

# Risk Factors and Early Prognosis in Stroke

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Stroke is still a common disabling and devastating disorder in spite of new post stroke treatment strategies. In this prospective study of 100 CT scan confirmed cases, we identified the risk factors and assessed the immediate prognosis. Analysis of the data showed ischaemic stroke to be 61%, cerebral hemorrhage 34% and subarachnoid hemorrhage 5%. The most likely stroke prone age in both sexes was 60-70 years. Hypertension (58%), ischaemic heart disease (35%), smoking (27%) and diabetes mellitus (18 %) were most commonly associated with increased risk for stroke. Overall stroke related in hospital mortality in this series was 17%. 60% patients of subarachnoid hemorrhage, 23% of cerebral hemorrhage and 9.8 % of cerebral infarction died of their diseases. Immediate functional outcome was better in cases of cerebral infarction.

**Key words:** Stroke, cerebrovascular disease, cerebral infarction, cerebral hemorrhage, subarachnoid hemorrhage.

The term "stroke" signifies the abrupt impairment of brain function caused by a variety of pathological changes involving one (focal) or several (multifocal) intracranial or extra cranial blood vessels<sup>1</sup>. Stroke is the most common life threatening neurological disease and is the third leading cause of death in the USA, after heart disease and cancer.<sup>2</sup> Cerebrovascular diseases cause approximately 200,000 deaths in the USA each year as well as considerable neurological disability.<sup>3</sup> These diseases cause either ischemia-infarction or intra-cranial hemorrhage. Cerebral infarction is usually more common, nearly 80 % in developed<sup>4</sup> and 60% in developing countries<sup>5</sup> whereas intracerebral hemorrhage constitutes 10-30%<sup>6</sup>, larger percentage in Asia<sup>3</sup>.

Identification of risk factors for stroke, awareness of its relative importance in pathogenesis of stroke, may yield important clues in preventing this lethal disease. In the past two decades, better understanding and interaction with the risk factors has declined the death rate from stroke in USA<sup>7</sup>. The management of mild hypertension, a major risk factor, causes more decline in stroke incidence than coronary heart disease<sup>8</sup>. It is therefore, worth while to reexamine the etiological factors for stroke from time to time to determine the avoidable factors involved<sup>9</sup>. The major risk factors in stroke are hypertension<sup>10,11</sup>. Ischemic heart disease<sup>12</sup>, diabetes mellitus<sup>13,14</sup>, smoking<sup>15, 16</sup> and obesity<sup>17</sup> etc. In this study, we have analyzed the predominant risk factors in our cases of stroke. The pattern of stroke subtypes varies in developing countries; the hemorrhagic strokes are of large percentage. We examined the stroke pattern in our study. In addition, we also recorded the early prognosis of the various subtypes of stroke.

## Patients and Methods.

This is a prospective study of consecutive 100 cases of stroke admitted in Medical Unit I Bahawal Victoria Hospital, Bahawalpur affiliated with Quaid-i-Azam Medical College, from June 1997 to October 1998. Only those cases were included in this study where CT scan

confirmed the lesion. Cases with traumatic hemorrhage, subdural haematoma, transient ischemic attacks and hypertensive encephalopathy were not included in the study.

A detailed history was taken and general physical, neurological and cardiovascular examination was carried out according to study protocol. Special emphasis was given to take history of hypertension, diabetes mellitus, present and past history of chest pain, previous neurological problems (TIAs), smoking, amount of physical activity at work, past history of stroke, family history of stroke, alcoholism, intake of oral contraceptive pills and cardiac problems. Investigations performed in all patients included complete blood counts, erythrocyte sedimentation rate, electrocardiography, blood glucose, serum lipids and computed tomography (CT) scan of the brain. Investigations in selected cases were antinuclear antibody (n = 4), prothrombin time and activated partial thromboplastin time (n = 12), cerebrospinal fluid examination (n = 4) and Doppler ultrasonography of neck vessels (n = 2). All patients were given standard general treatment. Specific treatment like anti-platelets was given to the patients with cerebral infarction and anticoagulants only to those with cardiac embolic source. Blood pressure was consciously controlled. Patients with subarachnoid hemorrhage and those cases of intracerebral hemorrhage who were having deterioration of conscious level or having large hemorrhage (3 cm or more supratentorially) and all infratentorial hemorrhage were sent for neuro-surgical intervention.

## Criteria

Stroke was defined according to world Health Organization (WHO) criteria as rapidly developing symptoms and / or signs of focal and at times global loss of cerebral function with no apparent cause other than that of vascular origin.

Cerebral infarction was labeled when a hypodense area on CT scan was detected corresponding to the clinical picture.

Intra cerebral haemorrhage was diagnosed when a parenchymatous hyperdense area on the brain CT scan with or without intra ventricular leak was seen.

Subarachnoid hemorrhage was identified by the presence of blood in the subarachnoid space on CT scan or by bloody cerebrospinal fluid in patients with a typical clinical picture of normal CT scan.

