Annals of R.S.C.B., ISSN: 1583-6258, Vol. 26, Issue 1, 2022, Pages. 2015 - 2024
Received 08 November 2021; Accepted 15 December 2021

Strokes Outcome Determinants in Pakistan Primary Stroke Center

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Abstract

Pakistan is among the leading Asian countries with high stroke mortality. The public perception & the knowledge level about the stroke outcome determinants are not cognizant. The primary aim of the study is to assess stroke outcomes determinant in Pakistan Institute of Medical science, Pakistan. This study assessed/evaluated a) demographic b)clinical c) outcome data of the patients with a) Ischemic stroke b) hemorrhagic stroke c) transient ischemic stroke (TIA) d) intra-cerebral hemorrhagic stroke (ICH), e) in-hospital mortality f) functional outcomes, admitted to the center along with the patient's demographic. Binary logistic regression & univariate analysis was performed for the analysis of the data .One hundred eighty four (184) stroke'spatients were included in the study, 52.20% being male with the 66.8±15.7 years means age. The stroke variations among the enrolled patients was; IS:59.2%, TIA: 29.6%, ICH:11.10%. This study report that ICH cases were associated with greater severe symptoms, poor prognosis & poor functional outcomes. The determinants of the poor functional outcomes were lower GCS (Glasgow coma score), higher NIHSS & reduced O_2 saturation level. Regarding the mortality determinant, visual symptoms presence was found to be the most important. Stroke outcomes determinants & stroke mortality found in this study is not significantly different from those found in the developed countries. Stroke prognosis is crucial in order to understand stroke's burden in the developing country like Pakistan.

Key Words: Strokes, Outcome, Determinants

Introduction

The study objective was to appraise stroke prognostic factors in population admitted in the primary stroke center of Pakistan.Stroke, as reported,is the leading of cause of disability, 2nd leading cause of cognitive impairments& 3rdleading cause of death in world[1]. It has been estimated that approximately 2/3rd of stroke-death occurs in the low & middle income

countries, stroke determinants& prognostic factors are poorly investigated in these region[2]. It has been reported that among western countries, Stroke is the leading cause of disability & death [3,4].

It has been reported that due to specified & determinable causes stroke incidence&prevalence has been increased by 20 percent in low –to-- middle income countries (LMIC). In LMIC country like Pakistan where 1/4th adults have one of life-long disorders, which includes:1) Type -II Diabetes 2) Hypertension 3) Cardiovascular disease- and these highly prevalent risks factors among the society across the society make the patients of LMIC susceptible to stroke. Due to lack of reliable epidemiologic data, snapshots show prevalence of 4.8% makes up 4 million stroke patients currently in Pakistan. To determine the actualincidence of stroke in Pakistan no large scale epidemiological studies has been carried out so for, however, the estimated annual incidence is 250/100,000, translating to 350,000 new cases/year, as reported in these studies[37,39-43]. The incidence, prevalence & burden of stroke in Pakistan remain speculative. Some studies has been carried out in Pakistan to find out the prevalence, incidence & burden of stroke in the country but the data insufficient to provide authentic stroke's audit in the country since most of researches were carried out in center or hospital with small sample size which can't be the reflection of the whole country[5]. Mostly conducted studies were carried out in the public hospital, thus, the data collected were socioeconomic inequality driven & the scarcity of the diagnostic & therapeutic resources in these hospitals proves its poor reliability. We haven't found any study carried out in Pakistan to investigate stroke outcome, stroke determinants & prognostic factors. Thus, the stroke-outcome measure in Pakistan is poorly known & needs to be investigated[5-10].

Studies carried out in the western developed countries have indentified these Variables as stroke-determinants, which includes: elder age, Atrial fibrillation, hypertension, higher score with the NIH stroke scale (NIHSS), diabetes mellitus, more time between the stroke onset & admission, low Glasgow scale score (GSS),visual field abnormalities presence at the time of initial assessment of the stroke patients are considered the prognostic factors[11-18].

