

“Pattern of Stroke in Diabetic and Non-Diabetic Patients Admitted at a Tertiary Care Hospital, a Cross Sectional Study”

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Abstract

Objective: To determine the frequency of diabetic among stroke patients and to compare the pattern of stroke in diabetic and non-diabetic stroke patients admitted at a tertiary care hospital in Hyderabad, Sindh.

Methods: A cross sectional study enrolled 148 consecutive adult acute stroke patients admitted at Liaquat University Hospital, Hyderabad, during Sep 2014 to Feb 2015. Demographic, clinical, radio-imaging and laboratory data were collected on structured questionnaire to identify diabetes, type of stroke and different risk factors of stroke. Data was entered and analysed by using SPSS version 16. Association was seen by using Pearson’s Chi-square test and Independent t test. A P value of < 0.05 was considered statistically significant.

Results: A total of 148 acute stroke cases were enrolled in the study. Males were 92 (62%). Mean age of study participants was 51.21 ± 10.19 years. Diabetes was found in 104 (70.3%) stroke patients. Ischemic stroke was seen in 101 (68.2%) and haemorrhagic stroke seen in 47 (31.8) stroke patients. Diabetes was more common in ischemic stroke 81 (80.2) as compared to haemorrhagic stroke 23 (48.9%) ($P < 0.05$). Hospital mortality of stroke patients was 37 (25%). No difference of mortality in diabetic and non-diabetic ($P > 0.05$) stroke patients was recorded.

Conclusion: Diabetes was found in majority of stroke patients. Ischemic stroke was more common than haemorrhagic stroke. Ischaemic stroke is more prevalent in diabetic whereas haemorrhagic stroke was more in non-diabetic stroke patients. Prognosis of stroke was bad in both diabetic and non-diabetic stroke patients.

Key words: stroke, ischemic, haemorrhagic, diabetes mellitus

Introduction

Stroke is the second most common cause of death and the first most frequent cause of permanent disability in the world [1]. World Health Organization (WHO) estimates that 5.5 million people died of stroke in 2002, and roughly 20 percent of these deaths occurred in South Asia [2]. India reported the annual incidence of stroke as 145 per 100,000 persons per year [3]. China reported total average age-adjusted incidence of stroke range from 116 to 219 per 100,000 per year [4]. In Pakistan only single study reported the prevalence of stroke was 4.8% with no difference in male to female [5]. Also, the reported study was based on verbal questions on stroke or illness like stroke without confirmation of stroke through CT scan or MRI. Pakistan stroke society claimed that estimated annual incidence of stroke was 250 per 100,000 population, translating to total population, 350,000 new cases of stroke were added every year [6].

A stroke is the rapid loss of brain function due to disturbance in the blood supply to the brain. This can be due to ischemia, lack of blood flow, caused by blockage by thrombosis, arterial embolism, or due to hemorrhage [7]. As a result, the affected area of the brain cannot function, which might result in an inability to move one or more limbs on one side of the body, inability to understand or formulate speech, or an inability to see one side of the visual field [8]. Strokes can be classified into two major categories: ischemic and hemorrhagic stroke [9]. Ischemic strokes are those that are caused by interruption of the blood supply, while hemorrhagic strokes are the ones which result from rupture of a blood vessel or an abnormal vascular structure. About 88% of strokes are caused by ischemia and the remainder by hemorrhage [10].

Diabetes mellitus supposed to be an independent modifiable risk factor for stroke. Diabetes patients were 1.5 to 3 times at higher risk of having stroke as compared to the general population [11, 12]. Diabetes associated mortality and morbidity was greater in diabetic stroke patients as compared to non-diabetic stroke [13, 14]. Stroke causes 20 percent of deaths in diabetic patients [1]. Substantially increasing diabetes prevalence every year across all age groups and race/ethnicity groups, the significance of diabetes as a separate risk factor for stroke is becoming more evidence [12]. Diabetes is clearly one of the most important risk factors for ischemic strokes, a large proportion of stroke patients have diagnosed with diabetes (16-24%), especially younger stroke patients who has age less than 65 years of age [12].

