

RISK FACTORS STRATIFICATION IN 100 PATIENTS OF ACUTE STROKE

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ABSTRACT

Objective: To find out the relative frequencies of various risk factors associated with first ever stroke.

Material and Methods: This prospective observational study was conducted in medical B unit of the Department of Medicine, Post Graduate Medical Institute, Government Lady Reading Hospital, Peshawar, Pakistan from March 2001 to January 2002. A total number of 100 patients, 64 males and 36 females, with first ever stroke were included in the study. A questionnaire was designed comprising detailed history, general physical and neurological examinations. The association of different risk factors with stroke was studied.

Results: The ages of patients ranged from 17 to 100 years with mean age of 59 years \pm 11.63 years standard deviation (SD). Cerebral infarction constituted 68%, intracerebral hemorrhage 31% and subarachnoid hemorrhage 01%. Hypertension (HTN) was the most common risk factor (60%) followed by diabetes mellitus (DM) (28%), hyperlipidemia (28%), smoking (22%), ischemic heart disease (IHD) (18%), atrial fibrillation (12%) and history of oral contraceptive use (10%).

Conclusion: Main risk factors for stroke are Hypertension, Diabetes mellitus, Hyperlipidemia and Smoking. Stroke can be prevented by modification of these risk factors. There is a genuine need for health education programmes on stroke and their mortality.

Key words: Stroke, Risk Factors, Hypertension, and Diabetes mellitus.

INTRODUCTION

Stroke is a clinical syndrome characterized by rapidly developing symptoms and/

or signs of focal, and at times global (for patients in coma), loss of cerebral functions, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.¹

Stroke is a major cause of mortality and morbidity with disability and social dependence. In the western world, stroke is the third commonest cause of death after heart disease and all cancers². The annual incidence of stroke in developed countries is about 2/1000 population but the exact figure depends on the age structure of population as the incidence rises steeply with increasing age³. According to WHO estimates for the year 2020, stroke will remain the second leading cause of death along with ischaemic heart disease both in developing countries and developed world.⁴ The overall burden of stroke will be greater in developing countries than in developed countries mainly due to ageing of population and transition to burden of chronic disease. The hospital based studies conducted in Pakistan revealed 31–40% cases of stroke due to cerebral haemorrhage and 60–69% due to ischaemia in centres where facilities for CT scan were available.^{5,6} Developing countries seem to have higher proportion of haemorrhagic stroke as compared to the developed countries⁷.

Due to severe morbidity and mortality of stroke and limited effective therapies, research has mainly focused on prevention of this debilitating illness by modification of risk factors.

Stroke risk factors are classified as non-modifiable and modifiable. The non-modifiable factors are few and include advanced age, male gender, and race. The modifiable risk factors for stroke are hypertension, atrial fibrillation, coronary artery disease, diabetes mellitus, hypercholesterolaemia, cigarette smoking, obesity, alcohol abuse and physical inactivity.⁸

The purpose of this study was to find out relative frequencies of the various risk factors associated with stroke as the local studies conducted on the topic are very limited.

MATERIAL AND METHODS

This study was conducted in the Department of Medicine, Post Graduate Medical Institute, Govt; Lady Reading Hospital, Peshawar, from March 2001 to January 2002. A total of 100 patients, 64 males and 36 females with age ranging from 17 to 100 years were included in the study.

Stroke was defined as 'a focal neurological deficit due to a vascular lesion, which may be a cerebral infarction or haemorrhage.' All these patients with the clinical diagnosis of stroke were then confirmed by CT scan of brain.

Inclusion Criteria were all the patients meeting the criteria for stroke as defined, irrespective of sex, admitted in the Department of Medicine, PGMI, Govt. LRH, Peshawar, stroke patients of more than 12 years of age, patients with first ever stroke. Patients with stroke of recent onset of more than 24 hours were included in the study.

Exclusion Criteria were patients with recurrent stroke, patients with stroke due to causes like trauma and brain tumor. Patients with stroke lasting more than five days were also excluded from the study.

