

# Complications of Cerebrovascular Accident in Two Tertiary Care Hospitals of Peshawar, Pakistan

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## Abstract

**Background:** Stroke is considered as a lethal condition associated with significant mortality and morbidity. After stroke, complications are common and cause devastating effects on rehabilitation. The present study was designed to study the frequency of complications in acute stroke patients in Peshawar, Pakistan.

**Methods:** This prospective observational study was conducted from March 2006 to February 2007 in the General Surgery and Neurosurgery Postgraduate Medical Institute, Lady Reading Hospital and Department of General Medicine of Hayatabad Medical Complex in Peshawar, Pakistan in a tertiary health care facility. The study was conducted on 100 consecutive patients of acute stroke, presenting within 7 days of the onset of stroke. All patients fulfilling WHO definition of acute stroke were admitted. The patients with subarachnoid hemorrhage were excluded from study. After initial assessment for the degree of neurological defect and functional disabilities, the patients were investigated for stroke types and cause. Daily assessment of all patients for occurrence of complications was done till discharge from hospital or death of the patient.

**Results:** Fifty-eight (58%) patients were male and 42 (42%) were female with a mean age of 59.98 ( $\pm 11.95$ ) years. The patients with intra-cerebral bleeding were 32 while those with cerebral infarction were 64 and cases with lacunar infarction, were 4. The median hospital stay was 6 days. The main complications were aspiration pneumonia in 28 (28%), constipation in 28 (28%), chest infection in 27 (27%), dehydration in 21 (21%) and urinary tract infection (UTI) in 12 (12%). 16 patients (16%) had no complications and seven patients died. Aspiration pneumonia was the cause of death in four patients (57%) during their hospital stay.

**Conclusion:** Post-stroke complications are very common and these can alter the outcome of stroke patients. Multidisciplinary stroke management is needed to decrease the complications of acute stroke.

**Keywords:** Stroke; Complications; Stroke, Cerebral infarct; Cerebral Hemorrhage; Lacunar infarction; Pakistan

## Introduction

Stroke has been defined by WHO as “an acute neurological deficit with focal and at times global neurological dysfunction, lasting for more than 24 hours or resulting in death before 24 hours in which, after adequate investigations, clinical signs are presumed to be of a non-traumatic vascular origin”. It is the third most common cause of death in developed countries. The age-adjusted annual death rate from

stroke is 116 per 100,000 people in the United States and 200 per 100,000 in the UK, while 12% of all deaths is higher in black African population than in Caucasian. The death rate following a stroke is around 25% in the elderly and it remains a major cause of morbidity and mortality.<sup>1</sup>

The incidence of stroke is decreasing due to better management of risk factors, but since stroke rates increase greatly with age and the number of elderly people is increasing, the burden of stroke on individuals, families and on the health services is unlikely to fall rapidly.<sup>2-4</sup>

Cerebrovascular disease has shown to be a major cause of death and disability in all societies.

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Patients with acute stroke are vulnerable to the development of various complications as a result of the stroke and the disability caused by it.<sup>5</sup> A substantial proportion of morbidity and mortality occurring later on in the ensuing weeks is due to potentially preventable or treatable complications of stroke. Not only are these complications common, but also they result into poor outcome. Such complications delay successful rehabilitation and start a vicious cycle of reconditioning which is the harbinger of further complications. The eventual outcomes are higher morbidity, mortality, prolonged hospital stays and escalating health care costs. The presence of even one medical complication has been shown to be an independent predictor of poor prognosis. Presence (or absence) of medical complications is one of the determinants of the final functional status achieved. The data from the Ranntas trial<sup>6</sup> showed that there was a relationship between serious medical complications and severe disability that was not due to the severity of stroke. The prevention, recognition, and management of medical conditions after stroke form an integral part of inpatient care.<sup>7-9</sup> The present study was designed to determine the frequency and complications of cerebrovascular accident in two tertiary care hospitals of Peshawar, Pakistan.

## Materials and Methods

This descriptive study consisted of 100 consecutive patients of acute stroke admitted to General Surgery and Neurosurgery Post-Graduate Medical Institute, Lady Reading Hospital in Peshawar and Department of General Medicine of Hayatabad Medical Complex in Peshawar, from March 2006 to February 2007. The inclusion criteria were all acute stroke patients, age above 15 years, and definition of a focal neurological deficit due to vascular lesion, which might be a cerebral infarction or hemorrhage persisting for more than 24 hours. The exclusion criteria were stroke patients for more than 7 days and the patients with documented evidence of subarachnoid hemorrhage.