No such epidemiological studies have been conducted in Pakistan to determine the pattern of stroke in diabetic and non-diabetic population. As burden of diabetes was high in Pakistan so assume high burden of stroke in our population. There was a paucity of stroke data from our population particularly about the pattern of stroke in diabetic and non-diabetic patients. Therefore the current study was aimed to identify the different patterns of stroke in diabetic and non-diabetic stroke patients.

Material and Methods

A cross sectional study was conducted at Liaquat University of Medical and Health Sciences (LUMHS), Hospital, Jamshoro/ Hyderabad, Sindh from Sep 2014 to Feb 2015. All consecutive adults of age 20 years or above admitted with clinical presentation of acute stroke during the study period, with or without diabetes, and later on stroke was confirmed on CT scan or MRI brain, were included in this study. All those patients who had head injury, receiving anticoagulant drugs or steroids prior to onset of stroke, and uncommon stroke caused by hyper-coagulation disorder, venous sinus, thrombosis, and vasculitis were excluded from the study.

Sample size calculation was based on the assumptions that anticipated prevalence of diabetes in stroke was 16 % [5], absolute precision was 5%, confidence level was 90%, and 2% bound on error, the minimum sample size was calculated 148 stroke cases. So, a total of 148 consecutive confirmed stroke patients were included in the study after taking informed consent from each participants or their attendant. Structured questionnaire was used for data collection. After taking demographic information, study participants were assessed through clinical history, physical and neurological examination, radio-imaging and laboratory investigation to identify stroke, type of stroke, ischemic or haemorrhagic, and risk factors of stroke like diabetes, hypertension, hyperlipidaemia, ischemic heart disease, previous cerebrovascular accidents (CVA) and smoking [8, 9]. Laboratory investigations included, serum glucose fasting/ random, HbA1c, and lipid profile. Fasting glucose ≥ 126 mg/dl, random glucose ≥ 200 mg/dl & HbA1c ≥ 6.5 m mol /dl were the standard measure used to diagnose diabetes mellitus [15]. Hyperlipidaemia was diagnosed if patients were on lipid lowering agents or with elevated serum cholesterol (≥ 200 mg/dl) and / or triglyceride (≥ 150 mg/dl) and/ or a low high density lipoprotein level (≤ 40 mg/dl) and/or a high low density lipoproteins (≥ 130) [16]. Hypertension was diagnosed [2] if patients were on anti-hypertensive drugs or have systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg more than two readings during hospitalization. CT scan (computed tomography) or/and MRI (Magnetic

Resonance Imaging) of brain were also taken to identify the type of stroke (ischemic or haemorrhagic). Prospectively stroke patients outcome was recorded as survived or died through questionnaire. Study approval was taken from Ethics Review Committee (ERC) of LUMHS, Jamshoro.

Data Analysis: Data was entered and analyzed by using Statistical Package for Social Science (SPSS) Software version 16.0. Standard descriptive statistics were used to summarize the information recorded. Pearson's Chi-square test for categorical variables and Independent t test to compared means of continuous variables were used to test the correlation between diabetic and non-diabetic stroke patients. A P value of < 0.05 was considered statistically significant.

Results

A total of 148 acute stroke cases were enrolled in the study. Male were 92 (62%) with male to female ratio of 1.6:1. Mean age of study participants was 51.21 ± 10.19 years. Stroke cases were raised with increasing age and majority stroke cases 53 (35.8) were fallen in the age group of 60 years or above. Of 148 stroke cases, around two-third 101 (68.2) cases were ischemic stroke and one-third 47 (31.8) cases were haemorrhagic stroke. Ischemic to haemorrhagic stroke ratio was 2.1:1 (Table 1).

Diabetes was found in around two-third 104 (70.3%) of stroke patients. Diabetic to non-diabetic stroke ratio was 2.4:1. Diabetes was more common in ischemic stroke 81 (80.2) as compared to haemorrhagic stroke 23 (48.9). The difference was statistically significant ($P < 0.05$) (Table 1). Among diabetic, stroke cases were seen more 37 (35.6) in younger age groups (< 50 years) as compare to non-diabetic, where stroke cases were 12 (27.24) under 50 years. ($P < 0.05$).