Patients admitted with the clinical diagnosis of stroke, whether through outpatient or emergency department, were selected at random and then confirmed by CT scan of the brain.

Hypertension was defined as systolic blood pressure (SBP) >140 mmHg, diastolic blood pressure > 95 mmHg or both on two separate occasions or the use of antihypertensive medication at any time before the onset of stroke.⁹ Patients were diagnosed as diabetic if fasting plasma glucose levels were 126mg/dl or higher after an overnight fast on more than one occasions or random glucose level 200 mg/dl or higher on more than one occasion.¹⁰ Patient was also labeled as

diabetic on the history of diabetes confirmed in patient's medical record, or the patient was taking insulin or an oral hypoglycemic agent.

There is no true normal range for serum lipids. In this study patients were labelled as hyperlipidemics if total serum cholesterol levels are 240mg/dl or higher, lower density lipoprotein cholesterol (LDL-C) levels are 130 mg/dl or higher, high-density lipoprotein cholesterol (HDL-C) levels 35mg/dl or lower.^[11] Patient was also considered hyperlipidemic if patient is already on lipid lowering medication.

A detailed history of patient was taken and general physical and neurological examination was carried out at the time of admission. History of hypertension, diabetes mellitus, smoking, alcoholism, oral contraceptives (in case of females), previous neurological problems, family history of stroke, menstrual and obstetric history (in case of females) and history of other known medical problems such as valvular heart disease, hyperlipidaemia, connective tissue disease, bleeding disorders and hyperviscosity syndrome was noted. History was taken from close relatives, as 14% patients were unconscious or drowsy while 60% patients were aphasic, making the direct communication with the patient almost impossible.

CT brain of each patient was performed by Radiology department, PGMI, Govt. LRH, Peshawar. Contrast was not given routinely. The time of the CT examination from the time of stroke onset varied from 24 hours to one week.

Statistical analysis of the results was performed by utilizing SPSS Version 10.

RESULTS

Out of 100 patients, 64 were males and 36 females. Mean age of presentation was 59

years (SD \pm 11.63 years) and ranged from 17–100 years. Mean age for men was 64 years and for women 49 years. 15% patients were under 40 years of age and 85% patients were more than 50 years old. Among female patients, 29 were postmenopausal and 07 were in reproductive age. Out of these 07 patients in reproductive age, 02 were suffering from toxemia of pregnancy.

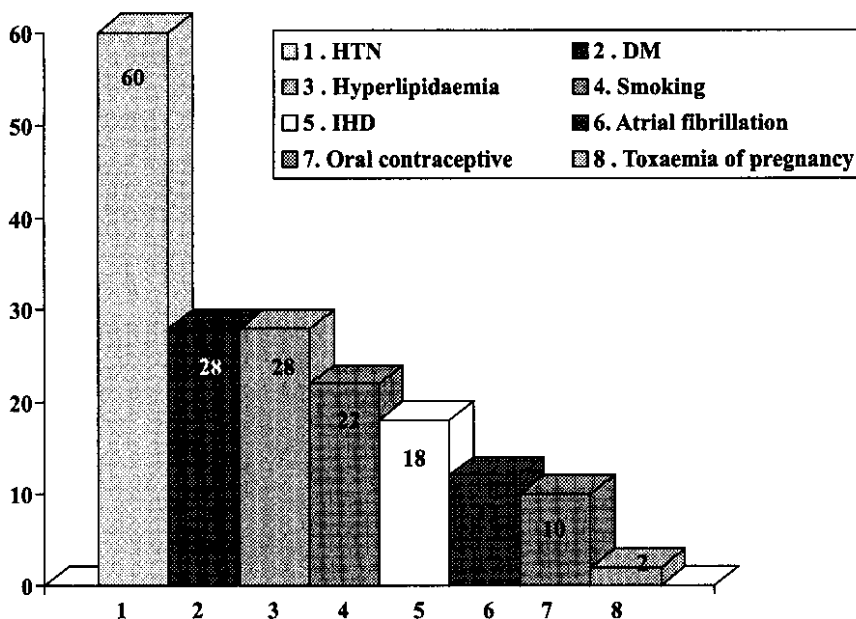
Ischaemic stroke constituted 68%, intracerebral haemorrhage 31% and subarachnoid haemorrhage 01% of the cases. In men, cerebral infarction constituted 71.9% (n=46) and haemorrhagic stroke 28.1% (n=18) cases. Among female patients, cerebral infarction contributed 61.1% (n=22) cases and haemorrhagic stroke in 38.9% (n=14) cases.