After informed consent that the information delivered will not be disclosed to anybody else, they were included in the study. Demographic characteristics were recorded. Detailed clinical history, examination and relevant investigation were performed, e.g. lipid profile and brain CT scan.

Complications at the time of admission, e.g. aspiration pneumonia and trauma history were recorded and treated accordingly. Every day, the patients were evaluated for the level of consciousness and mobility. Signs of raised intracranial pressure (ICP) were confirmed clinically. Bed sores and cellulitis were thoroughly looked for. Dehydration was clinically observed. We were interested basically in the complications of stroke and interested mainly in investigations like lipid profile and CT scan of brain. The patients' chests were examined and if any signs were found, chest x-ray was carried out. Fever was checked and Foleys catheter and IV lines were looked for infections possibilities. Deep vein thrombosis (DVT) signs were ruled out on clinical examination and if suspected, then Doppler study was carried out. The collected data were entered into SPSS version 10 for computer analysis. Mean of age and sex and percentages/ratios were calculated for variables such as aspiration pneumonia, DVT, urinary tract infection (UTI), raised ICP and dehydration, etc.

## Results

This study comprised 100 consecutive patients with acute stroke, ranging in age from 20-100 years with a mean of 59.98 years ( $SD=\pm 11.95$ ). The majority of patients were in age group of 50-70 years. Out of 100 patients, 58 (58%) were male and 42 (42%) were female. Thirty two patients (31%) had intracerebral hemorrhage (14 males and 18 females), 64 (64%) had cerebral infarction (40 males and 24 females), and 4 patients experienced lacunar infarcts (2 males and 2 females).

The most common trend of complications of different types was observed in the age group of 50-70 years (Table 1). Stroke had occurred for the first time in 96 patients (96%) and was recurrent in 4 patients (4%). Mean systolic BP was 150.15 mmHg ( $\pm 25.54$ ) and mean diastolic blood pressure was 98.1 mmHg ( $\pm 22.93$ ). The patients' stay in hospital was variable ranging from 1 to 12 days with a median stay of 5 days (Table 2). Seven patients died during the hospital stay (7%) among whom four died due to aspiration pneumonia with primary diagnosis of inter-cerebral bleeding, with a GCS of 3/15 to 6/15, while 93 patients (93%) were alive on the day of discharge. Out of 100 patients, 84 (84%) had one or more complications during hospital stay: chest infection in 27 (27%), constipation in 28 (24%), aspiration pneumonia in 28

(28%), and UTI in 12 (12%) patients. Dehydration was observed in 21 (21%) patients and raised intracranial pressure in 10 (10%) (Table 3). Less common complications were DVT in 7 (7%). No pulmonary embolism was observed; pressure sores being 7 (7%), trauma in 6(6%) and seizures in 5 (5%) patients. An increasing trend of aspiration pneumonia was noticed with GCS of low value (Table 4).

**Table 1:** Frequency of different age groups of patients with stroke

Age in years	Frequency	Percent
20	1	1.0
34	1	1.0
40	4	4.0
42	1	1.0
45	4	4.0
48	2	2.0
50	13	13.0
55	11	11.0
60	29	29.0
65	7	7.0
70	14	14.0
75	5	5.0
78	2	2.0
80	4	4.0
85	1	1.0
100	1	1.0
Total	100	100.0

**Table 2:** Hospital stay of patients with stroke.

Stay in hospital (days)	Frequency N=100	Percentages
1	13	13.0
2	17	17.0
3	13	13.0
4	12	12.0
5	11	11.0
6	7	7.0
7	12	12.0
8	4	4.0
9	2	2.0
10	7	7.0
11	1	1.0
12	1	1.0

**Table 3:** Frequency of complications in patients with acute stroke.

Complications	Frequency N=100	Percentage
Trauma	6	6
Aspiration Pneumonia	28	28
Epileptic seizures	5	5
Chest Infections	27	27
Deep vein thrombosis	7	7
Pulmonary embolism	0	0
Dehydration	21	21
Pressure soars	7	7
Constipation	28	28
Raised intra cranial pressure	10	10
Others	12	12