Of different risk factors of stroke, hypertension was the most common risk factor 113 (76.4%) identified among study stroke patients. Followed by diabetes mellitus 104 (70.3%), Hyperlipidemia 103 (69.6), smoking 68 (45.9%), family history of diabetes 58 (39.2%), previous history of IHD 44 (29.7%), previous history of stroke 26 (17.6%), family history of IHD 23 (15.5%), and family history of stroke 16 (10.8%) respectively (Table 1).

In study stroke patients, mostly means levels of lab indicators (glucose fasting/ glucose random/ HbA1c/ total cholesterol/ triglyceride/ LDL/ HDL) were lies within normal limits except glucose random and HbA1C. (See table2). When comparing means of these lab indicators among diabetic and non-diabetic stroke, the total cholesterol and LDL cholesterol mean levels differences were statistically significant ($P < 0.05$). On the other hands when comparing means of lab indicators of ischemic stroke versus haemorrhagic stroke, the difference in the mean levels of all lab indicators were statistically significant ($P < 0.05$) except triglyceride ($P > 0.05$) (See table 2).

Regarding stroke outcome, one-fourth 37 (25.0) of study stroke patients, were died in hospital. Including 23 (22.1) deaths in diabetic stroke and 14 (31.8) deaths in non-diabetic stroke. No statistical significant difference was found ($P > 0.05$). While comparing deaths in haemorrhagic stroke 17 (36.2) verses ischemic stroke 20 (19.8), the difference was statistical significant ($P < 0.05$).

Variables	Total Stroke cases (n=148)	Ischemic Stroke (n=101)	Haemorrhagic Stroke (n=47)	P Value	Diabetic Stroke (n=104)	Non-diabetic Stroke (n=44)	P Value
Gender				0.082			0.810
Male	92 (62.2)	58 (57.4)	34 (72.3)		64 (61.5)	28 (63.6)	
Female	56 (37.8)	43 (42.6)	13 (27.3)		40 (38.5)	16 (36.4)	
Mean Age with SD	51.21±10.19	51.79 ± 9.53	49.96 ± 11.51	0.310	50.62 ± 9.42	52.61±11.82	0.277
Age Category							
20-29 years	03 (2.0)	1 (1.0)	2 (4.3)		1 (1.0)	02 (4.5)	
30- 39 years	12 (8.1)	7 (6.9)	5 (10.6)		7 (6.7)	05 (11.4)	
40-49 years	34 (23.0)	26 (25.7)	8 (17.0)		29 (27.9)	05 (11.4)	
50- 59 years	46 (31.1)	30 (29.7)	16 (34.0)		37 (35.6)	9 (20.5)	
≥ 60 years	53 (35.8)	37 (36.6)	16 (34.0)		30 (28.8)	23 (52.3)	
Risk factors							
Previous H/o Stroke	26 (17.6)	22 (21.8)	4 (8.5)	0.048	20 (19.2)	6 (13.6)	0.414
H/o Hypertension	113 (76.4)	69 (68.3)	44 (93.6)	0.001	76 (73.1)	37 (84.1)	0.150
H/o Ischemic heart disease	44 (29.7)	40 (39.6)	4 (8.5)	0.000	32 (30.8)	12 (27.3)	0.671
Family history of Diabetes	58 (39.2)	51 (50.5)	7 (14.9)	0.000	48 (46.2)	10 (22.7)	0.008
Family history of Stroke	16 (10.8)	12 (11.9)	4 (8.5)	0.539	8 (7.7)	8 (18.2)	0.060
Family history of IHD	23 (15.5)	21 (20.8)	2 (4.3)	0.010	17 (16.3)	6 (13.6)	0.677
Hyperlipidemia	103 (69.6)	79 (78.2)	24 (51.1)	0.001	79 (76.0)	24 (54.5)	0.010
Smoker	68 (45.9)	49 (48.5)	19 (40.4)	0.358	52 (50.0)	16 (36.4)	0.128
Lab indicators							
Raised Glucose Fasting (≥126 mg/dl)	40 (27.0)	34 (33.7)	6 (12.8)	0.008	40 (38.5)	0 (0.0)	0.000
Raised Glucose Random (≥200mg/dl)	82 (55.4)	68 (67.3)	14 (29.8)	0.000	82 (78.8)	0 (0.0)	0.000
HBA1C (≥6.5 m mol /dl)	102 (68.9)	79 (78.2)	23 (48.9)	0.000	102 (98.1)	0 (0.0)	0.000
Raised Total Cholesterol (≥200mg/dl)	62 (41.9)	53 (52.5)	9 (19.1)	0.000	52 (50.0)	10 (22.7)	0.002
Raised Triglyceride (≥150mg/dl)	67 (45.3)	48 (47.5)	19 (40.4)	0.419	51 (49.0)	16 (36.4)	0.157
Raised LDL (≥130mg/dl)	68 (45.9)	58 (57.4)	10 (21.3)	0.000	57 (54.8)	11 (25.0)	0.001
Low HDL (<40mg/dl)	27 (18.2)	24 (23.8)	3 (6.4)	0.011	21 (20.2)	6 (13.6)	0.345
Diabetes				0.000			
Yes	104 (70.3)	81 (80.2)	23 (48.9)				
No	44 (29.6)	20 (19.7)	24 (51.1)				
Type of Stroke							0.000
Ischemic Stoke	101 (68.2)				81 (77.9)	20 (45.5)	
Haemorrhagic Stoke	47 (31.8)				23 (22.1)	24 (54.5)	
Outcome				0.032			0.213
Survive	111 (75.0)	81 (80.2)	30 (63.8)		81 (77.9)	30 (68.2)	
Died	37 (25.0)	20 (19.8)	17 (36.2)		23 (22.1)	14 (31.8)	