Risk factors associated with stroke are given in a graph (Graph #: 01). Hypertension was the most common risk factor found in 60% (n=60) cases of stroke. Among these patients, 60% (n=36) were known hypertensive while the remaining 40% (n=24) were not aware of hypertension before the incidence of stroke. Out of 36 known hypertensive patients, only 22% (n=8) patients were taking antihypertensive drugs on regular basis, whereas the remaining 78% (n=28) patients were either not taking the antihypertensive medication or taking it irregularly. Forty-two patients were hypertensive while remaining 18 patients were suffering from combined hypertension and diabetes mellitus.

Diabetes mellitus was present in 28% (n=28) cases. Among these 28 patients, 24 were known diabetics while 04 patients were diagnosed as diabetics during hospital stay. Among known diabetics, 04 patients were either not using antidiabetic medication or using it on off and on basis. All the diabetic patients were on oral hypoglycaemic agents. Eighteen patients were suffering from both hypertension and diabetes mellitus.

Twenty-eight patients were hyperlipidaemic and 22% (n=22) of stroke patients

MAJOR RISK FACTORS IN STROKE

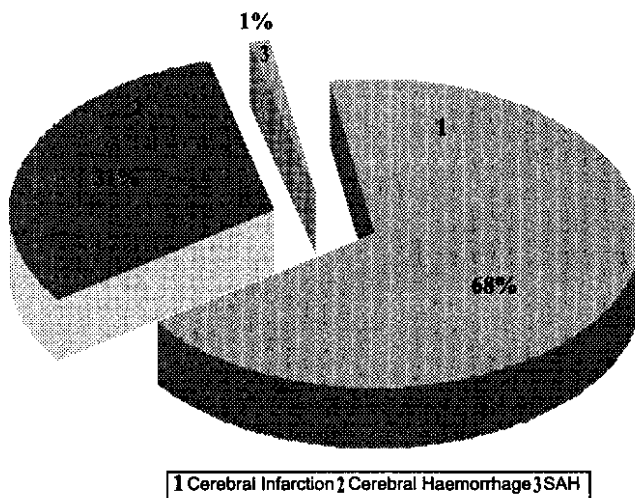


Graph No. 1

were smokers. Family history of stroke was present in 18% (n=18). Pulse rhythm was irregularly irregular in 12% cases, which was

confirmed with ECG as atrial fibrillation in all these cases. History of oral contraceptives was present in 10% of total patients (27.77%

SUBTYPES OF STROKE



Graph No. 2

**FREQUENCY OF RISK FACTORS IN CEREBRAL INFARCTION VERSUS
INTRA-CEREBRAL HAEMORRHAGE.**

Risk Factors	CI (n=68)	ICH (n=31)	SAH (n=01)	Total (n=100)
Hypertension	36(52.9%)	23(74.2%)	01(100%)	60
Diabetes mellitus	18(26.5%)	10(32.3%)	-	28
Hyperlipidemia	16(23.5%)	12(38.7%)	-	28
Smoking	12(17.6%)	10(32.3%)	-	22
Family History of stroke	8 (11.8%)	10(32.3%)	-	18
Atrial Fibrillation	12(17.6%)	-	-	12
Oral contraceptive use (in females)	8 (11.8%)	2 (6.5%)	-	10

CI = Cerebral infarction

ICH = Intra-Cerebral haemorrhage

SAH = Subarachnoid haemorrhage

TABLE-1

of female patients). 02% patients were suffering from toxemia of pregnancy. Carotid bruit was present in 02% cases. One patient was opium addict for the last 39 years. No history of alcoholism was obtained in any patient.. History of known medical illnesses in this study was as following:

- Thirty-six patients were known hypertensive.
- Twenty-four patients were known diabetic.