#### Definition of Risk Factors and Outcome:

**Hypertension:** Two or more readings of blood pressure of 160 (systolic) or 95 (diastolic) before the onset of stroke or the use of antihypertensive medication at any time before or at the time of stroke.

**Diabetes mellitus:** A history of diabetes that was confirmed in the patient's medical record, was taking insulin / oral hypoglycemic agent or had a random blood sugar concentration of 11 mmol/L.

**Ischemic heart disease:** Present / past history of chest pain along with ECG changes of pathological 'Q' waves / ST-T wave changes or cardiac enzyme level twice the upper normal level.

**Smoking status:** 'Never' current or ex-smoker (> 12 months) and number of cigarettes smoked per day.

**Body weight:** 20 % over that in standard height - weight tables, was arbitrarily considered obesity except for heavily muscled persons.

**Early prognosis of these patients was assessed by making three Groups. Group I, who died in the hospital, Group II, who improved, regained consciousness and some power of grade 2 but were dependent. Group III who showed marked improvement and were mobile, non-dependent.**

#### Results

In this series males were slightly predominant (51 vs 49) with age ranging from 21 to 78 years (mean age, 50 years) while females were rather older with age ranging from 24 to 83 years (mean age, 53 years). The most likely stroke prone age was 7<sup>th</sup> decade as is shown in Table 1.

Table 3 Main Risk Factors in Stroke.

Risk factors	n=.	Cerebral infarction (n =61)		Intra cerebral hemorrhage( n = 34)		Subarachnoid hemorrhage( n= 5)	
		No.	%age	No.	%age	No.	%age
Hypertension	58	29	47.5	25	73.5	4	80
Ischemic heart disease	35	24	39.3	10	29.4	1	20
Smoking	27	20	32.7	5	14.7	2	40
Diabetes mellitus	18	14	22.9	4	11.7	-	-
Low physical activity	13	12	19.6	1	2.9	-	-
Past H/O stroke	10	9	14.7	1	2.9	-	-
Obesity	9	5	8.1	4	11.7	-	-
Family H/O stroke	6	6	9.8	-	-	-	-
Hyperlipedemia	6	5	8.1	1	2.9	-	-
T I As	5	5	8.1	-	-	-	-
Cardiac emboli	3	3	4.9	-	-	-	-
Oral contraceptives	-	-	-	-	-	-	-
Alcoholism	-	-	-	-	-	-	-
No risk factor	7	6	9.8	1	2.9	-	-

Table 1 Age And Sex Distribution In Stroke (N = 100)

Age group	Males (n = 51)	Female (n = 49)
21-30	4	2
31-40	1	-
41-50	4	4
51-60	11	10
61-70	16	23
> 70	15	10

Cerebral infarction (61 %) was the common stroke subtype (Table 2).

Table 2 Types Of Strokes (N = 100)

Type	Number	%age
Cerebral infarction	61	61
Cerebral hemorrhage	34	34
Subarachnoid hemorrhage	5	5

Risk factors associated with each type of stroke are given in Table 3. Hypertension was the most common risk factor found in 58 %. All these were known hypertensive but were not taking the medicine or taking irregularly. Smoking was found in 27% of these cases and majority was smoking more than 20 cigarettes a day for longer than 16 years. Diabetes mellitus was 4<sup>th</sup> (18%) most common risk factor. All were cases of NIDDM and were in poor control of their sugar level. Among the three cases of cardiac emboli, two were having atrial fibrillation with mitral stenosis and one with dilated cardiomyopathy and intraventricular thrombus.

Final analysis revealed that one or more risk factors were present in 93 cases and in 7 cases, we could not detect any risk factor (Table 4).

Early in hospital mortality was more in cases of hemorrhage especially subarachnoid (60%). Early functional outcome was better in cases of cerebral infarction (Table 5).

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Table 4 Risk Factors in Stroke.

Number of risk factors	Cerebral Infarction(n = 61)	Cerebral hemorrhage(n = 34)	Subarachnoid hemorrhage (n = 5)
None	6	1	1
One	13	17	1
Two	21	9	1
Three	14	5	2
Four	5	1	-
Five	2	1	-

Table 5 Early prognosis of stroke patients (n = 100)

Sub types	Group I (Died)		Group II. Improved but dependent		Group III. Improved and independent	
	No.	%	No.	%	No.	%
Cerebral infarction (n=61)	6	9.8	32	52.4	23	37.7
Intra cerebral hemorrhage (n = 34)	8	23	23	67.6	3	8.8
Sub arachnoid hemorrhage (n= 5)	3	60	1	20	1	20

### Discussion.

Stroke is a common neurological disorder, which causes a lot of mortality as well as morbidity. It increases a formidable burden of disability and misery for patients and their careers and the wider community<sup>18</sup>. So its prevention is main cause of concern for the community.