Methods:

Thestudy was carried out between 2015-2018at PIMS hospital, Pakistan. The study was formerly approved by concerned ethical committee & subsequently informed written consent was taken from selected study patients or from their relatives. Patients were assessed by the Neurologists at the time of admission & submitted to the standardized protocol set for study. Data such as; delay- time between stroke onset & admission to the hospital, gender, urban/rural, age, stroke's warning signs (speech difficulty, numbness, comprehension, vision abnormalities, difficulty in walking, headache, dizziness & movement in-coordination weakness & confusion) & stroke's risk factors a) obesity b) smoking c) hypertension, d) diabetes mellitus e) familial history f) history of stroke (TIA) were compiled. The other routinely associated clinical data were also collected from these patients which includes; a) Vital signs b) capillary oxygen saturation levels c) GCS score.

After the baseline assessments, enrolled study's participants were submitted to non-contrast CT with 10mm slice (thickness level)& the radiological findingsseen in the stroke population are a) Brain infarct b) Dense artery sign c) Cerebral edema distant brain damage d) Intra-

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cerebral hemorrhage, were recorded for each patient. Subsequently, study's participants were diagnosed as having ischemic stroke (IS),Hemorrhagic stroke (HS), subarachnoid hemorrhage stroke (SHA) or intra-cerebral hemorrhage (ICH), according to the standard medicaldefinition[17]. Data were collected & compiled regarding the IS treatment such as; thrombolytic therapy, the venous thrombosis prophylaxis & the use of antithrombotic agent in the 1st 48hours of the stroke onset. Those patients which no stroke & SHA were excluded. The final outcome analysis was carried out only for the confirmed cases of ICH or IS among all the cases screened.

For the statistical analysis, we used SPSS version 23.0 for windows with P-value set at P<0.05 significance level, confidence interval-95%. Student's T-test was applied for continues data &chi-square testfor comparison of the categorical datawhile Kolmogorov – Smirnov test was used for the Normality assessment. Mortality in-hospital& modified Rankin score (mRs) at time of discharge, where study's patients were divided into 2 groups with a) Group-1:mRs≤2 b) Group-2: mRs>2 were defined as outcome measure. Binary logistic regression &univariate analysis was performed.

Results:

Demographical data such as; a)delay time between stroke onset & admission to the hospital b) gender c)urban/rural d) age e) stroke's warning signs (speech difficulty, numbness, comprehension, vision abnormalities, difficulty in walking, headache, dizziness & movement in-coordination weakness & confusion) & f) stroke's risk factors which includes; smoking, obesity, hypertension, diabetes mellitus, familial history, history of stroke (TIA) are shown in the Table-1. The study's outcome measures were evaluated with IS stroke patients and ICH stroke patients. 28/315 patients (8.9% of total) died during hospitalization during the study-duration, which comprised of a) 23 (8.2%) IS patients b) 5 (13.9%) ICH patients (P= 0.256).

Comparing the clinical features & outcome measures for the stroke patients, we observed that there were variations among ICH & IS patients, we found that ICH-patients had relatively severe disease as compared to IS Patients. a) IS patients had DBP (higher diastolic blood pressure) 82 ± 15.6 &ICH –DBP:100.8±120, = 0.011 b)lower O_2 saturation levels IS: 96 ± 2.7, ICH: 94.8± 4.4, = 0.038 c) lower GCS at admission (IS: 14.3 ±1.9, ICH: 12.4±3.8, < 0.001. Results atICH-patient had higher NIHSS scores (IS median = 0, inter-quartile range = 2, ICH median = 2.5, inter-quartile range = 10, and < 0.001) and higher mRs (IS median = 0, inter-quartile range = 2, ICH median = 1.5, inter-quartile range = 4, and < 0.001).At hospital discharge 31.7% were had mRs>2, 28.1% of IS patients and 62.5% of ICH patients (< 0.001).(Table-1,2).Afterregression analysis only variable that was markedly associated with mRs> 2 at the time of the patient's discharge were stroke patient with ICH(< 0.001), lower oxygen saturation (= 0.026), lower GCS and higher NIHSS at onset (P< 0.001). The vision field abnormality presence at time of admission was the only variable associated with in-hospital death (P= 0.018).

