



# **To Determine the Mortality and Factors Responsible for Mortality in Patients Presenting with Acute Stroke within 5 Days of Admission at a Tertiary Care Hospital Hyderabad/Jamshoro**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Introduction:** Stroke is the third most common cause of death and the first leading cause of disability in developed and developing countries. Various clinical variables have been implicated as predictors of final outcome of acute stroke. These predictors are demographic characteristics, types of stroke, co-morbidities and therapy. Identification of modifiable predictors of death is of paramount importance for clinicians in resource poor-setting, so that specific therapies and management strategies can be applied to patients at high risk of dying.

**Objective:** To determine the mortality and factors responsible for mortality in patients presenting with acute stroke within 5 days of admission at a tertiary care Hospital, Hyderabad/Jamshoro.

**Setting:** Medical Unit-I, Liaquat University Hospital, Hyderabad/Jamshoro.

**Duration:** Six months from 01-02-2019 to 31-07-2019

**Design:** prospective, (non -interventional) study.

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**Subject and Methods:** Two hundred and fourteen acute stroke patients confirmed by CT scan brain were included in the study. Patients were assessed through history and examination and brief history was taken about the disease and cigarette smoking. Blood Pressure was measured twice. Patients who died during admission were evaluated for the factors responsible for the mortality. The findings of variables were entered in a Pro forma.

**Results:** The average age of the patients was  $55.65 \pm 8.38$  years. Frequency of mortality in patients presenting with acute stroke within 5 days of admission in hospital was observed in 29.91% (64/214) cases. Regarding factors leading to mortality, Rate of mortality was 23 times more like in those patients who had dyslipidemia [OR= 23.13 95%CI= 1.86 to 7.98] similarly mortality in patients was 2 to 4 times more likely in diabetic, hypertensive cases and smokers.

**Conclusion:** Frequency of mortality was high and factors leading to mortality within 5 days were dyslipidemia, diabetic, hypertensive cases. Mortality associated with acute stroke needs prevention and control of risk factors. Treatment and control of diabetes mellitus and hyperlipidemia have contributed to the stroke mortality declines; however, the onset of these interventions is more recent, and thus their impact is less clear.

*Keywords: Stroke; dyslipidemia; diabetic; hypertensive.*

## 1. INTRODUCTION

Stroke is the third most common cause of death and the first leading cause of disability in developed and developing countries [1]. World Health Organization (WHO) estimates, 5.5 million people died of stroke in 2008, and roughly 20% of these deaths occurred in South Asia [2]. Stroke specific mortality has been reported between 7% and 20% in various studies from Pakistan. About 10% of patients with an acute ischemic stroke die within 30 days with immense socioeconomic and health cost burden [3,4]. Various clinical variables have been implicated as predictors of final outcome of acute stroke. These predictors are demographic characteristics, types of stroke, co-morbidities and therapy [5,6]. Identification of modifiable predictors of death is of paramount importance for clinicians in resource poor-setting, so that specific therapies and management strategies can be applied to patients at high risk of dying [7].

Hypertension, a trial fibrillation, diabetes mellitus, ischemic heart disease, hyperlipidemia, cigarette smoking, alcohol abuse, obesity, physical inactivity, asymptomatic carotid stenosis, transient ischemic attack and other cardiac disorders are all potentially treatable conditions that predispose to stroke [8]. Diabetes mellitus doubles the risk of ischemic stroke and worsens survival of patients with acute stroke. The previous studies showed that the prevalence of diabetes ranged from 21% to 44.4% among patients with acute ischemic stroke and ranged from 25% to 37.5% among intracerebral hemorrhage [9,10]. Abnormalities of serum lipids are major risk factors for coronary heart disease