Table 1: Characteristics of Study stroke cases (N=148)

Lab Indicators	Mean \pm SD Total Stroke cases (n=148)	Mean \pm SD Ischemic Stroke (n=101)	Mean \pm SD Haemorrhagic Stroke (n=47)	P Value	Mean \pm SD Diabetic Stroke (n=82)	Mean \pm SD Non-diabetic Stroke (n=66)	P Value
Glucose Fasting	110.39 \pm 39.28	118.0 \pm 41.11	94.0 \pm 29.27	0.017	122.84 \pm 40.08	80.95 \pm 12.92	0.000
Glucose Random	223.75 \pm 80.93	241.6 \pm 79.93	185.4 \pm 69.58	0.051	255.11 \pm 76.69	149.64 \pm 17.45	0.000
HBA1C	7.49 \pm 01.48	7.8 \pm 1.41	6.7 \pm 1.34	0.301	8.20 \pm 1.17	5.81 \pm 0.38	0.000
Serum Cholesterol	193.4 \pm 39.54	203.0 \pm 38.17	172.5 \pm 34.37	0.171	202.44 \pm 38.84	171.86 \pm 32.54	0.000
Serum Triglyceride	143.4 \pm 33.95	145.1 \pm 32.51	139.57 \pm 36.96	0.653	148.18 \pm 31.39	131.93 \pm 37.31	0.007
Serum LDL-Cholesterol	126.4 \pm 43.55	49.9 \pm 15.31	58.0 \pm 20.51	0.128	136.47 \pm 43.81	102.57 \pm 32.55	0.000
Serum HDL-Cholesterol	52.5 \pm 17.47	137.5 \pm 41.40	102.6 \pm 38.55	0.233	51.13 \pm 17.92	55.84 \pm 16.05	0.134

Table 2: Compare means of lab indicators among Ischemic & Haemorrhagic Stroke groups and among Diabetic and non-diabetic stroke groups (N=148)

Discussion

The main findings of current study was reported that around two-third (68.2%) of the study stroke patients had ischemic stroke and nearly one-third had haemorrhagic stroke (31.8%). In other words Ischemic stroke was 2.1 times higher than haemorrhagic stroke. Similar findings were reported by a study conducted at a tertiary care hospital in Lahore and reported that 78% of study patients had ischemic stroke and 22 % were haemorrhagic stroke¹⁷. Consistent finding were also reported by other hospital based studies that reported 22-31% haemorrhagic stroke [18-20].

