

Ischemic Stroke: Risk Factors and Prediction of Length of Stay in Hospital

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ABSTRACT

Background: Stroke is one of the leading cause of disability as well as mortality throughout world. Multiple risk factors have different association with ischemic stroke and also different impact on length of stay in hospital.

Aim: To identify the major risk factors in patients of first ever ischemic stroke and impact of National institute of health stroke scale score and Modified Barthel Index score on length of stay in hospital.

Study design: Retrospective analysis

Setting: Medical Unit of Teaching Hospital, University College of Medicine Lahore.

Duration: 6 months (January-June 2018)

Methods: We enrolled 87 patients in our study who were admitted in medical unit with ischemic stroke. All information sorted out from medical record of the patients. Age & length of hospital stay documented as mean + SD, risk factors as frequency and percentages. NIHSS and MBI score were noted. Data were analyzed in SPSS version 21. Relationship of NIHSS and MBI with length of hospital stay was determined using regression analysis.

Results: A total 87 patients, age of 58.5 ± 15 years, mean length of stay 3.8±3.1 days. Hypertension was found in 56%, smoking 37%, diabetes 24%, Ischemic heart disease 18%, atrial fibrillation 11% and valvular heart diseases in 3% cases. NIHSS score more than 16 was related to greater than 7 days stay in hospital in 85% cases while MBI score of less than 50 was associated with greater than 7 days stay in hospital in 92% cases showing significant results.

Conclusion: Hypertension, smoking, diabetes and ischemic heart disease are risk factors for Ischemic stroke while high NIHSS and low MBI score are predictors of longer hospital stay in patients of acute ischemic stroke.

Key words: Ischemic stroke, NIHSS score, MBI score.

INTRODUCTION

Stroke is one of the leading cause of disability as well as mortality throughout world. The causes of ischemic stroke could be multifactorial. It includes medical problems like hypertension, diabetes mellitus, ischemic heart disease, infections, atrial fibrillation, valvular heart diseases^{1,2}. The causes could be even large vessels arteritis or even undetermined in certain number of cases^{3,4}. It require lot of resources to provide standardized care and treatment to stroke patients and therefore it poses economic burden on healthcare providing facilities and system. This further aggravate the situation if these patients require prolonged admission in hospitals. Clinical trials show that significant number of patients with ischemic stroke need to be managed in medical emergency and in selected number of patients, there may be better outcome with the use of thrombolytic agents⁵.

Depending upon different protocols and practices in different countries, cost-effective measures are required along with speedy recovery of stroke patients as its management and definite treatment is quite expensive. The overall outcome of stroke depends upon multiple factors including underlying risk factors, mode of clinical

presentation as well as early and prompt start of treatment. Post admission NIHSS and MBI score were considered among the important factors to determine the patient outcome^{6,7}.

Risk factors minimization and prompt treatment may help to reduce overall clinical neurological deterioration especially in patients with large vessel atherosclerosis, aggressive medical treatment and early surgical intervention was helpful to have better neurological outcome^{8,9}. Considering different variables that contribute to overall cost of treatment and hospitalization, an important marker to measure resource utilization could be length of stay in hospital and it would be highly predictive of overall expense for the given patient treatment and management. Therefore, an accurate prediction of stay in hospital is becoming important for hospital administration and national health systems¹⁰.

The objective of the study was to identify the major risk factors in patients of first-ever ischemic stroke and impact of National institute of health stroke scale score and Modified Barthel Index score on length of stay in hospital.

OPERATIONAL DEFINITION:

First-Ever Ischemic Stroke: First episode of ischemic stroke and no previous history of transient ischemic attack or stroke; and onset of stroke within 48 hours before admission to hospital.