and most recently established as risk factor in cerebrovascular disease [11]. As many as 30% of all coronary heart disease (CHD) deaths each year are attributable to cigarette smoking, with the risk being strongly dose-related [12]. Smoking acts synergistically with other risk factors and nearly doubles the risk of ischemic stroke [13]. Zuhaid et al. found in his study that among 150 stroke patients, hypertension, diabetes and smoking was found in 127 (84.7%), 31 (20.7%) and 28 (16.7%) respectively [14]. Another study found hypertension in 60%, followed by smoking in 44.4%, diabetes in 25.5% and dyslipidemia in 18.8% [15]. The most frequent risk factors in another study included hypertension (86.8%) followed by diabetes mellitus (59.8%), dyslipidemia (59.1%), and smoking (18.1%) [16]. Development of pneumonia after stroke was associated with mortality at 30 days and 1 year, longer length of stay, and dependency at discharge. Patients who received more inpatient stroke services had reduced mortality after pneumonia [17]. The aim of this study is to determine the frequency of mortality and factors responsible for mortality in patients presenting acute stroke. The results of local data show variability. Moreover, in resource-poor setting, identification of factors responsible for mortality in acute stroke patients is of paramount importance for clinicians, so that specific therapies and management strategies can be applied to patients at high risk of dying.

## 2. OBJECTIVE

To determine the frequency of mortality and factors responsible for mortality in patients presenting with acute stroke within 5 days of

admission at a tertiary care Hospital Hyderabad/Jamshoro.

### 3. OPERATIONAL DEFINITIONS

**Acute stroke:** Rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin, proven by CT scan brain showing hypodense area (ischemic stroke) or hyperdense area (hemorrhagic stroke), was labeled as having suffered from stroke.

**Mortality:** The state of being subject to death within 5 days of admission after acute stroke

### 4. PREDICTORS OF MORTALITY

**Hypertension:** Patients was labeled as having hypertension who have two measurements of blood pressure >160/95.

**Diabetes mellitus Type 2:** Patient was labeled as having type 2 diabetes mellitus when RBS on two occasions is more than 200 mg/dl.

**Cigarette smoking:** Patients was labeled as cigarette smokers who smoked at least one cigarette/tobacco per day for preceding three months.

**Dyslipidemia:** Patients was considered as having dyslipidemia with the presence of any one of the following:

Lipid Profile: Cholesterol	> 200 mg/dL
Triglyceride	> 150 mg/dL
LDL	> 100 mg/dL
HDL	< 40 mg/dL

### 5. MATERIALS AND METHODS

**Study design:** Descriptive study.

**Study setting:** Study was conducted at Medical Unit-I, Liaquat University Hospital Hyderabad/Jamshoro.

**Duration of Study:** Six months from 01-02-2019 to 31-07-2019

**Sample size:** The required sample size was calculated using WHO software by taking the least prevalence amongst the predictors 16.7%, confidence level "C.I" = 95%,d=0.05.the sample size came out to be 214 patients.

**Sampling technique:** consecutive patients (Non probability)

#### 5.1 Sample Selection

**Inclusion criteria:**

- Patients presented within 7 days of acute stroke confirmed by CT scan brain was included in the study.

- Either gender.
- Age 30-70 years.

**Exclusion criteria:**

Patients with:

- Secondary stroke.
- H/O head injury or subarachnoid hemorrhage.
- H/O hyperthyroidism or hypothyroidism.
- On anticoagulant drugs or steroids prior to onset of stroke.
- Renal impairment and chronic obstructive pulmonary disease, chronic liver disease and CCF was excluded.
- Nonvascular causes (primary and metastatic neoplasm, post seizure paralysis, head trauma, hyper coagulable disorder, venous sinus thrombosis and vasculitis) that lead to brain function deficit.

#### 5.2 Data Collection Procedure

This study was conducted on the patients who meet the inclusion criteria of the study. Consecutive cases as defined in operational definition, meeting inclusion and exclusion criteria were enrolled in the study from the outpatient department of Medical Unit-I, LUH Hyderabad/Jamshoro. Patients were assessed through history and examination and brief history was taken about the disease and cigarette smoking. Blood Pressure was measured twice by the researcher using a standard mercury sphygmomanometer, after five minutes and the mean systolic and diastolic blood pressure was used for analysis. Blood sample was collected in a sterile manner after an overnight fasting of 12 hours for fasting blood HbA1c, serum cholesterol, triglycerides, LDL, VLDL and HDL levels. Patients who will die during admission were evaluated for the factors responsible for the mortality. The findings of variables as mentioned above were entered in a proforma attached as annexure.