Prevalence of diabetes was found 70% in study stroke patients, mostly diagnosed during the routine investigation of stroke in hospital. Similar high prevalence was also reported by a study conducted at a tertiary care hospital in Lahore by Qureshi and revealed that the presence of diabetes in study stroke patients was 52.5 % [17]. Diabetes was more prevail in ischemic stroke (78%) 3.5 times higher as compare to haemorrhagic stroke (22%). A Framingham heart study reported the similar finding as the incidence of ischemic stroke has been found to be from 2.5- to 3.5-times higher among diabetic than among non-diabetic subjects [21]. Another study by Sarkar also reported that ischaemic stroke was higher in diabetic (69%) than non-diabetic (45.8%) [22]. This may be explained that diabetes mellitus is associated with accelerated atherogenesis [23], it is very likely that diabetes is a separate risk factor that plays an essential role in producing the vascular pathology underlying ischemic stroke.

Pattern of stroke in diabetic and non-diabetic stroke population was significantly different. Diabetes mellitus increases the risk of stroke 1.5 to 3 times higher as compare to non-diabetic population¹¹. Diabetes may increase the risk of stroke in earlier age and also increase risk of stroke in women due to increase atherogenic risk within the extra and intra-cranial arteries and due to tendency of hyperglycaemia [11, 12]. Previous studies have provided the evidence that diabetic stroke patients were younger than non-diabetic stroke patients [10, 14, 22, 24]. The current study reported the mean age of diabetic stroke patients was 50.67 \pm 8.74 years and non-diabetic stroke patients was 51.88 \pm 11.78. Diabetic stroke patients were 1.2 years younger than non-diabetic stroke patients, though difference was not statistically significant. A Copenhagen stroke study by Jorgensen [14] was reported the similar finding that the diabetic stroke patient was 3.2 years younger than the non-diabetic stroke patient (P < 0.001). Zafar et al¹⁰ also reported the mean age of diabetic stroke patients was 59.5 \pm 11.82 and non-diabetic patients was 60.4 \pm 14.80. Diabetic patient was 0.9 year younger than non-diabetic [10].

The current study reported high prevalence of hypertension (76%), hyperlipidaemia (70%), and smoking (46%) among study stroke patients. These are established risk factors of stroke. When we compared these risk factors among diabetic and non-diabetic stroke patients, then only hyperlipidaemia was found statistically significant (P< 0.05). On the other hand, when we compared these risk factors among ischemic and haemorrhagic stroke, the hypertension and hyperlipidaemia were statistically significant (P<0.05). High prevalence of hypertension (66%) in stroke patients was also reported by Aga Khan University study¹⁸ and other studies such as OXVASC (55.9%), OCSP (65.5%) [23, 24].

Regarding prognosis of stroke, the current study reported 25% stroke related deaths in hospital. Previous studies have reported the stroke related mortality in the range of 11-30 % [17, 19, 25, 26]. Deaths were more in haemorrhagic stroke (36%) as compared to ischemic stroke (20%) (P <0.05). But no significant difference in deaths related to diabetes versus non-diabetes stroke patients were found.

Study Limitations: Current study was small sample size with convenient sampling due to time and financial constraint. Therefore, this study data was not extrapolated on general population. Strokes other uncommon risk factors like atrial fibrillation, carotid artery stenosis, peripheral vascular disease, use of oral contraceptive pills (OCP) by women study participant and obesity were not investigated due to low frequency of these findings among study patients were reported in previous study [27].

Conclusion

Ischemic stroke was more common than haemorrhagic stroke among study stroke patients. Diabetes was found in majority stroke patients particularly in ischemic stroke patients. Diabetes exacerbated the risk of stroke in younger people. Hypertension, hyperlipidemia and smoking were found as a major risk factors in the study stroke patients. Prognosis of stroke was bad particularly in haemorrhagic stroke patients.

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