



**Research Article**

## **TIME OF STROKE ONSET TO ARRIVAL TO THE HOSPITAL: AN EXPERIENCE FROM TERTIARY CARE CENTRE**

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### **ABSTRACT**

**Introduction:** There is lack of awareness of stroke in India instead of improvement in healthcare facilities and healthcare professional.

**Objective:** The aim of the present study was to compare the time of onset of stroke to arrival in hospital between the patients recruited in current registry R2 (July 2012 to January, 2014) to retrospectively recruited in earlier registry R1 (1998 to 2011)

**Methods:** In an observational study, consecutive patients were recruited from July 2012-January 2014 who were admitted in the wards or attending the out patients department. Prospectively recruited patients in R2 were compared with retrospective data of earlier registry R2.

**Results:** The median time (IQR) to reach for previous stroke registry (R1)s was 10(9) hours and for R2 registry was 24(48) hours which was significantly delayed ODT in the present registry ( $p < 0.0005$ ). In all stroke patients, 74/1416 (5.2%) in R1 and 38/259 (7.8%) in R2 registry of the patients reached within 4.5 hours. For ischemic stroke patients, 81/212(6.9%) and 24/194(12.4%) patients reached AIIMS within 4.5 hours in R1 and R2 registry respectively which was significantly more in the present registry ( $p = 0.005$ ). For hemorrhagic stroke patients, 12/204(5.9%) and 14/57(24.6%) patients reached AIIMS within 4.5 hours in R1 and R2 registry respectively which was significantly different (0.001).

**Conclusion:** The study concludes that despite increase in the medical facilities and advancements the mean time of reaching a tertiary care centre after the onset of stroke has increased to seek specialist care.

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## **INTRODUCTION**

Stroke is the second most leading cause of death and disability all over the world. Incidence of stroke has significantly increased in developing countries, having a huge impact in the health care system and leading to economic loss.<sup>1,2</sup> About 85% of stroke cases are ischemic while the rest 15% are hemorrhagic. Incidence of stroke in South Asian countries has increased by more than 100%, while this is decreased by 42% in developed European countries in last four decades.<sup>3</sup> Tissue plasminogen activator is the only approved therapy for the treatment of stroke, when administered within 4.5 hours of onset of stroke. But due to narrow time window very few patients are able to receive this therapy. A campaign to increase public awareness has therefore been encouraged to reduce this delay.<sup>4</sup> Several factors have been found to be associated with the time of onset and hospital arrival.<sup>5,6</sup> These factors may involve referral bias, socioeconomic status, nocturnal onset, living alone, transportation problems etc.<sup>7</sup>

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Continued and strengthened educational program to increase the knowledge of stroke are required by policy makers as well as local and national organisations. There is lack of awareness and warning symptoms of stroke in India instead of improvement in healthcare facilities and health professional.

The aim of this present study was to compare the time of onset of stroke to arrival in hospital between the patients recruited in current registry R2 (July 2012 to Jan, 2014) to earlier registry R1 (1998 to 2011).

## **MATERIAL AND METHODS**

**Study design:** Observational.

Consecutive patients were recruited from July 2012-January 2014 who were admitted in the wards or attending the out patients OPD in neurology unit II. All the patients' record admitted from July 2012 onwards was examined from the hospital record section of All India Institute of Medical Science (AIIMS) hospital, New Delhi. In AIIMS Neurology stroke unit, there exists a computerized record of patient details of admitted patients since 1998. The data are exhaustive and caters to >180 different patient variables. One time patient

interview was done on the phone for the patients previously admitted to our wards prior to December 2012. Patients were included if: patients with ischemic or hemorrhagic stroke who were admitted in the Neurology ward or attended our OPD; age > 18 years; both sexes. Patients were excluded if: patient not amenable to follow up; denied consent; pregnancy; presence of Subarachnoid Hemorrhage (SAH).