#### 5.3 Data Analysis Procedure

Data was analyzed by SPSS version 16.0. Demographic data was presented as simple descriptive statistics, giving mean and standard deviation for age of the patient, BMI, and duration of disease. For qualitative variables like gender, BMI, socioeconomic status, type of stroke (ischemic/hemorrhagic) hypertension

(yes/no), diabetes status (yes/no), smoking status and dyslipidemia (yes/no), and mortality (yes/no) was presented as frequency and percentages. Effect modifiers was controlled through stratification of age, gender, BMI, socioeconomic status, type of stroke to see the effect of these on outcome variable. Post stratification chi square test was applied taking p-value of  $\leq 0.05$  as statistically significant.

Logistic multiple regression model was used, and the co-variates was adjusted for each independent (regression) variable to find independent predictors of in-hospital mortality.

## 6. RESULTS

Two hundred and fourteen acute stroke patients confirmed by CT scan brain were included in the study. Age distribution of the patients is presented in Fig. 1. The average age of the patients was  $55.65 \pm 8.38$  years. The average BMI and duration of disease was also shown in Table 1.

There were 59.81% (128/214) male and 40.79% (86/214) female. Most of the patients were belong to middle class. Out of 214, 53.74%

patients had ischemic stroke and 46.26% had hemorrhage stroke as shown in Fig. 2.

Frequency of mortality in patients presenting with acute stroke within 5 days of admission in hospital was observed in 29.91% (64/214) cases. Regarding factors leading to mortality, Rate of mortality in patients presenting with acute stroke within 5 days was 23 times more like in those patients who had dyslipidemia [OR= 23.13 95%CI= 1.86 to 7.98] similarly mortality in patients presenting with acute stroke within 5 days was 2 to 4 times more likely in diabetic, hypertensive cases and smokers.

Stratification analysis was performed and rate of mortality was observed with respect to age groups, gender, BMI, Socioeconomic status and type of stroke but there were not significant difference in mortality in all these stratified variables as shown in Table 2. Multivariate logistic regression was applied to observed effect of stratified variables of outcome and observed that higher age (61 to 70 years of patients), gender, hypertension, smoker and dyslipidemia increased mortality in patients presenting with acute stroke within 5 days as shown in Table 3.

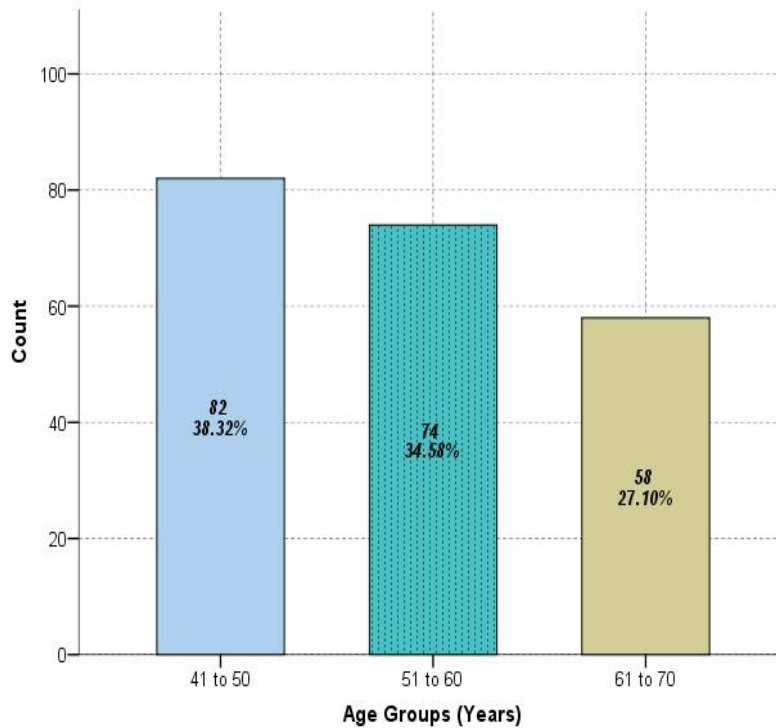
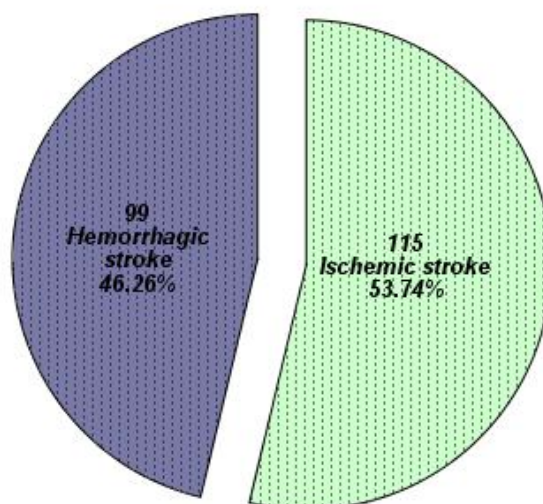