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MATERIAL & METHODS

We enrolled 87 patients in our study who were admitted in medical unit with ischemic stroke. All information was sorted out from medical record of the patients. Age & length of hospital stay documented as mean + standard deviation, risk factors as frequency and percentages. NIHSS and MBI score were noted. Data were analyzed in SPSS version 21. We used Regression analysis as statistical test to determine the relationship of NIHSS and MBI with length of hospital stay. This retrospective analysis was conducted in Medical Unit of Teaching hospital, University College of Medicine Lahore for a period of six months from January 2018 to June 2018. Convenient sampling technique was used. Sample size was 87 patients included

Inclusion/ Exclusion criteria: Patient aged 30-75 of either gender who presented with first ever episode of acute ischemic stroke that has been confirmed on radiological modalities either CT scan or MRI scan in a duration of less than 48 hours. However, patients with stroke of more than 48 hours or referred from other hospital were excluded due to lack of complete information.

RESULTS

A total of 87 patients with mean age of 58.5 ± 15 years, mean length of stay 3.8±3.1 days. Hypertension was found in 56%, smoking 37%, diabetes 24%, Ischemic heart disease 18%, atrial fibrillation 11% and valvular heart diseases in 3% cases. NIHSS score more than 16 was

related to greater than 7 days stay in hospital in 85% cases while MBI score of less than 50 was associated with greater than 7 days stay in hospital in 92% cases showing significant results.

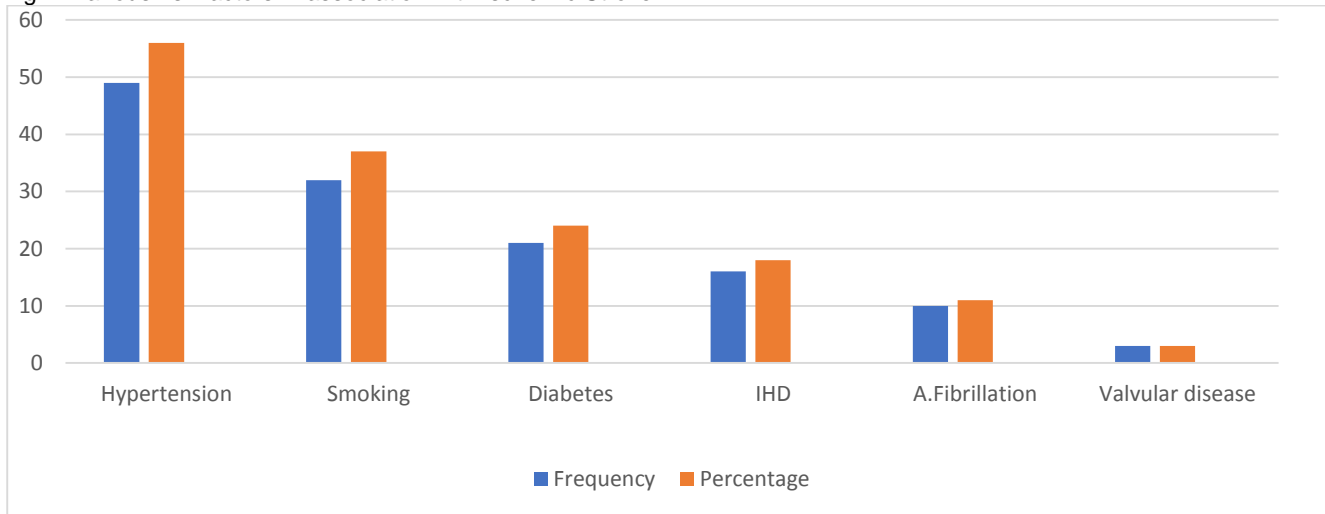
Table 1: Cross tabulation: NIHSS and length of stay (LOS) in hospital

| NIHS | Length of stay | | Total |
|-------------------------|----------------|----------|-------|
| | > 7days | < 7 days | |
| 0-6 | | | |
| Count | 1 | 10 | 11 |
| % within Length of stay | 7.7% | 13.5% | 12.6% |
| Count | 1 | 30 | 31 |
| 7 - 15 | | | |
| % within Length of stay | 7.7% | 40.5% | 35.6% |
| Count | 11 | 34 | 45 |
| > 16 | | | |
| % within Length of stay | 84.6% | 45.9% | 51.7% |
| Count | 13 | 74 | 87 |