- Ten patients were known cases of ischaemic heart disease.
- One patient was suffering from cirrhosis secondary to Hepatitis 'C' virus. He suffered ischemic stroke.

In this study, most patients were from lower social class. Some of the known hypertensive patients were using hakeemi/herbal medicines, while some were blaming the high cost of allopathic medicines as the main reason for non-compliance.

COMPARISON OF DIFFERENT PATTERNS OF STROKE

Authors	No. of Pts	ICI	PICH	SAH	Uncertain
Lausanne ^[15]	1000	88%	12%	Excluded	Excluded
Leftovits et al ^[16]	925	76%	16%	08%	-
Bramford et al ^[17]	675	81%	10%	05%	04%
Yanok et al ^[18]	587	74%	18%	06%	02%
Kagan et al ^[19]	530	73.4%	23.4%	01%	2.2%
Aketa ^[20]	500	56%	30%	09%	05%
Javatorp et al ^[21]	225	60%	26%	07%	07%
Present study	100	68%	31%	01%	-

ICI=Intracerebral infarction

PICH=Primary Intracerebral haemorrhage

SAH=Subarachnoid haemorrhage

TABLE - 2

DISCUSSION

Stroke is currently the third leading cause of death in the developed world, surpassed only by heart disease and malignancies respectively. This disease causes a devastating impact on individuals, families and communities. Emergency and long-term care for stroke patients and the loss of productivity costs at least 40 billion US dollars annually. Furthermore, many of the more than 4 million stroke victims in the United States, who are alive today suffer severe disability and require continued medical care when they are discharged from the hospital.¹²

The main pathological types of stroke are cerebral infarction, primary intra-cerebral haemorrhage and subarachnoid haemorrhage. In developed countries, about 85-90% of strokes are due to cerebral infarction and 10-15% due to intracranial haemorrhage.⁷

Haemorrhagic stroke constitutes a larger percentage in Asians. The incidence of haemorrhagic stroke in various Asian countries is as follows:

Malaysia 33%, Indonesia and Singapore 26%, Taiwan 28%, Thailand, Hong Kong, Philippines and Korea 30 % while in India, the incidence of haemorrhagic stroke ranged from 35-40 % in different studies.^{13,14} The hospital based studies in Pakistan have almost the same results.^{5,6}

In this study, hypertension was the most common risk factor for stroke. 60% stroke patients were hypertensive. Among these hypertensive patients, 60% were known hypertensive. Only 22% of these patients were taking antihypertensive on regular basis while remaining 78% were having poor compliance with the medication. The remaining 40% patients were diagnosed hypertensive after frequent recording of their blood pressure.

Twenty-eight stroke patients were type 2 diabetics. They were taking oral hypoglycaemic agents with poor compliance. 64.29% of these diabetic patients suffered from cerebral infarction and 35.71% from haemorrhagic stroke.

Atrial fibrillation was present in 12% cases. All of them suffered ischaemic stroke with good recovery. 08% patients were suffering from valvular atrial fibrillation and 04% from non-valvular atrial fibrillation.

Two patients were suffering from toxæmia of pregnancy. These patients were shifted from Gynae department in very precarious condition, both these patients expired.

Twenty-two of stroke patients were smokers. In Pakistani culture, smoking is generally restricted to men and this is the reason that all smokers in this study were men. Family history of stroke was present in 18% cases

The higher incidence of haemorrhagic stroke can be partly explained by the fact that this study only included hospitalized patients in a tertiary care setting. There are various studies showing incidence of different patterns of stroke as shown in table. (Table: 2) Most of these studies are from developed countries where the incidence of all types of stroke is already declining, while the incidence of stroke is higher in Asia and Eastern European countries.

