



ORIGINAL ARTICLE

Predictors of morbidity and mortality during hospitalization following stroke.

Muhammad Akbar Memon¹, Kamran Baig Memon², Masood Uz Zaman Babar³, Uzma Aashique⁴, Kiran Hafeez⁵, Zia Farooqui⁶

Article Citation: Memon MA, Memon KB, Babar Masood Uz Zaman, Aashique U, Hafeez K, Farooqui Z. Predictors of morbidity and mortality during hospitalization following stroke. Professional Med J 2022; 29(3):339-344. <https://doi.org/10.29309/TPMJ/2022.29.03.6102>

ABSTRACT... Objective: To determine the predictors of morbidity and mortality during hospitalization caused by cerebrovascular accident. **Study Design:** Cross Sectional study. **Setting:** Emergency Department of Medicine, Isra University Hospital, Hyderabad. **Period:** October 2017 to May 2018. **Material & Methods:** We have evaluated a total of 124 patients who presented and were admitted with signs and symptoms of stroke and confirmatory diagnosis was made based on CT scan. All baseline and clinical variables recorded in a structured questionnaire and the data were evaluated in Statistical Package for the Social Sciences (SPSS) version 21.0. Outcome of these patients were observed based on the number of patients died during hospitalization and poor outcome associated predictors. **Results:** A total of 124 patients were selected for this study. The mean age of patients was 58.52 years (13.44 ± SD). In this observational study we have observed hypertension (N = 106, 85.5%) was the most common predictor of hospitalization among patients with stroke. The overall mortality associated with stroke was 16.13% (20 cases out of total 124). Infection of urinary tract during hospitalization, patients presented with unconsciousness, area of thalamic infarction, involvement of middle cerebral artery, and posterior cerebral artery infarction were the most common predictors of stroke related in-hospital mortality. **Conclusion:** Overall, corrected stroke related in-hospital mortality rate was 16.13% and patients who presented with loss of consciousness, infection of urinary tract, thalamic infarction, and area involving the middle cerebral artery were associated with higher in-hospital stroke related mortality.

Key words: Mortality, Predictors of Stroke, Pakistan.

INTRODUCTION

Stroke is a medical emergency due to a sudden alteration in blood supply to the brain, usually caused by a blocked artery (ischemic stroke) or a burst blood vessel (hemorrhagic stroke). Approximately 700,000 people suffer new or recurrent strokes in the United States each year, killing more than 150,000, and leaving many more people permanently disabled and overall 30-day mortality rate is about 8-12% for ischemic stroke and 37-38% for hemorrhagic stroke.¹

Worldwide concerns regarding its disability are increasing day by day because it is the third main cause of mortality and leading cause of disability. Population based studies have shown direct relation of stroke with increasing age, as the age increases the probability of new onset CVA also increases particularly this trend has

been observed in Southeast Asia regions. It is well recognized that stroke prevalence, mortality, and incidence varies widely in different parts of the world. Population-based epidemiological studies are lacking in many parts of Asia including Pakistan. Hospital-based registries have been particularly successful in identifying the peculiar clinical features of stroke in Asia. According to WHO report, total mortality due to stroke in Pakistan was 78,512. Case fatality rate averages about 35% but could be as low as 14.9% or as high as 77%. The stroke recurrence rate is about 5% per annum in those with previous stroke. Nowadays, up to 10% of patients with an acute ischaemic stroke die within 30 days of the onset of symptoms.^{2,3}

Several studies have been conducted regarding the predictors associated with poor outcome

1. MBBS, FCPS (Medicine), Assistant Professor Medicine, Isra University Hospital Hyderabad, Sindh, Pakistan.
2. MBBS, MD (Internal Medicine), Senior Registrar Medicine, Isra University Hospital Hyderabad, Sindh, Pakistan.
3. MBBS, FCPS (Neurology), Senior Registrar Neurology, Isra University Hospital Hyderabad, Sindh, Pakistan.
4. MBBS, (MD Medicine), Senior Medical Officer Medicine, Isra University Hospital Hyderabad, Sindh, Pakistan.
5. MBBS, FCPS (Medicine), Senior Registrar Medicine, Isra University Hospital Hyderabad, Sindh, Pakistan.
6. MBBS, MRCP, Senior Registrar Medicine, Isra University Hospital Hyderabad, Sindh, Pakistan.