**Definition of Variables**

The following working definitions were used: Age- was taken as completed years as informed by the patient or the family in completing years. Hypertension: subjects were considered to have hypertension if they either had the diagnosis of hypertension or were treated for hypertension before the stroke or reference date. Diabetes: if a subject had the diagnosis documented by a physician on the medical record or if fasting blood sugar levels were >126 mg/dl or Hb1Ac >6.4. Dyslipidemia: if they either had the diagnosis of dyslipidemia or were treated for dyslipidemia before the stroke or reference date. Smoker: a regular smoker was defined as a person smoking ≥1 cigarettes, bidis, and cigar daily for more than three preceding months. Family history of stroke: a positive family history of stroke was diagnosed if a subject had a first degree relative (parent or sibling) who have had a stroke. A stroke is a clinical syndrome characterized by rapidly developing clinical symptoms and / or signs of focal, and at times global (applied to patients in deep coma and those with subarachnoid hemorrhage), loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.<sup>8</sup> This definition includes stroke due to cerebral infarction, primary intracerebral hemorrhage (PICH), intraventricular hemorrhage, and most cases of subarachnoid hemorrhage (SAH); it excludes subdural hemorrhage, epidural hemorrhage, or intracerebral hemorrhage (ICH) or infarction caused by infection or tumor. Atrial fibrillation (AF) is an atrial tachyarrhythmia characterized by predominantly uncoordinated atrial activation with consequent deterioration of atrial mechanical function. On the electrocardiogram, AF is described by the absence of consistent P waves; instead there are rapid oscillations or fibrillatory waves that vary in size, shape and timing and are generally associated with an irregular ventricular response when atrioventricular (AV) conduction is intact. Socioeconomic status was assessed by the number of listed assets possessed by the patient. All the available biochemical, radiological and other relevant investigations like chest x-ray, Transthorasic echocardiography, ECG was recorded in a prespecified pro forma. All brain-imaging studies were evaluated by a Neuroradiologist. Vascular imaging of intracranial or extracranial vessels done was noted. Specific coagulation testing was performed, depending on the need of the patients. More specific diagnostic testing like vasculitis was done at clinician’s discretion.

**Statistical Analysis**

Analysis of data was done using Statistical Program for Social Sciences (SPSS) for window version 17 (SPSS Inc. Chicago, Illinois). Categorical variables were expressed as frequency and percentage while continuous variables were expressed as mean and standard deviation. T test was used for continuous and normally distributed data while Mann Whitney test was used for data not normally distributed. Chi square test was

used to compare frequency distributions between two or more groups. P value <0.05 was considered statistically significant.

**RESULT**

Table 1 shows the baseline characteristics of patients of hospital registry R2. The median time (IQR) to reach for previous stroke registry (R1) was 10 (9) hours and for R2 registry was 24 (48) hours which was significantly delayed ODT in the present registry (p=<0.0005).

**Table 1** Baseline characteristics of 631 stroke patients

Demographics	Ischemic Stroke (IS) [N= 501]		Hemorrhagic Stroke (HS) [N= 130]		P- Value (IS vs HS)
	OPD N=293	IPD N=208	OPD N=41	IPD N=89	
	Male(%)	239(81.6)	161(77)	31(75.6)	
Age (mean± S.D)	52.8±13.04	51.7±14.8	49.7±11.6	54.16±13.9	0.80
Age ≤50 Years(%)	122(41.6)	103(49.3)	25(61)	40(45.5)	0.25
Age >50 Years(%)	171(58.4)	106(50.7)	16(39)	48(54.5)	
<b>Education</b>					
None(%)	26(8.9)	9(4.6)	1(2.5)	2(3.5)	0.27
Primary School(%)	109(37.2)	53(27.3)	14(35)	15(26.3)	
Secondary School(%)	52(17.7)	40(20.6)	9(22.5)	8(14)	
Graduate(%)	68(23.2)	67(34.5)	7(17.5)	22(38.6)	
Post Graduate(%)	38(13)	25(12.9)	9(22.5)	10(17.5)	
<b>Employment</b>					
Currently employed(%)	167(58.2)	104(54.2)	21(55.3)	36(63.2)	0.03
Retired(%)	68(23.7)	38(19.8)	8(21.1)	4(7)	
Housewives(%)	48(16.7)	46(24)	8(21.1)	13(22.8)	
Student(%)	4(1.4)	4(2.1)	1(2.6)	4(7)	
<b>Risk factors</b>					
Atrial Fibrillation (%)	21(7.2)	19(9.7)	1(2.4)	0(0)	0.008
Diabetes Mellitus(%)	125(42.7)	43(22.1)	17(41.3)	13(22.8)	0.48
Hypertension(%)	198(67.8)	149(76.8)	26(63.4)	42(76.4)	0.92
Smoking(%)	108(36.9)	59(30.4)	6(14.6)	13(22.8)	0.004
Hyperlipidemia(%)	58(19.8)	34(17.5)	3(7.3)	1(1.8)	<0.0005
Alcohol intake(%)	66(22.5)	26(13.4)	0(0)	4(7)	<0.0005
Time to reach AIIMS (Median IQR in hours)	52(64)	10(18)		47(42)	<0.0005

