ORIGINAL ARTICLE
Risk factors and types of recurrent stroke.

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ABSTRACT… Objective: To identify the types and risk factors of recurrent stroke. **Study Design:** Cross-sectional study. **Setting:** Department of Medicine, Nishtar Hospital Multan. **Study Period:** January to June 2021. **Material & Methods:** One hundred twenty patients diagnosed as recurrent stroke admitted in Nishtar Hospital Multan in the study period. **Results:** Sixty six patients (55%) were female. Mean age of patients was 63.14± 15.28 years. Sixty three (52.5%) were from urban areas. Ninety one (75.8%) patients had ischemic stroke (one (0.8%) had venous infarction) and 29 (24.2%) had intracerebral hemorrhage. Risk factors observed were hypertension present in 91 patients (75.8%), diabetes mellitus in 49 (40.8 %), heart disease in 47 (39.2%), dyslipidemia in 42(35%) and smoking in 24 (20%) patients. Sixty four (53.35%) patients had more than one risk factor. **Conclusion:** Common risk factors of recurrent stroke in our population are old age, female gender, hypertension, diabetes, hyperlipidemia and smoking. Recurrence is more common after cerebral infarction. Modifiable risk factors should be controlled to prevent a second event.

Key words: Hemorrhage, Infarction, Recurrent Stroke, Risk Factors.

INTRODUCTION
Stroke is defined as an abrupt onset of a neurologic deficit due to a focal vascular cause. Universally, stroke adversely affects 16.9 million people annually and is an important cause of disability and mortality.[1] The primary pathological types of stroke are ischemic and hemorrhagic.

Recurrent stroke is defined as any stroke occurring more than 24 hours after the onset of the incident stroke in a different vascular territory or occurring in the same territory more than 21 days after the first stroke.[2] It is associated with greater morbidity and mortality as compared to the first stroke. Hypertension, diabetes mellitus, heart diseases, smoking and hyperlipidemia are definite risk factors of recurrent stroke.[3] Exploration of these risk factors is very important for adequate secondary prophylaxis. By determining the risk factors we can minimize these episodes and can bring an improvement in public health.

Several studies in different regions of world have been carried out to determine types and risk factors of recurrent stroke but less work is done in South Punjab.[4,5,6]

The purpose of this study is to identify the types and risk factors of recurrent stroke in our patients so as to recognize and potentiate secondary prophylactic measures.

MATERIAL & METHODS
This study was carried out at Department of Medicine, Nishtar Hospital Multan from January to June 2021. Permission from ethical review committee of Nishtar Medical University and consent from patients or their relatives was taken. The consecutive 120 patients above 18 years age, diagnosed as having recurrent stroke either on history or on brain imaging and admitted in medical and neurology wards of Nishtar Hospital Multan in the study period were included in the study. Patients with transient

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ischemic attack were excluded. Demographic data (like age, sex, residence) comorbidities, treatment history, clinical data like vital signs and findings of investigations like CT scan brain, ECG, echocardiography, Carotid Doppler and lipid profile were noted on a specially designed proforma.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive analysis was applied to calculate frequency and percentage for qualitative variables. Mean and standard deviation was calculated for quantitative variables.

RESULTS
Out of 120 patients included in our study, 66 were female (55 %) and 54 were male (45%). The mean age of patients was 63.14± 15.28. Sixty three patients (52.5 %) belonged to urban areas and 57 (47.5%) were from rural areas. Mean duration from previous stroke was 3.82±4.62 yrs. (1 week -20 years).

Fifteen (12.5%) patients had more than one stroke in the past. 29 (24.2%) patients had only radiological evidence of a previous stroke on CT scan. Only 41 (34.2%) patients were taking medicines with good compliance for secondary prophylaxis.

The most common type of recurrent stroke observed was ischemic (75.8%) followed by hemorrhagic (24.2%). Sixty four patients (53.3 %) had right sided weakness while 56 patients (46.7 %) had left sided weakness.

Hypertension was the most frequently observed risk factor found in 91 patients (75.8%) followed by diabetes mellitus in 49 (40.8 %) and heart disease in 47(39.2 %). Forty two patients (35 %) had dyslipidemia and 24 patients (20 %) had history of smoking.

ECG showed left ventricular hypertrophy in 58 (48.3%) cases, ischemic changes in 40 (33.3%) and atrial fibrillation in 9 (7.5 %) patients. Only 13 patients (10.8 %) patients had normal ECG. 33(27.5%) had stenosis on carotid Doppler and

54 (45%) had abnormalities on echocardiography.