Correspondence Address:
Dr. Muhammad Akbar Memon
Department of Medicine
Isra University Hospital Hyderabad, Sindh,
Pakistan.
akbar_physician@yahoo.com

Article received on: 24/09/2020
Accepted for publication: 14/06/2021

of patients with cerebral stroke but in Pakistan, there is a huge scientific gap present that has to be covered by conducting such study in which identification of poor morbidity and mortality factors can be addressed. That is why, due to this gap, we have planned to conduct this study in patients admitted with stroke to determine their poor prognostic factors associated with higher rates of morbidity and mortality rates so that it may help in determining the early management plans by the clinicians improved patients outcome.

MATERIAL & METHODS

This study was planned and conducted in the Emergency Department of Medicine of a Tertiary Care Hospital, Isra University Hospital, Hyderabad, between the periods of eight months from 1st October 2017 to 31st May 2018.

We have evaluated a total of 124 patients with a diagnosis of stroke and who presented and were admitted to department of emergency within 24 hours of symptoms of stroke, having age ranges between 25 years to 70 years of either gender were considered for enrollment in this study. Patients with subarachnoid hemorrhage/sub dural hematoma, complete heart block and/or acute myocardial infarction, head injury, meningitis, encephalitis, tuberculoma, and chronic renal failure were excluded from the study. Informed consent was sought from the patient and if the patient was unable to give consent then the consent was taken from the patient's family.

Diagnosis of cerebral stroke was made based on the signs and symptoms of cerebral stroke and was confirmed using radiology technique (CT scan). A preformed structured questionnaire was used to collect the relevant data regarding basic demographics (such as age, gender, area of residence, marital status, and level of education), clinical data (such as common risk factors of stroke, associated conditions with stroke, and presenting complaints), and laboratory parameters (such as complete blood count (CBC), serum creatinine, blood urea, total bilirubin, prothrombin time with international normalized ratio, serum albumin, serum sodium, serum potassium, serum chloride, and serum bicarbonate). The data were

evaluated in Statistical Package for the Social Sciences (SPSS) version 21.0 and a p value of <0.05 is considered to be statistically significant.

RESULTS

The study subjects consisted of 90 males (72.58%) and 34 (27.42%) females. Minimum age of the study participant was 30 years and maximum was 65 years. The mean age of patients was 58.52 years (13.44 ±SD). Out of 124 patients a total of 98 patients (79.03%) were of Sindhi ethnicity and the least frequent was Pathan ethnicity 1 case (0.81%) and most of the patients have non-primary education level (N = 83 cases, 66.94%) and only 9 cases (7.26%) have education level ≥graduate.

Risk factors among patients with stroke were evaluated. Most common risk factor that we have observed in our study was hypertension (N = 106, 85.5%), then second most prevalent risk factor was presence of Diabetes Mellitus (N = 43, 34.7%), after that underlying coronary artery disease (N = 28, 22.6%), and the least prevalent was history of previous stroke (N = 8, 6.5%).

There were two main objectives of the study. First was to find out the correctly predicted frequency of death in patients who were admitted and diagnosed as a case of stroke. The outcome was divided into three main categories, those who died, those who discharged without improvement, and those who become discharged with improvement. The overall mortality associated with stroke was 16.13% (20 cases out of total 124). [Outcome of these patients demonstrated via Figure-1].

Second objective was to assess the factors predicting mortality rate. When comparing the baseline demographics, the Sindhi ethnic group and those who had non-primary education level were significantly associated with poor outcome (p value 0.01 and <0.01, respectively). There is an insignificant association were observed when predicting the outcome in stroke patients in association with conventional underlying risk factors of stroke (p value >0.05). On the other hand, infection of urinary tract infection during hospitalization observed to be associated

with poor outcome of the patients (p value 0.002). Those patients who presented with unconsciousness were more likely to have poor stroke associated outcome when comparing with other patient's presenting complains (p value <0.05). Area of thalamic infarction is the significant predictor of poor outcome of patient (p value 0.022) as compared to other brain area involved in stroke (p value >0.05). Patients of stroke who had involvement of middle cerebral artery were significantly associated with poor overall outcome (p value 0.048) as compared with anterior (p value 0.729) and posterior cerebral arteries (p value 0.145), respectively. [Mortality predictors are presented via Tables-I to VI].