The mean age in our patients was 51.5 years and the risk of stroke increased with age, which has also been shown by other studies<sup>3, 19 & 20</sup>. In both male and female patients, the most stroke prone age was 60-70 years, similar as reported by Al- Rajeh<sup>6</sup>. Cerebral infarction was found in 61% of our patients. This figure corresponds to the Japanese patients (56%)<sup>21</sup> but lower than that reported in western studies (88%)<sup>22</sup>. Cerebral hemorrhage constitutes the larger percentage (34 %) in our series than in western patients (12%)<sup>22</sup> but the figure is closer to Japanese study (30%)<sup>21</sup>. Subarachnoid hemorrhage was the least common (5%) in our study.

Hypertension is a well established risk factor of stroke both diastolic as well as isolated systolic<sup>10 & 11</sup>. In our study it was found to be the most common (58%) culprit. The figure is almost similar to that reported by Al-Rajeh et al<sup>6</sup> and Ali-L et al<sup>20</sup>. Hypertension was found in 47.5 % cases of cerebral infarction, which is comparable to Sandercock (52%)<sup>23</sup>. It was present in 73.5% cases of cerebral hemorrhage, which is slightly higher than that of Karachi study (68%)<sup>20</sup>.

Many studies have shown that diabetics are at increased risk of stroke<sup>13, 14</sup>. In our study diabetes mellitus was present in 18% of stroke cases, the reported literature shows its wide range (13-36%)<sup>24</sup>. Diabetes was more common (22.9%) in our cerebral infarction cases than in cases of cerebral hemorrhage (11.7%). The same pattern has also been observed in other study<sup>20</sup>. The diabetic angiopathy increased platelet adhesiveness and decreased fibrinolytic activity, increase the risk of atherothrombosis, so more cases of ischemic strokes are seen with diabetes than that of hemorrhage.

Smoking was the third most common risk factor (27%) in our study. It increases the risk of both types of stroke<sup>15</sup> and the risk increases as number of cigarettes smoked per day is increased both in men and women<sup>16</sup>. A

recent Finnish study confirms that decrease in smoking declines the incidence of stroke<sup>25</sup>. So smoking should be discouraged at all levels. Ischemic heart disease and ischemic strokes are very close relatives being atherosclerotic diseases. So it has been documented<sup>12</sup> that ischemic heart disease not only myocardial infarction (Q wave and non Q wave) but also angina pectoris and silent MI increases the risk of ischemic stroke. In our patients ischemic heart disease was found in 35%, the second most common risk factor. This figure is closer to that of Al-Rajeh (33%). Recent studies show that low physical activity especially at work increases the risk of stroke<sup>26</sup>. In our study low physical activity was seen in more cases of cerebral infarction (19.6%) than hemorrhage (2.9%). Probably less active patients are obese, increased chance of atherosclerosis and ischemic stroke.

Family history<sup>27</sup> and past history of stroke<sup>28</sup> also increases the risk of stroke. The role of hyperlipidemia has been controversial in the past but recent reports<sup>20 & 29</sup> show a positive co-relation especially with cerebral infarction. The same we have observed. Though in literature, alcoholism<sup>30</sup> and oral contraceptive pills intake<sup>31</sup> increase the risk of stroke, these were not found in our series.

The prognosis in stroke cases varies according to the subtypes. In general, longer the delay in onset of recovery, poorer the prognosis<sup>32</sup>. So the immediate, in hospital, prognosis predicts the long-term prognosis. Therefore, we assessed the immediate prognosis of both ischemic as well as hemorrhagic strokes. About 10 to 15 % of patients with ischemic stroke die, some because of brain swelling or neurological dysfunction, but most because of systemic complications such as myocardial infarction, pulmonary embolism and pneumonia<sup>1</sup>. In our study 9.8% of patients died. 37% of our infarction cases showed good recovery and it is hoped that they will be improving with little disability. The mortality in cases of cerebral hemorrhage is usually higher than in ischemic stroke. Some 30 to 35 % cases of cerebral hemorrhage die in one to 30 days<sup>32</sup>. 23% of our cases died in hospital stay. The patients die because of temporal lobe herniation and midbrain compression, intraventricular leak or direct seepage of blood into vital

centers like hypothalamus or midbrain. Even gastrointestinal hemorrhage of neurogenic origin may be fatal. Younger patients with small hemorrhage show good prognosis<sup>1</sup>. In patients who survive, adequate restitution of function can be expected but the function may return slowly<sup>32</sup>. In our patients of hemorrhage, improvement of function was rather slow than that of infarction. The prognosis in subarachnoid hemorrhage is rather gloomy. 60% of our patients die of this disorder, the same figure is given in literature<sup>2</sup> for high grade cases.

### Conclusion.

The main risk factors in our study were hypertension, ischemic heart disease, smoking and diabetes mellitus. Hypertension is the most important factor for both types of strokes, so its early detection and regular treatment will decrease a formidable burden of disability in the community. Smoking has emerged too as important risk factor and every effort be made to curtail it. The prognosis of stroke patients especially hemorrhagic cases has not improved significantly and because most of these cases are hypertensive, again showing the importance of blood pressure control.

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