Table 2: Cross tabulation: Modified Barthel Index score and length of stay.

| Modified Barthel Index score | Length of stay | | Total |
|------------------------------|----------------|----------|-------|
| | > 7days | < 7 days | |
| < 50 | | | |
| Count | 12 | 61 | 73 |
| % within Length of stay | 92.3% | 82.4% | 83.9% |
| > 50 | | | |
| Count | 1 | 13 | 14 |
| % within Length of stay | 7.7% | 17.6% | 16.1% |
| Count | 13 | 74 | 87 |

Fig.1: Various risk factors in association with Ischemic Stroke



DISCUSSION

This retrospective analysis was aimed to find the common risk factors leading to acute ischemic stroke as well as the determination of relationship of various scoring systems with the length of stay in hospital. We found that out of total 87 patients, hypertension was the leading risk factor while valvular heart disease the least one. However, diabetes mellitus, smoking, atrial fibrillation and ischemic heart disease were at different proportions and percentages. We also found that NIHSS score of more than 16 was related

to greater than 7 days stay in hospital in 85% cases while MBI score of less than 50 was associated with stay in hospital of greater than 7 days in 92% cases. The outcome and efficiency of treatment of post stroke patients is related to length of hospital stay. Ng, YS and colleagues analyzed a large cohort of stroke patients and their management in rehabilitation center and they concluded that early aggressive treatment helped to shorten the length of stay in hospital¹¹.

Another factor predicting the cost and length of hospital stay is the neutrophil to lymphocyte ratio. Zhao L and colleagues found in a study on 346 patients that Neutrophil count to lymphocyte count (NLR), diabetes mellitus, stroke subtype, and initial stroke severity were significantly associated with prolonged length of stay in hospital¹². Similarly, rheumatological conditions like antiphospholipid antibody syndrome has been considered as possible risk of hemorrhage in patients of ischemic stroke. This fact was documented by Mehta T and colleagues who also found antiphospholipid antibody syndrome as an independent risk factors of increasing length of stay in hospital and overall expenses of disease management¹³.

Considering clinical parameters on presentation Erdur H found that there is increased risk of mortality in patients who presented with ischemic stroke and a heart rate of equal to or more than 83 beats per minute. This is because of early negative effects of autonomic imbalance and it may be considered as prognostic as well as treatment target to help improve the disease outcome.¹⁴ Moving on to the more serious clinical presentation of patients of acute ischemic stroke requiring mechanical ventilation, Gupta P and colleagues conducted a prospective analysis to identify clinical predictors that could suggest the need for artificial ventilation in patients of stroke and they found that poor sensorium, motor loss and the progression of symptoms were independent predictors of it¹⁵. Cancer is another risk factor of poor outcome in patients of acute stroke. Cutting S found in a retrospective analysis that almost 50% patients of acute stroke having underlying cancer die at three months in spite of treatment¹⁶.

Our report is quite consistent with previously documented predictors of length of stay in hospital in stroke patients as i.e., Tian Mj and colleagues found that advanced age, longer stay in hospital, and significant cerebral infarction were associated with poor outcome and lesser number of discharge from hospital¹⁷. On the other hand, increasing NIHSS score was associated with poor outcome and increased mortality in addition to other multiple factors in a retrospective analysis conducted by Li S¹⁸. NIHSS in addition to other risk factors were found as an independent predictors of hospital stay and overall outcome of the patient supporting the importance of clinical characteristics related to neurologic impairment on admission¹⁹,

CONCLUSION

We concluded that hypertension, smoking, diabetes mellitus and ischemic heart disease are risk factors for Ischemic stroke while high NIHSS and low MBI score are predictors of longer hospital stay.

Conflict of interest: NIL

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