Fig. 1. Age distribution of the patients N=214

**Table 1. Descriptive statistics of characteristics of the patients**

Statistics		Age (Years)	BMI (kg/m <sup>2</sup> )	Duration of disease (Years)
Mean		55.65	28.330	3.30
Std. Deviation		8.38	4.77	1.57
95% Confidence Interval for Mean	Lower Bound	54.52	27.686	3.09
	Upper Bound	56.78	28.973	3.51
Median		55.00	27.615	3.00
Interquartile Range		12	6.3	3

**Fig. 2. Type of stroke of the patients N=214****Table 2. Frequency of mortality in patients presenting with acute stroke within 5 days of admission in hospital stratified by different variables**

Variables	Mortality		P-value
	Yes	No	
<b>Age Groups (Years)</b>			0.16
41 to 50	22(34.4%)	60(40%)	
51 to 60	19(29.7%)	55(36.7%)	
61 to 70	23(35.9%)	35(23.3%)	
<b>Gender</b>			0.19
Male	34(53.1%)	94(62.7%)	
Female	30(46.9%)	56(37.3%)	
<b>BMI (kg/m<sup>2</sup>)</b>			0.78
Normal	15(23.4%)	29(19.3%)	
Overweight	28(43.8%)	71(47.3%)	
Obese	21(32.8%)	50(33.3%)	
<b>Socioeconomic Status</b>			0.91
Upper	9(14.1%)	20(13.3%)	
Middle	49(76.6%)	113(75.3%)	
Lower	6(9.4%)	17(11.3%)	
<b>Type of Stroke</b>			0.28
Ischemic	38(59.4%)	77(51.3%)	
Hemorrhagic	26(40.6%)	73(48.7%)	

**Table 3. Multivariate analysis of factor responsible for mortality in patients presenting with acute stroke within 5 days of admission at hospital**