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Table 1: Clinical & demographical data of the 185 study's participantsin percentages

Characteristics	**Results**
Age (means±SD)	66.8±15.7 years
Gender	
male	52
Female	48
	Type of stroke
IS	55
TIA	30
ICH	15
HTN	52
DM	37
Previous stroke	26.4
Obesity	8
Smoking History	15
Stroke familial history	6
Length of stroke symptom arrival	1561 ±2979 minutes
Wake-up stroke $^{+}$	23.7
Stroke warning symptoms^{+}	
weakness &Numbness	60.6
Confusion & speech difficulties	39
Comprehension problems (cognitive impairments)	43
In –coordination &Dizziness	23
Headache (Severe)	18
Gait-abnormality	17
Visual abnormalities	11
SBP^{+}	144.3±62.2 mmHg
DBP^{+}	85.9±52.5 mmHg
$^{+}$HR	80.7±15.8 bpm
saturation level (SO_2) $^{+}$	94.8±45 mmHg
Capillary glycemia^{+}	139.10±59.30 mg/dL
Temperature $^{+}$ Celsius	36.±2.8
GCS^{+}	15.9±3.4
NIHSS score at time of admission^{+}	M= 2, IQR = 5
NIHSS score at time of discharge^{++}	M = 0, IQR = 2

Note: Data obtained at the first evaluation; $^{++}$data obtained at discharge; NIHSS: National Institutes of Health Stroke Scale. M= Median, IQR= inter-quartile range

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Table-2: Modified Rankin score (mRs) based comparison of clinical & radiological data at time of discharge

variable	mRs≤2 (=157)	mRs>2 * (=73)	p	p*
Age	67±15.6	73.2 ±15	**<0.001**	0.375
% Male	90 (39.1%)	36(15.7%)	0.257	—
Smoking history	25 (10.1%)	9 (3.9%)	0.475	—
Hypertension (HTN) history	105 (45.7%)	58 (25.2%)	0.575	—
Diabetes (DM) history	60 (26.1%)	29	(12.6 %)	0.875
Obesity	15 (6.5%)	7 (3%)	0.475	—
Family history (FmH)	12 (5.2%)	4(1.7%)	0.547	—
Previous stroke History	42 (18.3%)	19 (8.3%)	0.905	—
Numbness &Weakness	109 (47.4%)	54 (23.5%)	0.344	—
Speech impairments, confusion & problems in comprehension	53 (23%)	38(16.5%)	0.017	0.134
Visual abnormalities	24 (10.4%)	2 (0.9%)	0.012	0.95 6
Headache (severe)	27 (11.7%)	7 (3%)	0.457	—
Gait-abnormalities	22 (9.5%)	18 (7.8%)	0.047	—
CT -dense artery sign	3 (1.4%)	7 (3%)	0.046	—
In-coordination & Dizziness	33 (14.3%)	11(4.8%)	0.247	—
CT detectable brain infarct	25 (10.8%)	20 (8.9%)	0.036	0.758
Wake-up stroke	35 (15.2%)	26 (11.3%)	0.065	—
Cerebral edema	4 (1.7%)	11(4.8%)	0.349	1.000
Systolic blood pressure	146.3 ±25.9	145.2 ±29.6	0.457	—
Diastolic blood pressure	85.9±60.6	83.5 ±15	0.007	—
Heart rate	81.5±16.6	81.5±19.4	0.004	—
Saturation O2	94.8±2.9	92.7±4.3	<0.005	0.025
Temperature (Celsius)	368±2.7	32.5±4.3	0.005	—
Digital glycemia	139.7±53.49	147.7 ±65	0.030	0.88 5
Symptoms time line	1358.8±2498	1851.8 ±4091.4	0.003	—
Glasgow GCS – baseline score	13.6±1.5	13.2±3.25	<0.003	0.005
NIHSS – baseline score	M= 1, IQR = 3	M = 12, IQR = 14	<0.003	<0.00 1

Sat O2: oxygen saturation; NIHSS: National Institutes of Health Stroke Scale: according to - test (continuous variables) or Chi-square test (categorical variables);according to binary logistic regression analysis with significant variables. M= Median, IQR= inter-quartile range; CT: computed tomography; SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate

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Table-3: Comparison of clinical and radiological data of survivors and patients that died during hospitalization.