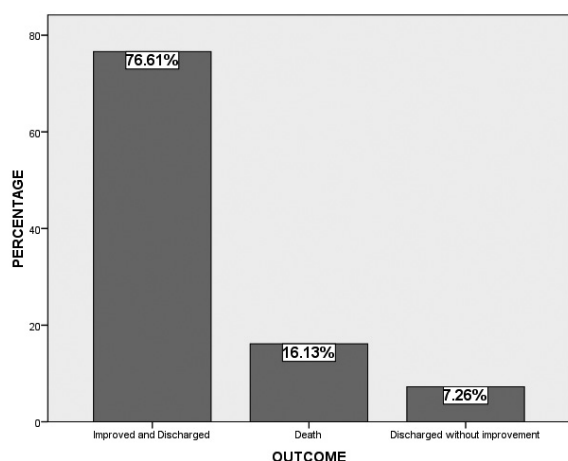


Figure-1. Stroke associated outcome of our study participants. (N = 124)

Variables	Died (N = 20)	Survived (N = 104)	P-Value
Gender			
Male	14	76	0.77
Female	6	28	
Ethnicity			
Sindhi	17	81	0.01*
Punjabi	2	3	
Urdu	0	20	
Pathan	1	0	
Level of Education			
Non-Primary	8	75	≤0.01*
Primary	6	16	
Matric	0	10	
≥Graduate	6	3	

Table-I. Baseline characteristics as a predictor of stroke. (N=124)

*A p value of <0.05 is considered as statistically significant.

Risk Factors	Died (N = 20)	Survived (N = 104)	P-Value
Diabetes Mellitus			
Yes	7	36	0.97
No	13	68	
Hypertension			
Yes	16	90	0.44
No	4	14	
History of Previous Stroke			
Yes	2	6	0.48
No	18	98	
Coronary Artery Disease			
Yes	6	15	0.88
No	14	89	

Table-II. Conventional risk factors of stroke as a predictor of stroke hospitalized in our hospital. (N = 124)

*A p value of <0.05 is considered as statistically significant.

Comorbid Conditions	Died (N = 20)	Survived (N = 104)	P-Value
Chronic Kidney Disease			
Yes	0	1	0.66
No	20	103	
Chronic Obstructive Pulmonary Disease			
Yes	4	24	0.51
No	16	80	
Pneumonia			
Yes	9	39	0.34
No	11	65	
Urinary Tract Infection			
Yes	11	21	0.002*
No	9	83	

Table-III. Comorbid conditions as an outcome predictor of stroke. (N = 124)

*A p value of <0.05 is considered as statistically significant

Presenting Complains	Died (N = 20)	Survived (N = 104)	P-Value
Right Sided Weakness			
Yes	7	59	0.062
No	13	45	
Unconsciousness			
Yes	18	43	≤0.001*
No	2	61	
Fever			
Yes	12	46	0.147
No	8	58	
Left Sided Weakness			
Yes	4	39	0.103
No	16	65	

Table-IV. Presenting complains as an outcome predictor of stroke. (N = 124)

*A p value of <0.05 is considered as statistically significant

CT Scan Findings	Died (N = 20)	Survived (N = 104)	P-Value
Right Sided Involvement			
Yes	6	34	0.519
No	14	70	
Hypodense Area			
Yes	10	63	0.262
No	10	41	
Hyperdense Area			
Yes	9	34	0.209
No	11	70	
Left Sided Involvement			
Yes	10	43	0.317
No	10	61	
Basal Ganglia			
Yes	11	40	0.13
No	9	64	
Thalamus			
Yes	8	18	0.022*
No	12	86	
Cerebellum			
Yes	4	10	0.179
No	16	94	

Table-V. Computed tomographic findings as an outcome predictor of stroke. (N = 124)

*A p value of <0.05 is considered as statistically significant

Artery Involved	Died (N = 20)	Survived (N = 104)	P-Value
Middle Cerebral Artery			
Yes	10	29	0.048*
No	10	75	
Anterior Cerebral Artery			
Yes	2	8	0.729
No	18	96	
Posterior Cerebral Artery			
Yes	3	6	0.145
No	19	98	