## Discussion

In several studies of variable designs conducted in overseas centers, the complication rates after a stroke vary from 48% to 96%. The complication rate in the study by Roth et al. was 75%<sup>10</sup> and 85% in Langhorne et al.<sup>11</sup> The results from these studies show a wide variation due to differences in study designs and patient cohort, selection and diagnostic criteria, length of inpatient stay and duration of follow-up.<sup>12</sup> Also, most of these studies focused on individual complications rather than a spectrum of complications, thus enabling more detailed diagnostic criteria to be employed. The study by Roth et al.<sup>10</sup> was one of the largest studies done in a rehabilitation center to look at post-stroke complications, using a pre-defined list of complications adapted from Davenport et al.<sup>13</sup> The prevalence of constipation in the general population is high (around 15%).<sup>12</sup> The prevalence is higher in the female population and in the elderly. A study on 15,000 women, quoted in a review article by Winge et al.<sup>14</sup>, found that 14% to 27% were constipated. After an electronic search of various databases, we were unable to find previous studies, which looked specifically

**Table 4:** Association of aspiration pneumonia and Glasgow coma scale in patients with stroke.

	Glasgow coma scale (/15)											Total	
	3	4	5	6	7	8	9	10	11	12	13		15
Aspiration pneumonia	1	1	6	6	8		1		1	2		2	28

into constipation as a complication of post-stroke. The studies by Davenport et al., Langhorne et al.<sup>11</sup>, Roth et al.<sup>10</sup> and Kalra et al.<sup>15</sup> (all of which looked at multiple complications) also did not include constipation as a complication. Yet, constipation and stroke seems to be associated. In our observation, constipation turned out to be the most common complication (28% of strokes). We felt that this result has important implications to clinical practice. Constipation can be associated with significant morbidity; e.g. acute confusion, subacute intestinal obstruction, abdominal pain, loss of appetite, nausea and vomiting, etc. All of these have a significant negative impact on the rehabilitation process and eventual outcome. The stroke event itself, immobility after stroke, dehydration and nasogastric formulations can all contribute to constipation.<sup>16</sup> Awareness of all of these contributory factors among healthcare professionals dealing with stroke patients is, therefore, extremely important. Early mobilization, ensuring adequate hydration, use of appropriate nasogastric formulations together with the judicious use of oral laxatives and enemas when necessary can greatly alleviate constipation. In our study, aspiration pneumonia and chest infections other than pneumonias were among the top observed complications (28 % and 27%, respectively). These were also observed in a local study carried out by Khan<sup>17</sup> and Langhorne et al.<sup>11</sup> This study shows that chest problems are very common complications after-stroke, contributing independently to the likelihood of poorer outcome. Seven patients (7%) died during the hospital stay. Four patients died due to aspiration pneumonia with primary diagnosis of ICH. Death was also observed in a study by Khan et al.<sup>16</sup> Another study by Mertha Argas et al.<sup>18</sup> even suggested antibiotic prophylaxis. However, many studies showed increased chest problems.<sup>19</sup> Dehydration was observed in a very high proportion (21%) in our observation compared to 10% in Langhorne et al.'s study.<sup>11</sup> It might be due to improper and substandard care in our set up. This study draws our attention towards a multidisciplinary approach towards patient's nutrition and hydration. Evaluation and management of urinary symptoms is often complicated by other comorbidities, including indwelling catheter, diabetes mellitus, bladder instability and benign prostatic hypertrophy (BPH). The frequency of UTI (12%) was lower than that found by Roth et al. (30.5%).<sup>10</sup> The observations by Davenport et al.<sup>13</sup> and Langhorne et al.<sup>11</sup> yielded 16% and 24% UTI frequencies, respectively. The rates of post-stroke raised intracranial