**Abbreviations:** IS- ischemic stroke; HS- hemorrhagic stroke. Chi square test for categorical variables and t test for continuous variables

**Table 2** Risk factor difference between both the stroke registries

Variables	Registry I (R1) N=2277 n (%)			Registry II (R2) N=631 n (%)			Total n (%)	R1 vs R2 P value
	IS N=1970 (86.5)	HS N=307 (13.5)	P value	IS N=501 (79.4)	HS N=130 (20.6)	P value		
	Hypertension	1098(55.8)	188(61.2)	0.07	346(71.3)	68(70.8)		
Diabetes	402(20.2)	70(22.8)	0.34	167(34.3)	30(30.6)	0.48	768(24)	<0.005
Smoking	678(34.4)	117(38.2)	0.19	167(34.3)	19(19.4)	0.004	1126(35)	0.68
Alcohol	435(22.5)	72(23.8)	0.66	92(18.8)	4(4.1)	<0.001	795(25.2)	0.13
Male	1289(65.4)	199(64.8)	0.83	399(80.6)	96(73.8)	0.23	2173(66.4)	<0.0005

**Abbreviations:** IS- ischemic stroke; HS- hemorrhagic stroke

Comparisons of risk factors between both the registries are given in Table 2. Difference in time (hours) of Indoor patients to reach AIIMS hospital between both the registries is given in Table 3. We also tried to look into the number of patients reaching AIIMS in less than 4.5 hours across both the registries along with subgroup study in both ischemic stroke (IS) and hemorrhagic stroke (HS). In all stroke patients, 74/1416 (5.2%) in R1 and 38/259 (7.8%) in R2 registry of the patients reached within 4.5 hours.

**Table 3** Difference in time (hours) of Indoor patients to reach AIIMS hospital between both the registries

Variables	1998 to 2012 (R1 registry) N= 1469 N (%)	2012 to 2014 (R2 registry) N=297 N (%)	R1 vs. R2 P Value
Median (IQR) [In hours]	10 (9)	24 (48)	<0.0005

Mann Whitney t test

For IS patients, 81/212 (6.9%) and 24/194(12.4%) patients reached AIIMS within 4.5 hours in R1 and R2 registry respectively which was significantly more in the present registry (p=0.005). For HS patients, 12/204(5.9%) and 14/57(24.6%) patients reached AIIMS within 4.5 hours in R1 and R2 registry respectively which was significantly different (0.001) (Table 4).

**Table 4** Difference in time to reach (within 4.5 hours) to AIIMS hospital between both the registries

	R1 (all) N=1416	R2 (all) N=297	R1 (HS) N=204	R2 (HS) N=89	R1 (IS) N=1212	R2 (IS) N=208
Number N/total number (%)	74/1416 (5.2)	38/259 (7.8)	12/204 (5.9)	14/57 (24.6)	81/1212 (6.68)	24/194 (12.37)
P value Comparison of R1 and R2	0.26	0.01			0.005	