There is no established cause for high incidence of haemorrhagic stroke in this study but it could be social or environmental, related to generally poor control of risk factors in our population. The other reasons may be the disease pattern or different social factors in different communities.

In this study, ischemic stroke contributed 68%, intracerebral haemorrhage 31%

and SAH 01% cases. These findings are almost comparable with that of Liaquat A²² (ischaemic stroke 69.3%, ICH 27.7%), All-Rajeh S et al²³ (cerebral infarcts 76.25% ICH 21.4% and SAH 2.35%), Tanveer A²⁴ (cerebral infarct 76% and ICH 24%) and Memon AR²⁵ (CI 70% and ICH 30%). However these results are different from that of Basharat RA⁶ (cerebral infarct 54% and ICH 46%), Javaid MA²⁶ (CI 56.4 %, ICH 37.8 SAH 5.8%), Amin R²⁷ (CI 58%, ICH 35%, SAH 7%) and Rehman S²⁸ (CI 58%, ICH 42%). These differences may be due to small size of study (Basharat RA, 46 patients) or admission criteria for stroke patients (Rehman S)²⁸ in which only haemorrhagic stroke and infarcts with hemiplegia were admitted while mild hemiparesis were not included in the study.

Hypertension is found as a major risk factor in this study. This finding is almost consistent with the studies conducted by Memon AR²⁵ (61%), Basharat RA⁶ (59%), Javed MA²⁶ (62%), Kaul S²⁹ (62%), Amin R²⁷ (58%), Kase³⁰ (58%) and AL-Rooim³¹ (58.9%) but lower than that of Reman S²⁸ (70%) and higher than Leckner H³² (40.6%) and Liaquat A²² (56.4%). History of irregular treatment of hypertension and no check on the control of blood pressure emphasize the importance of health education program on stroke related mortality at primary health care center.

Diabetes mellitus increases the risk of stroke.³³ Twenty-eight stroke patients were diabetics in this study. In other studies, diabetes mellitus has been reported as following:

Kaul S²⁹ (38%) Liaquat A²² (27%) Basharat RA⁶ (21%), Javaid MA²⁶ (32%), All-Rajeh²³ (42%), Leckner H³² (8.5), Amin R²⁷ (04%) Rehman S²⁸ (12%) and Tanveer A²⁴ (25%). In this study, 64.29% diabetic patients were having cerebral infarcts and 35.71% haemorrhagic stroke. The frequency of intracerebral haemorrhage is low in diabetic

individuals as compared to cerebral infarction in this study. This observation of lower frequency of intracerebral haemorrhage in the diabetic patients has also been reported by Basir F³⁴ and Jorgensen.³⁵

The low frequency of haemorrhage in the patients with diabetes might be related to the specific angiopathy induced by diabetes in the small vessels that is characterized by the thickening of the basement membrane and proliferation of the endothelium. These changes might not favour haemorrhage. Moreover, the prostacyclin synthesis is impaired, coagulability is increased, fibrinolytic activity is decreased and plasminogen activator inhibitor levels are increased. All these may tilt in favour of thrombosis rather than haemorrhage in diabetics.³⁵

Twenty eight patients were hyperlipidemic in this study which is almost comparable with Liaquat A²² (23%) but higher than Tanveer A²⁴ (10%).

In this study, twenty-two patients were smokers. This finding is comparable with that of Liaquat A²² (21%) and Tanveer A²⁴ (16%) but lower than that of Kaul S⁹ (28%), Amin R²⁷ (28%) and Javaid MA²⁶ (42%).

Atrial fibrillation was present in 12% patients. This finding is higher than that of Kaul S²⁹ (6%) but lower than Amin R²⁷ (23%).