pressure, trauma/falls, DVT, pulmonary embolism, trauma, seizures and pressure sores were 10%, 7%, 0%, 6%, 5% and 7%, respectively. Yet, these are important complications after a stroke event with high mortality rates. The low frequencies of complications like pressure sores, skin-breakdown, DVT, and thrombo-embolism might be attributed to the short stay in the hospital and active physiotherapy with side nursing care, mostly emphasized in acute stroke care. Not many studies on post-stroke falls have been done. Falls in an elderly patient result in fractures, with significant morbidity and mortality. Langhorne et al.<sup>11</sup> in a study observed an overall of 30% falls but the results were because of a long duration follow-up. In the 1950's, it was recognized that patients with hemiplegia have a propensity to hip fractures on the hemiplegic site secondary to unilateral loss of bone density at this site. With the concurrent motor, sensory and visual-perceptual deficits, the risk of fractures secondary to falls is high. Hip fractures in stroke patients result in greater mortality than in those without stroke. Rannemark et al.<sup>20</sup> showed that survival and recovery of independent mobility after hip fracture significantly reduced in patients with stroke compared with those who had not had a previous history of stroke. In a Swedish study, the risk of sustaining a hip fracture in the immediate post-stroke period was four times the risk in the general population.<sup>20</sup> Also, there was a substantial increase in risk of hip fracture during the first year post-stroke in all ages and regardless of the gender of the patient.<sup>21</sup> Hence, stroke is a condition associated with an increased risk of falls. The studies mentioned above have shown that falls after stroke result in significant morbidity and mortality. Therefore, to reduce this morbidity and mortality, we have to reduce the risk of falls. More focus need to be placed on and a multidisciplinary approach taken for patients who fall in hospital after a stroke. A good proportion of patients were observed with raised ICT; however, no further events were associated with it, and also no specific studies were available to ascertain the facts.

DVT and pulmonary embolism are uncommon but important complications after stroke. Langhorne et al.<sup>11</sup> has also a small percentage of DVT observation in his study (2%). A study by Kelly<sup>22</sup> suggests that dehydration is associated with increased incidence of DVT. There was insufficient awareness of the dangers of DVT in a stroke patient. Although the incidence of both DVT and seems to be low, one factor of this in our study was short span of duration and

provision of physiotherapy, but they are potentially fatal conditions and can lead to early sudden mortality after stroke. Hence, clinicians should have a low threshold for suspicion of pulmonary embolism in stroke patients who develop acute cardiorespiratory symptoms. The use of heparin for prophylaxis against DVT and pulmonary embolism post-stroke has been shown to be effective. Multiple complications were more common in the older age group. The most common group of complications was among those between 50-70 years. The presentations of the stroke patients were also in the same age group. This may be because in the older age group, there are other confounding factors, that is, the patient may be having other co-morbidity conditions. Regarding sex, females were equally suffering from various complications although they were fewer in number than males. Surprisingly, UTI was observed more commonly in men. Seizures and dehydration were observed more in men.

This is a descriptive study detailing the complications encountered in our local stroke population during inpatient rehabilitation. Despite our small study cohort, we have shown that post-stroke complications are common and pose a significant challenge to the healthcare provider as well as the patient. We have also shown that medical complications continue to occur during the rehabilitative phase after a stroke. The rehabilitation process is a medically active discipline.

The implications to our clinical practice are tremendous. There are infinite numbers of medical complications which can occur after stroke, many of which are fatal. Hence, it is vital to identify these problems early. All medical complications may be

preventable to some extent. Implementation of certain interventions during acute care and rehabilitation may reduce the frequency of certain complications. Some of these interventions may be most effective when commenced immediately after stroke, as certain complications are more likely to originate in the acute post-stroke phase. More studies are required to determine the time interval from the onset of stroke to the development of a complication and to determine the risk factors for developing these complications in our local population. Modification of these risk factors will reduce the rate of complications. This in turn will improve patient outcome and hopefully reduce healthcare costs. Studies also need to be done to ascertain the pre-existing medical conditions in these patients as these may modify risk factors. We also need local statistics for some of the rare but potentially fatal complications of stroke, namely, DVT, pulmonary embolism and recurrent stroke. We need a multidisciplinary stroke management plan to be laid down, most probably including physicians, nurses, physiotherapists, and social workers.