**Abbreviations:** IS- ischemic stroke; HS- hemorrhagic stroke

## DISCUSSION

The present study looks at the demographic profile of patients in a tertiary hospital in north India attending the Neurology department, outpatient as well as the admission in wards in the period 2012-2014 and explores some of the difference between the earlier registry R1 (1998 to 2011) to present registry R2 (2012 to 2014). The median time to reach AIIMS after the onset of stroke was significantly higher in the R2 than R1. The difference in median time to reach AIIMS was done to look at the trends of the population to seek the specialty care. The median time to reach tertiary care in T1 was 11.6±6.01 hours as compared to 18.6±22.3 hours in the T2 registry and this delay was statistically significant. But when we compared the proportion of patients reaching AIIMS, within 4.5 hours for ischemic and hemorrhagic strokes independently, it was significantly more in the present comparison year than compared to the previous years. This finding is consistent to the findings of European hospital based centers that have looked at the onset to door time (ODT) in a hospital based study. Fonarow G.C. *et al.* (2011) studied onset to door and door to needle time in acute stroke patients across 1082 hospitals in United States from the time period of April 2004 to September 2009 in 25509 patients of acute IS treated with IV rtPA and concluded that onset to door time was 1.27±10 hours measured over a period of 5 years.<sup>9</sup>

Strbian D *et al.* (2013) studied the relationship between the onset to door time and door to needle time and door to thrombolysis which was a pooled study of ten dedicated stroke centres and concluded that the mean onset to door time was 80 minutes and found a weak correlation between onset to door and door to needle time.<sup>10</sup> The Paul Coverdell Registry found that twenty-three percent of admissions arrived at the emergency department within 3 hours of onset and overall

4.5% of ischemic stroke admissions were thrombolysed.<sup>11</sup> Chee B *et al.* (2014) tried to study the outcome of stroke and the onset to door time and found that the mean ODT was 70.6 8.04 hours but did not find any correlation between outcome at 90 days and the ODT.<sup>12</sup> In contrast, to the European and American studies, the registries published from Japan and Asian studies differ in their ODT studies. Choi J.C. *et al.* (2007) studied the “hospital delays” as an important obstacle in thrombolytic therapy following acute IS over two years in 195 consecutive admitted patients in a Korean tertiary care hospital and found that seventeen (20%) of the 85 patients who arrived within 3 hours of the onset of symptoms received intravenous thrombolysis.<sup>13</sup> The reasons for not receiving thrombolytic therapy in these patients were mild neurological deficit, rapidly improving symptoms, and insufficient time to work up. Another study from South Korea found that the median interval from onset to emergency room admission was 243 minutes (interquartile range [IQR], 82-894 minutes) and the mean interval was 824±1,437 minutes. The prehospital delay was greater in patients with IS than in those with HS and in comparison with data from 2005 and 2008, the prehospital delay was greater in 2010.

In another study, Uehara T *et al.* (2014) tried to evaluate the factors associated with ODT and admissions with transient ischemic attack admitted to Stroke Centers in Japan and found, 55.3% (233/464) patients reached hospital within 3 hours of the subset and analyzed various factors associated with ODT.<sup>14</sup> Although, our study had ischemic patients, but some had an episode of TIA, which was ignored by them and no medical advice was sought. In yet another hospital based study, Tan M.Sh. *et al.* (2014) in a hospital based study in Singapore reported that of the consecutive 642 IS patients studied, in 33% patients the median onset-to-door duration was 14.3 hours (Interquartile range, 4.8 to 38.2 hours), 20% of them arrived <3.5 hours.<sup>15</sup> In another study done by Srivastava AK & Prasad K (2001) at a tertiary centre found that the median time to casualty arrival was 7.66 hours with 25% cases arriving within 3 hours and 49 % cases within 6 hours.<sup>5</sup> We could not find any study investigating the onset to door time for HS to best of our knowledge. The trend of ODT in the present study has shown a statistically significant increase in the ODT from the 1998-2011 and 2012 to 2014 and the possible explanation of the same could be attributed to the increasing patient to bed ratio in a tertiary health care system like ours and the inadequate doctor to patient ratio in the present health system and another reason could be the increased number of private nursing homes which could lead to referral bias of the patient and timely referral of the patients. The second possible reason could be the lack of knowledge to seek immediate advice from the specialist and a delayed referral from the respective hospitals to the specialty care hospital.