Table-VI. Culprit cerebral artery and its relation as an outcome predictor of stroke. (N = 124)

*A p value of <0.05 is considered as statistically significant

DISCUSSION

Stroke is becoming an important cause of premature death and disability in low-income and middle-income countries like Pakistan, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors.² The distribution of the burden of stroke morbidity and mortality is heterogeneous in the

US population and is changing dramatically with time. Stroke mortality remains the third leading cause of death in the United States, accounting for 1 in every 15 deaths during 1992.^{3,4} Stroke is a significant medical problem that affects more than 700,000 Americans annually. In the United States, it is the third leading cause of death, the major cause of disability, and the primary reason for nursing home admissions.

In comparison with developed countries, it is estimated and documented in the previous literatures that stroke has the double overall burden in developing countries. The prevalence of stroke in Pakistan is 21.8%.^{5,6} In our study most of the patients of stroke were of older age group with a mean age in years were 58.2. This mean age is quite higher in our study when comparing it with a latest literature review published by the Mohammad Wasay and colleagues in 2014 from Karachi mentioned a mean age of patients with stroke was 45 years.⁷ This variation in the mean age could possibly be due to areas where the studies were conducted because these both studies were hospital based. On the other hand, our observed findings are consist of slightly younger group of population than the international data where the mean age is slightly higher (69.6)⁸ which is due to their improved quality of life and advancement in the medical field. Our study population were comprises of male predominance. This gender predominance is also seen in both national and international literature.^{9,10}

High blood pressure is the single most common risk factor and attributed to be the number one cause of stroke by the American heart association and American stroke association.¹¹ The most common risk factor observed in our study patients with stroke was also hypertension followed by diabetes mellitus, coronary artery disease, and less common was previous history of stroke. National data from Pakistan in previously conducted studies also favor our findings.¹²

Stroke Patients in our study had varying degree of presenting complaints but the most common was hemiparesis of right side and then the second common complaint was unconsciousness.

The same findings were also observed in studies conducted by Leach RA in 2010 and Gargano JW and colleagues in 2009 where in their studies the findings were consistent with unilateral hemiparesis were their chief presenting complaints.^{13,14}

Every hour, 15 individuals on average die of a stroke in the United States. Fortunately, recent data suggest that overall annual stroke death rates are steadily declining.¹⁵ Our study's main objectives were to correctly determine the mortality rates associated with stroke and the predictors which affects in-hospital outcome. Our study find out that patient with stroke had overall mortality rate of 16.13% (N = 20). A recent study conducted in Southern Iran which included 16351 patients with stroke of different age groups had slightly higher percentage of stroke associated mortality in comparison with ours (20%).¹⁶ This could be due to larger number of patients they have enrolled in his study. On the other hands, the in-hospital stroke associated mortality in America was quite lower (8.9%).¹⁵ The possible reason is could be due to their improved health care system in comparison with ours. In Pakistan, the stroke related fatality rate varies from 7% to 20% in different studies which clearly demonstrates best the health care system would be the reason of decrease in stroke related in-hospital mortality because the risk factors are the same as in western countries like Hypertension and diabetes mellitus but the difference is probably is the in-hospital care.¹⁷

There are certain factors which directly or indirectly affect the in-hospital outcome of patients with stroke. In our study population, Sindhi ethnic group and those who had low literacy level were the most important baseline predictors of poor in-hospital outcome. The basic reason behind these observations is that more than 90% of the presenting patients were from Sindhi ethnicity and belongs to rural areas. Risk factors such as hypertension and diabetes mellitus although play an important role in determining the occurrence of stroke but they are less significant in determining the in-hospital outcome of patients with stroke, that we have observed from our study. Admitted

patients those who develop infection particularly urinary tract infection are more likely to have poor in-hospital outcome.

In our study, we have observed that clinical presentation of patients with stroke has association with in-hospital disease outcome. Patients who presented with unconsciousness were suffered from poor in-hospital outcome as compared with those who presented with hemiparesis of any side of the body. Patients with thalamic infarction and those who had involved brain area of middle cerebral artery were significantly associated with poor in-hospital outcome.