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### References

- Clarke CRA. Neurologic disease. In: Kumar PJ, Clark CRA, eds. Clinical medicine. 5<sup>th</sup> ed. Philadelphia:WB Saunders, 2002; pp. 1123-4.
- Broderick JP, William M. Feinberg Lecture: stroke therapy in the year 2025: burden, breakthroughs, and barriers to progress. *Stroke* 2004;**35**:205-211. [14671248] [10.1161/01.STR.0000106160.34316.19]
- Pulsinelli WA. Cerebrovascular diseases. In: Goldman L, Bennett CJ Eds. Cecil Textbook of Medicine. 21<sup>st</sup> ed. Philadelphia:WB Saunders, 2000; pp. 2092-2114.
- Van-Gijn J, Rinllet GJ. Subarachnoid hemorrhage: diagnosis, causes and management. *Brain* 2001; 124:249-78. [11157554] [10.1093/brain/124.2.249]
- Doshi VS, Say JH, Young SH, Doraisamy P. Complications in stroke patients. *Singapore Med J* 2003;**44**:643-52. [14770260]
- Johnston KC, Li JY, Lyden PD, Hanson SK, Feasby TE, Adams RJ, Faught RE Jr, Haley EC Jr. Medical and neurological complications of ischemic stroke: experience from the RANTTAS trial. RANTTAS Investigators. *Stroke* 1998;**29**:447-53. [9472888]
- Vataja R, Pohjasvaara T, Leppävuori A, Mäntylä R, Aronen HJ, Salonen O, Kaste M, Erkinjuntti T. Magnetic resonance imaging correlates of depression after ischaemic stroke. *Arch Gen Psychiatry* 2001;**58**:925-31. [11576030] [10.1001/archpsyc.58.10.925]
- Lara Staub BA, Morgenstern LB. Stroke on Hispanic Americans. *Neurologic Clinics* 2000;**18**(2):291-307. [10757827] [10.1016/S0733-8619(05)70193-6]
- Li H, Forsterman U. Nitric oxide in the pathogenesis of vascular disease. *J Pathol* 2000;**190**:244-54. [10685059] [10.1002/(SICI)1096-9896(200002)190:3<244::AID-PAT-H575>3.0.CO;2-8]
- Langhorne P, Stott DJ, Robertson L, MacDonald J, Jones L, McAlpine C, Dick F, Taylor GS, Murray G.

- Medical complications after stroke. *Stroke* 2000;**31**:1223-9. [10835436]
- 11 Roth EJ, Lovell L, Richard L, Heinemann AW, Semik P, Diaz S. Incidence of and risk factors for medical complications during stroke rehabilitation. *Stroke* 2001;**32**:523-9. [11157192]
  - 12 Stewart WF, Liberman JN, Sandler RS, Woods MS, Stenham A, Chee E, Lipton RB, Farup CE. Epidemiology of constipation (EPOC) study in the United States: Relation of clinical subtypes to sociodemographic features. *Am J Gastroenterol* 1999;**94**:3530-40. [10.1111/j.1572-0241.1999.01642.x]
  - 13 Davenport R, Dennis M; Neurological emergency: acute stroke. *J Neurol Neurosurg Psychiatry* 2000;**68**:277-88. [10675208] [10.1136/jnnp.68.3.277]
  - 14 Winge K, Rasmussen D, Werdelin LM. Constipation in neurological diseases. *J Neurol Neurosurg Psychiatry* 2003;**74**:13-9. [12486259] [10.1136/jnnp.74.1.13]
  - 15 Kalra L, Yu G, Wilson K, Roots P. Medical complications during Stroke rehabilitation. *Stroke* 1995;**26**:990-4. [7762051]
  - 16 Harari D. Constipation in the elderly. In:Hazzard WR (ed). Principles of geriatric medicine and gerontology. McGraw Hill. Fourth edition, 1999.
  - 17 Khan A, Sherien A, Ahamed H, Khalil KM. Acute complications of stroke. *J Postgrad Med Inst* 2004;**18**(2):220-4.
  - 18 Vargas M, Horcajada JP, Obach V, Revilla M, Cervera A, Torres F, Planas AM, Mensa J, Chamorro A. Clinical consequences of infection in patients with acute stroke:is it prime time for further antibiotic trials? *Strok* 2006;**37**:461-5. [16385093] [10.1161/01.STR.0000199138.73365.b3]
  - 19 Prass K, Braun JS, Dirnagl U, Meisel C, Meisel A. Stroke propagates bacterial aspiration to pneumonia in a model of cerebral ischemia. *Stroke* 2006;**37**:2607-12. [16946159] [10.1161/01.STR.0000240409.68739.2b]
  - 20 Mackintosh S F, Hill K, Dodd K J, Goldie P, Culham E. Falls and injury prevention should be part of every stroke rehabilitation plan. *Clin Rehabil* 2005;**19**:441-51. [15929514] [10.1191/0269215505cr796oa]
  - 21 Ramnemark A, Nilsson M, Borssen B, Olsson T, Gustafson Y. Stroke, a major and increasing risk factor for femoral neck fracture. *Stroke* 2000;**31**:1572-7. [10884456]
  - 22 Kelly J, Hunt BJ, Lewis RR, Swaminathan R, Moody A, Seed PT, Rudd A. Dehydration and venous thromboembolism after acute stroke. *QJM* 2004;**97**:293-6. [15100423] [10.1093/qjmed/hch050]