There were a few limitations in our study. First, the present study is done at the tertiary care centre in north India and the results cannot be extrapolated to the community and could just represent the patients with the referral bias. Second, the study also carries the risk of having admission bias and only the sick patients requiring urgent admission and medical attention were admitted. Third, the data was inadequate for 130 patients and could not be included and 30 patients died within hospital stay and were excluded from inclusion.

## CONCLUSION

The study concludes that despite increase in the medical facilities and advancements, the mean time of reaching a tertiary care centre after the onset of stroke has increased to seek specialist care.

## References

1. Feigin VL, Lawes CMM, Bennett DA, Barker-Collo SL, Parag V. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. *Lancet Neurol* 2009; 8:355-69.
2. Strong K, Mathers C, Bonita R. Preventing stroke: saving lives around the world. *Lancet Neurol* 2007; 6:182-7.
3. Feigin VL. Stroke epidemiology in the developing world. *Lancet* 2005; 365:2160-1.
4. Audebert HJ, Schenkel J, Heuschmann PU, Bogdahn U, Haberl RL, Telemedic Pilot Project for Integrative Stroke Care Group. Effects of the implementation of a telemedical stroke network: the Telemedic Pilot Project for Integrative Stroke Care (TEMPiS) in Bavaria, Germany. *Lancet Neurol* 2006; 5:742-8.
5. Srivastava AK, Prasad K. A study of factors delaying hospital arrival of patients with acute stroke. *Neurol India* 2001; 49:272-6.
6. Wang P-L, Zhao X-Q, Yang Z-H, Wang A-X, Wang C-X, Liu L-P, *et al.* Effect of in-hospital medical complications on case fatality post-acute ischemic stroke: data from the China National Stroke Registry. *Chin Med J (Engl)* 2012; 125:2449-54.
7. Carrera E, Maeder-Ingvar M, Rossetti AO, Devuyst G, Bogousslavsky J, Lausanne Stroke Registry. Trends in risk factors, patterns and causes in hospitalized strokes over 25 years: The Lausanne Stroke Registry. *Cerebrovasc Dis Basel Switz* 2007; 24:97-103.
8. Hatano S. Experience from a multicentre stroke register: a preliminary report. *Bull World Health Organ* 1976; 54:541-53.
9. Fonarow GC, Smith EE, Saver JL, Reeves MJ, Bhatt DL, Grau-Sepulveda MV, *et al.* Timeliness of tissue-type plasminogen activator therapy in acute ischemic stroke: patient characteristics, hospital factors, and outcomes associated with door-to-needle times within 60 minutes. *Circulation* 2011; 123:750-8.
10. Strbian D, Michel P, Ringleb P, Numminen H, Breuer L, Bodenart M, *et al.* Relationship between onset-to-door time and door-to-thrombolysis time: a pooled analysis of 10 dedicated stroke centers. *Stroke J Cereb Circ* 2013; 44:2808-13.
11. Reeves MJ, Broderick JP, Frankel M, LaBresh KA, Schwamm L, Moomaw CJ, *et al.* The Paul Coverdell National Acute Stroke Registry: initial results from four prototypes. *Am J Prev Med* 2006; 31:S202-9.
12. Chee B, Raman R, Ernstrom K, Guzik AK, Hemmen TM, Rapp KS, *et al.* Does symptom onset to primary stroke center time goals affect stroke outcome? *J Stroke Cerebrovasc Dis Off J Natl Stroke Assoc* 2014; 23:993-1000.
13. Choi JC, Kang S-Y, Kang J-H, Ko Y-J, Bae J-M. Are in-Hospital Delays Important Obstacles in Thrombolytic Therapy Following Acute Ischemic Stroke? *J Clin Neurol Seoul Korea* 2007; 3:71-8.
14. Uehara T, Kimura K, Okada Y, Hasegawa Y, Tanahashi N, Suzuki A, *et al.* Factors associated with onset-to-door time in patients with transient ischemic attack admitted to stroke centers. *Stroke J Cereb Circ* 2014; 45:611-3.
15. Tan MS, Ang ES, Ho SS, Ng SC, Talabucon L, Woon FP, *et al.* Wake-up Stroke and Onset-to-door Duration Delays: Potential Future Indications for Reperfusion Therapy. *Ann Acad Med Singapore* 2014; 43:11-4.

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