Factors responsible For mortality	Mortality		P-value	Odd ratio	95%CI of OR	
	Yes	No			Lower	Upper
<b>Age Groups (Years)</b>						
41 to 50 Years	22(34.4%)	60(40%)	.	Ref		
51 to 60 Years	19(29.7%)	55(36.7%)	0.39	0.61	0.19	1.89
61 to 70 Years	23(35.9%)	35(23.3%)	0.03*	3.28	1.07	10.04
<b>Gender</b>						
Male	34(53.1%)	94(62.7%)	0.006*	0.26	0.09	0.68
Female	30(46.9%)	56(37.3%)		Ref		
<b>Body Mass Index (kg/m<sup>2</sup>)</b>						
Normal	15(23.4%)	29(19.3%)	0.89	Ref		
Overweight	28(43.8%)	71(47.3%)	0.66	1.27	0.43	3.68
Obsess	21(32.8%)	50(73.3%)	0.86	1.10	0.34	3.48
<b>Socio Economic Status</b>						
Upper Class	9(14.1%)	20(13.3%)		Ref		
Middle Class	49(76.6%)	113(75.3%)	0.65	1.534	0.23	10.19
Lower Class	6(9.4%)	17(11.3%)	0.13	2.504	0.76	8.25
<b>Type of Stroke</b>						
Hemorrhage	26(40.6%)	73(48.7%)	0.50	.756	0.33	1.71
Ischemic	38(59.4%)	77(51.3%)		Ref		
<b>Diabetic Mellitus</b>						
Yes	42(65.6%)	76(50.7%)	0.34	1.56	0.62	3.91
No	22(34.4%)	74(49.3%)		Ref		
<b>Hypertensive</b>						
Yes	55(85.9%)	87(58%)	0.0005*	7.57	2.67	21.41
No	9(14.1%)	63(42%)		Ref		
<b>Smoker</b>						
Yes	20(31.3%)	16(10.7%)	0.0005*	10.35	2.94	36.42
No	44(68.8%)	134(89.3%)		Ref		
<b>Dyslipidemia</b>						
Yes	60(93.8%)	59(39.3%)	0.0005*	24.51	7.58	79.29
No	4(6.3%)	91(60.7%)				

OR- Odd Ratio; Ref. Reference group, Model Accuracy =82.7% Multivariate Logistic regression applied

## 7. DISCUSSION

Stroke is a rapidly developing phenomenon of focal and at times global loss of cerebral function with no apparent cause other than that of vascular origin [18]. Stroke is the second most common cause of death and the first leading cause of disability in developed and developing countries [19]. Moreover, according to WHO report 2002, total number of deaths due to stroke in Pakistan was 78512. Stroke specific mortality has been reported between 7% and 20% in various studies from Pakistan. It's having growth rate of 2% per year. Stroke and transient ischemic attacks (TIA) are highly prevalent in Pakistan. A recent community based study suggested approximately 21.8% prevalence of stroke and/or TIA in an urban slum of Karachi [20].

The average age of the patients was 55.65±8.38 years which is nearly similar to a study conducted in Nigeria but greater than a study conducted in Bannu district which is 57.5 years [21]. This may be due to lack of awareness regarding risk factors and health facilities in that under developed area resulting in an early initiation of the disease.

In this study there were 59.81% (128/214) male and 40.79% (86/214) female. In Zuhaid et al study showed male to female ratio of 1.5:1, similar to some other studies [22].

According to a World Health Organization (WHO) report from 2002, the total mortality from stroke in Pakistan is more than 75,000. The risk factors for stroke are classified as non-modifiable and modifiable. Non-modifiable risk factors

include age, family history, prior stroke, gender, and race, whereas modifiable risk factors are hypertension, diabetes mellitus, coronary artery disease, atrial fibrillation, dyslipidemia, cigarette smoking, obesity, valvular heart disease, homocystinemia, alcohol abuse, and physical inactivity [23].

In our study regarding factors leading to mortality, rate of mortality in patients presenting with acute stroke 23 times more like in those patients who had dyslipidemia, 2 to 4 times more likely in diabetic, hypertensive cases and smokers. In the present study dyslipidemia contributed equally to stroke occurrence, and this is a novel finding. The higher prevalence of dyslipidemia could be due to stress, smoking, and underlying diabetes.

## 8. CONCLUSION

Frequency of mortality was high in patients within 5 days of admission in hospital. Factors leading to mortality within 5 days was dyslipidemia, diabetic, hypertensive cases. Mortality associated with acute stroke needs prevention and control of risk factors. Treatment and control of diabetes mellitus and hyperlipidemia have contributed to the stroke mortality declines; however, the onset of these interventions is more recent, and thus their impact is less clear.

## CONSENT

Informed consent was obtained from all the patients for assigning them to sample and using their data in research.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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