CONCLUSION

Most of the patients in our study with stroke presented in their late fifth decade with male predominance. The single most important risk factor in our patients of stroke was hypertension but it has no significant association with stroke related in-hospital mortality. Overall, corrected stroke related in-hospital mortality rate was 16.13% and patients who presented with loss of consciousness, infection of urinary tract, thalamic infarction, and area involving the middle cerebral artery were associated with higher in-hospital stroke related mortality.


Copyright© 14 June, 2021.

REFERENCE

1. Rosamond WD, Folsom AR, Chambless LE, Wang CH, McGovern PG, Howard G, et al. **Stroke incidence and survival among middle-aged adults: 9-year follow-up of the Atherosclerosis Risk in Communities (ARIC) cohort.** Stroke 1999 Apr; 30(4):736-43.
2. Khealani BA, Hameed B, Mapari UU. **Stroke in Pakistan.** J Pak Med Assoc 2008 Jul; 58(7):400-3.
3. Everson-Rose SA, Roetker NS, Lutsey PL, Kershaw KN, Longstreth WT, Jr., Sacco RL, et al. **Chronic stress, depressive symptoms, anger, hostility, and risk of stroke and transient ischemic attack in the multi-ethnic study of atherosclerosis.** Stroke 2014 Aug; 45(8):2318-23.
4. Sacco RL. **Risk factors, outcomes, and stroke subtypes for ischemic stroke.** Neurology 1997 Nov; 49(5 Suppl 4):S39-S44.

5. Khatri IA, Wasay M. **Can we stop the stroke epidemic in Pakistan?** J Coll Physicians Surg Pak 2011 Apr; 21(4):195-6.
6. Pandian JD, Sudhan P. **Stroke epidemiology and stroke care services in India.** J Stroke 2013 Sep; 15(3):128-34.
7. Wasay M, Khatri IA, Kaul S. **Stroke in South Asian countries.** Nat Rev Neurol 2014 Mar; 10(3):135-43.
8. Wang Y, Rudd AG, Wolfe CD. **Age and ethnic disparities in incidence of stroke over time: The South London Stroke Register.** Stroke 2013 Dec; 44(12):3298-304.
9. Gibson CL. **Cerebral ischemic stroke: Is gender important?** J Cereb Blood Flow Metab 2013 Sep; 33(9):1355-61.
10. Kamal AK, Itrat A, Murtaza M, Khan M, Rasheed A, Ali A, et al. **The burden of stroke and transient ischemic attack in Pakistan: a community-based prevalence study.** BMC Neurol 2009; 9:58.
11. Meschia JF, Bushnell C, Boden-Albala B, Braun LT, Bravata DM, Chaturvedi S, et al. **Guidelines for the primary prevention of stroke: A statement for healthcare professionals from the American Heart Association/American Stroke Association.** Stroke 2014 Dec; 45(12):3754-832.
12. Taj F, Zahid R, Syeda UE, Murtaza M, Ahmed S, Kamal AK. **Risk factors of stroke in Pakistan: A dedicated stroke clinic experience.** Can J Neurol Sci 2010 Mar; 37(2):252-7.
13. Gargano JW, Wehner S, Reeves MJ. **Do presenting symptoms explain sex differences in emergency department delays among patients with acute stroke?** Stroke 2009 Apr; 40(4):1114-20.
14. Leach RA. **Patients with symptoms and signs of stroke presenting to a rural chiropractic practice.** J Manipulative Physiol Ther 2010 Jan; 33(1):62-9.
15. Ovbiagele B. **Nationwide trends in in-hospital mortality among patients with stroke.** Stroke 2010 Aug; 41(8):1748-54.
16. Borhani-Haghighi A, Safari R, Heydari ST, Soleimani F, Sharifian M, Yektaparast KS, et al. **Hospital mortality associated with stroke in southern Iran.** Iran J Med Sci 2013 Dec; 38(4):314-20.
17. Khatri IA, Wasay M. **Can we stop the stroke epidemic in Pakistan?** J Coll Physicians Surg Pak 2011 Apr; 21(4):195-6.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Muhammad Akbar Memon	All authors have contributed equally.	
2	Kamran Baig Memon		
3	Masood Uz Zaman Babar		
4	Uzma Aashique		
5	Kiran Hafeez		
6	Zia Farooqui		