Carotid bruit was present in 02% cases, which is comparable with that reported by Liaquat A²² (06%) but very lower than that reported by Sander Cock³⁶ (14%). However, it is very difficult to comment on its contribution to stroke as asymptomatic bruit can be present in 04% of the population, because it needs a reduction in the lumen of the carotid vessel to more than 75% of the normal to cause a stroke.

CONCLUSIONS

Patients need education about modifiable risk factors for cerebral stroke. They should be informed about the deleterious effects of hypertension, diabetes mellitus, hyperlipidaemia, smoking, and other risk factors for stroke. The physician must make sure that his patient understands the importance of regular medication and control of his blood pressure. Diabetic patients, likewise, must be instructed about their diet and medication. Good control of glycaemic state is the key to their good health and prevention of complications.

There is a genuine need for health education programmes on strokes and their mortality. This may help promote more adherences to medication schedules, proper nutrition, regular exercise and the cessation of habits that may be deleterious to good health.

REFERENCES

- Davenport R, Denis M. Neurological emergencies: Acute Stroke. *J Neurol Neurosurg Psychiatry* 2000; 68: 277-88.
- Michael JA. Nervous System. In: Lawrence M, Tierney Jr, Stephen JM, Maxine AP (Eds). *Current Medical Diagnosis and Treatment*. 43rd ed. New York: McGraw Hill; 2004:956-60.
- Warlow CP. Neurology: Cerebrovascular disease. In: Weatherall DJ, Ledingham JGG, Warrell DA Eds. *Oxford Textbook of Medicine*. 3rd ed. Oxford university press; 1996:3946-64
- Vohra EA. Stroke: The challenge and response. *Pak J Med Sci* 2001; 17(2): 65-6.
- Vohra EA, Ahmed WU, Ali M. Aetiology and prognostic factors for outcome of patients admitted with Stroke. *J Pak Med Assoc* 2000; 50: 234-6.
- Basharat RA, Elahi A, Tariq M, Saeed A. One-month audit of Stroke at PIMS. *Pak J Neurol* 1999; 5(1): 12-5.
- Easton DJ, Hauser SI, Martin JB. Cerebrovascular diseases. In: Fauci SA, Baraunwald E, Isselbacher JK, Wilson DJ Eds. *Harrison's Principles of Internal Medicine*. 15th ed. New York: McGraw Hill; 2002; 2325-38.
- Benson RT, Sacco RL. Stroke prevention: *Neur Clinics* 2000; 18(2): 309-16.
- The sixth report of the Joint National Committee on detection, education, and treatment of high blood pressure (JNC VI). *Arch Intern Med* 1997; 157:2413.
- Masharani U. Diabetes mellitus. In: Tierney LM Jr, Stephen JM, Maxine AP Eds. *Current Medical Diagnosis and Treatment*. 43rd ed. New York: McGraw Hill; 2004:1146-8.
- Chandrasoma P, Taylor CR. The blood vessels. In: *Concise Pathology*. 2nd ed. Norwalk, CT: Appleton and Lange; 1995: 307-14.
- Gorelick PB, Sacco RL, Smith DB. Prevention of a first stroke: A review of guidelines and multidisciplinary consensus Statement from National stroke Association. *J Am Med Assoc* 1999; 281:1112-20
- Niplon P. Stroke in developing world. *Lancet* 1998; 353 (Suppl 111):19-22
- Daga MK, Sarin K, Negi VS. Comparison of Siri Raj and Guy's Hospital score to differentiate Supratentorial ischaemic and haemorrhagic strokes in the Indian population. *J Assoc Physicians India* 1994;42(4):302-3.
- Bogousslavsky J, Van MG, Regli F. The Lausanne Stroke Registry: Analysis of 1,000 consecutive patients with first stroke. *Stroke* 1988; 19:1083-92.
- Leftovits J, Davs MS, Rossiter SG, Kilpatrick CJ, Heroper JL, Green R, et al. Acute stroke outcome, effects for stroke and risk factors. *J Med* 1992; 22(1): 30-5.
- Bramford J, sandirock P, Dennis M, Bura J, Waslow C. A Prospective study of acute cerebrovascular disease in the community, Stroke project 1981-86. Incidence, case fertility rate and overall of one year cerebral infarction, primary intracerebral and sub-arachnoid haemorrhage. *J Neurol Neurosurg Psychiatry* 1990; 54(1): 16-22.