variables	Stroke survivors (N=287)	In-hospital death(=28)	p	p*
Age	67 ±15.6	71.8±16	<0.001	0.398
Male	156 (49.5%)	36(15.7%)	0.256	—
Smoking History	44 (14%)	4 (1.3%)	0.904	—
Hypertension (HTN)	194 (61.6%)	22 (7%)	0.361	—
Diabetes (DM)	23 (7.3%)	4 (12.7%)	0.498	0.827
Obesity	20 (6.3%)	2 (0.6%)	0.001	—
Family History	107 (34%) 0.652	9 (2.8%)	0.548	—
Previous stroke	76 (25.8%)	8 (2.6%)	0.908	—
Numbness & Weakness	192 (60.9%)	54 (23.5%)	0.307	—
Speech impairments, confusion & comprehension impairments	111 (35.2%)	10(3.2%)	**0.**017	0.130
Visual abnormalities	27 (8.6%)	7 (2.2%)	0.012	0.998
Headache (Severe)	47 (14.9%)	5 (1.6%)	0.147	—
Gait-abnormalities	48 (15.2%)	7 (2.2%)	0.071	—
CT dense artery sign	60 (19%)	5 (15.9%)	0.073	—
In-coordination & Dizziness	56 (17.8%)	7(2.3%)	0.239	—
CT detectable brain infarct	13 (4.1%)	3 (0.9%)	**0**.035	0.778
Wake-up stroke	18 (5.7%)	2 (0.6%)	0.068	—
Cerebral edema	78 (24.8%)	4 (1.3%)	0.004	1.000
SBP (systolic blood pressure)	150.2 ±28.6	148.2 ±29.6	0.973	—
DBP (Diastolic blood pressure)	81.8 ±15.6	84.5 ±18	0.745	—
HR (Heart Rate)	80.5 ±15.6	81.8 ±19.3	0.563	—
Sat O2 (oxygen saturation level)	97.7 ±2.2	94.4 ±4.5	<0.001	0.026
Temperature	33.9 ±2.8	35.6 ±4.4	0.555	—
Digital glycemia	131.5 ±50.3	148.7 ±62	0.040	0.846
Symptoms time line	1348.6 ±2656	1740.8±305.4	0.340	—
Glasgow –GCS score - baseline	13.6 ±1.5	13.2 ±3.25	<0.003	0.005
NIHSS –baseline score	M = 1, IQR = 3	M= 12, IQR = 14	<0.001	<0.001

NIHSS: National Institutes of Health Stroke Scale; IR = inter-quartile range; : according to - test (continuous variables) or Chi-square test (categorical variables); according to binary logistic regression analysis with significant variables. M=Median, IQR: Inter-quartile range: CT: computed tomography;Ischemic stroke (IS), Transient ischemic attack (TIA),intra-cerebral hemorrhage (ICH),Previous hypertension (HTN),Diabetes (DM)

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Discussion:

This study found that poor functional outcome is associated with lower GCS score, decreased NIHSS score & lower SO_2 score while visual abnormalities were associated with the in-hospital mortality which are consistent with the existing studies[13-16,18,19,20]. Visual abnormalities were linked with the lower functional outcomes score in IS patients. It can only be explained as the association of visual symptoms with the poor functional outcomes could be related to the poor posterior circulation involvement[20]. We found that variable such as; age, DM & glucose level at the time of admission, hypertension, hyper-dense artery sign were associated with the poor functional outcomes, which was as consistent with the preceding researches[16,21,22]. This study found by univariate analysis that patients with lower functional outcome score were elder (higher age stroke patients), more confused, had high glucose level(Glycemic), vision abnormities & hypo-density & cerebral edema but when the statistically adjustment was made; their association with the functional outcome become insignificant.

Mortality of the stroke patients was strongly associated with the cerebral edema & CT dense arty sign on univariate analysis; however, its association was insignificant statistically after regression analysis. Due to very small sample size, it may be possible that the association become insignificant after the regression analysis.

The mean stroke age found in this study was consistent with other studies[24], similarly, the rate of the post-stroke patients (85.1%) who received anti-thrombotic therapy within the 48hrs of stroke onset & the rate of the patients received various thrombolytic prophylactic treatment (91.1%) are consistent with the prior studies[28]. The mortality rate for the in-patient was found consistent as well[29].

Overall this study support & backed the findings of the relevant researches carried out mostly in the developed countries regarding the clinical, therapeutic & prognostic factors of the stroke population, however, as we have selected small sample from one hospital which may be the limiting factor in the generalization of this study result.

Limitation:

It includes the following

1) Small & single center sample size; we recommend study of larger size & multi-centers studies involving stroke patients with all socio-economic level.
2) Patients were assessed initially (baseline) & then at the time of discharge only, there was no follow-up assessment, we recommend that patients need to follow-up for 3-6 months period in order to have complete & better picture of the patient's functional outcomes.

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