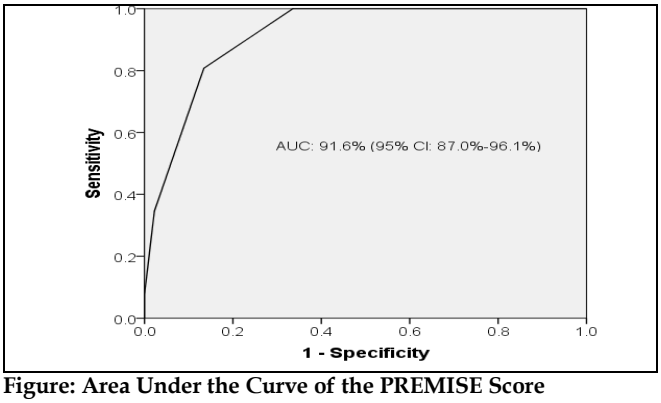

Figure: Area Under the Curve of the PREMISE Score

Table II: Comparison of Mortality with Baseline and Clinical Characteristics (n=160)

Characteristics	Study Patients		*p*-value
	Death (n=26)	Alive (n=134)	
Age, years	81.19±7.39	63.13±7.34	<0.001
≤65	2(2.2)	91(97.8)	<0.001
>65	24(35.8)	43(64.2)	
Gender			
Male	22(18.2)	99(81.8)	0.243
Female	4(10.3)	35(89.7)	
Risk Factors			
Hypertension	26(20.2)	103(79.8)	0.006
Diabetes Mellitus	24(18.0)	109(82.0)	0.172
Dyslipidemia	26(25.7)	75(74.3)	<0.001
Carotid Stenosis	25(25.8)	72(74.2)	<0.001
Atrial Fibrillation	21(40.4)	31(59.6)	<0.001
Smoking Status			
Current	13(21.7)	47(78.3)	0.015
Former (<5 years)	13(19.7)	53(80.3)	
Never Smoker	0(0)	34(100)	
Clinical Stroke at admission			
Lacunar infarcts	5(13.2)	33(86.8)	0.452
Middle Cerebral Artery	11(20.8)	42(79.2)	
Anterior Cerebral Artery	8(18.6)	35(81.4)	
Posterior Circulation Infarction	2(7.7)	24(92.3)	
Stroke cause			
Cardiogenic Embolism	11(28.9)	27(71.1)	<0.001
Macroangiopathy	1(2.5)	39(97.5)	
Microangiopathy	14(23.0)	47(77.0)	
Unknown	0(0)	21(100)	

Table-III: Mean Difference of Predictive Score for In-Hospital Mortality in Causes of Ischemic Stroke with Respect to Mortality Status of the Patients (n=160)

Predictive Scores	Study Patients		*p*-value
	Death	Alive	
	Mean±SD	Mean±SD	
Predicting Early Mortality from Ischemic Stroke	7.84±0.54	6.03±1.19	<0.001
National Institutes of Health Stroke Scale	27.23±5.06	20.05±3.56	<0.001
Glasgow Coma Scale	3.07±1.16	10.58±0.76	<0.001
Previous Modified Ranking Scale	3.54±1.61	2.68±0.81	<0.001

DISCUSSION

The findings of the current study showed that mortality at 1-month was found to be 16.3%. From the years 2000 to 2016, a crude age and gender adjusted stroke incidence of 95 for every 100,000 people per year[11] was reported in literature. Previous studies reported that in industrialized nations, the total mortality rate from stroke is between 10%-12% over the age of 65, and almost 88% of stroke deaths occur over the age of 65. In most developed countries, a reduction of roughly 7% has been reported in recent decades.[12] In the current study, the AUC of the PREMISE score was found to be 91.6%. Gattringer et al. in their study also reported somewhat similar AUC of the PREMISE score in predicting early mortality and the AUC of the PREMISE score was found to be 87.9%.[13] Another study reported increase in the risk of mortality with the increase in the PREMISE score.[14] Among ischemic stroke patients in whom mortality was observed at 1-month, the predictive score for mortality reported a significantly higher mean PREMISE score, NIHSS score, and previous mRS whereas GCS level was found significantly lower in deceased patients, as is evident from the findings from previous study as well.[14] According to the current study findings, a significant association of mortality at one month was observed with age, dyslipidemia, hypertension, carotid stenosis, and atrial fibrillation, similar to findings reported in literature.[15-21]

In the current study, no considerable association of mortality was observed with gender of the patients, similar to a previously published study.[22]

LIMITATION OF STUDY

This study did not report laboratory and hematological characteristics, and therapeutic profile of the patients.

CONCLUSION

The PREMISE scoring system is highly recommended scoring system to predict one-month mortality in patients with ischemic stroke at admission.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MJ & JW: Data acquisition, critical review, approval of the final version to be published.

SK & TI: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

ASA & FT: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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