18. Yanok S, Popper JS, Kagan A, Chyore PH, Grover JS. Epidemiology of stroke among Japanese men in Hawaii during 24 years of follow up. *Health Republic* 1994; 6(1): 28-38.
19. Kagan A, Popper JS, Reed DM, Madean CJ, Grove SJ. Trends in stroke incidence and mortality in Hawaiian Japanese men. *Stroke* 1994; 25(6): 1170-5.
20. Suzuki K, Vutsuzawa T, Takita K, Ito M, Sakamoto T, Hirayama A, et al. Clinicoepidemiologic study of stroke in Aketa, Japan. *Stroke* 1987; 18: 402-6.
21. Jevatorp P, Bergland G. Stroke Registry in Maline, Sweden. *Stroke* 1992; 23(3): 3570.
22. Liaquat A, Jamil H, Alam MS. Risk factors in stroke. *J Coll Physician Surg Pak* 1996; 7(1): 7-10.
23. All Rajeh S, Adnan A, Gulzar N, Emmanuel L. Stroke in a Saudi Arabian National Guard community: Analysis of 500 consecutive cases from a population based hospital. *Stroke* 1990; 24: 1635-9.
24. Tanveer A. Localization and management in CVA: A comparison of clinical assessment versus CT Scan [Dissertation]. *Coll Physician Surg Pak Karachi*, 1996:5-6
25. Memon AR, Hussain T, Qureshi MS. Haemorrhagic Stroke incidence, risk factors and mortality. *J Coll Physician Surg Pak* 1995; 5(6): 267-9.
26. Javaid MA, Ahmed M, Sial H, Naheed T. Risk factors in stroke. *Pak J Neurol* 1998; 4(1): 55-8.
27. Amin R. Risk factors evaluation in patients presenting with acute stroke [Dissertation], *Coll Physician Surg Pak Karachi*, 1998: 100.
28. Rehman S. Comparison of clinical and CT scan diagnosis in 50 cases of stroke [Dissertation], *Coll Physician Surg Pak Karachi* , 1996: 95
29. Kaul S, Venkateswamy P, Meena AK, Sahay R, Murthy JM. Frequency, clinical features, outcome and risk factors of lacunar infarction (data from a stroke registry in south India). *Neurol India* 2000; 48(2): 116-9.
30. Kase CS. Intracerebral haemorrhage: non-hypertensive causes. *Stroke* 1986; 17: 590-5.
31. Al Rooim K, Heller RF, Holland T, Floate D, Wlodaczyc J. The importance of hypertension in the aetiology of infarctive and haemorrhagic stroke. The lower Hunter Stroke Study. *Med J Aust* 1992; 157(7): 452-5.
32. Leckner H, Eisworth CC, Hachinski VC. Risk factors for stroke in Australian population. *Wien Klin Wochensher* 1993; 105(14): 393-403.
33. Boysen G, Nyboe J, Appleyerd M, Sorensen PS, Boas J, Somnier F. Stroke incidence and risk factors for stroke in Copenhagen, Denmark stroke 1988, 19: 1345-53
34. Basir F, Ali S, Aziz H. Infarction versus haemorrhage in stroke patients with and without diabetes. *J Coll Physician Surg Pak*, 2001; 11(2): 88-90.
35. Jorgenson JHS, Nakayama H, Raaschou HO, Olesen TS. Stroke in patients with Diabetes: The Copenhagen Stroke Study. *Stroke* 1994; 25: 1977-83.
36. Sander Cock PA, Warlow CP, Jones LN, Starkey IR. Predisposing factors for Cerebral infarction: Oxford shire community stroke project. *Br Med J* 1989; 298; 75-80.

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