Variables	N=120 (%) mean± SD

Age (years)
  1) <40
  2) 40-60
  3) >60
	63.14 ±15.28
	09 (7.5%)
	47 (39.2%)
	64 (53.3%)

Gender
  1) Male
  2) Female
	
	54 (45.0%)
	66 (55.0%)

Residence
  1) Urban
  2) Rural
	
	63 (52.5%)
	57 (47.5%)

Ischemic -Arterial infarct -Venous inarct	91 (75.8%) 90 (75.0%) 01 (0.8%)
Hemorrhage -Intracerebral -Subarachnoid	29 (24.1%) 27 (22.5%) 02 (1.6%)
Hypertension	91 (75.8%)
Diabetes mellitus	49 (40.8%)
Heart disease 1)IHD 2)Valvular heart disease 3)Congenital heart disease	47 (39.2%) 40 (31.6%) 06 (5.0%) 01 (0.83%)
Dyslipidemia	42 (35%)
Smoking	24 (20%)
More than one risk factor	64 (53.3%)
Duration of previous stroke < 1momth < 1 year 1-5 years 5-10 years >10 years	 10 (8.3%) 25 (20.8%) 34 (28.3%) 13 (10.8%) 09 (7.5%)
Medicine intake 1)no 2)poor compliance 3)good compliance	28 (23.3%) 51 (42.5%) 41 (34.2%)

Table-I. Demography, types and risk factors of recurrent stroke

DISCUSSION
Stroke is a common and leading cause of hospitalization. There are many risk factors, majority of which are preventable but still we see that many patients present with recurrent strokes.[7] Many studies have been done all over the world to see the frequency of these risk factors but to our knowledge few studies are done to study recurrent strokes in our population.

Investigation	N=120	Percentage / mean± SD
ECG		
Normal	13	(10.8%)
Left Ventricular Hypertrophy	58	(48.3%)
Ischemic changes	40	(33.3%)
Atrial fibrillation	09	(7.5%)
Echocardiography		
Normal	65	(54.1%)
Reduced ejection fraction	27	(22.5%)
Left Ventricular Hypertrophy	18	(15.0%)
Valvular Heart disease	06	(5.0%)
Systolic wall motion abnormality	03	(2.5%)
Congenital Heart disease	01	(0.83%)
Carotid Doppler		
Stenosis (20-50%)	33	(27.5%)
Site of lesion on CT scan		
1) anterior	03	(2.5%)
2) middle	32	(26.7%)
3) posterior	05	(4.2%)
4) brainstem	02	(1.7%)
5) subarachnoid	02	(1.7%)
6) multiple	76	(63.3%)

Table-II. Investigations of patients with recurrent stroke

Risk Factors	CVA Infarction (N= 91)	CVA Hemorrhage (N=29)
Hypertension	64(70.32 %)	27(93.10%)
Diabetes Mellitus	39(42.85 %)	10(34.48%)
Cardiovascular disease	40(43.95 %)	7(24.13%)
Dyslipidemia	32(35.16 %)	10(34.48%)
Smoking	22(24.17 %)	02(6.89%)
Old age > 60 years	55(60.43%)	09(31.03%)

Table-III. Comparison of risk factors with types of stroke

The main purpose of this study was to identify the main types and risk factors of recurrent stroke so as to make efforts for their prevention. Compared with the first stroke, neurological impairment in recurrent stroke is more serious and difficult to treat, and is associated with higher mortality. Therefore, secondary prevention after the first stroke is crucial to reduce the recurrence of stroke.[8]

The results of this study are comparable with the results of other studies. The most common type of stroke observed was cerebral infarction (75.8%) while hemorrhage was seen in 24.16% cases. This is comparable with a study in Saudi Arabia by El-Gohary, in which 83.93% patients had ischemic stroke and 10.71 percent had hemorrhagic stroke.[4] In another study conducted in Indonesia, 63.3% patients had ischemic stroke and 36.7% patients had hemorrhagic stroke.[9]

As observed in many other studies, old age is an important predictor for stroke recurrence. In our study 53.3% were above the age of 60 years.[9,10,11]

In this study, hypertension was associated with highest risk, found in 75.8% cases. These results are quite consistent with study by El-Gohary et al in which hypertension was in reported in 90.2% cases.[4] Malaysian study also demonstrated that hypertension was the reason of recurrent stroke in 85 to 90% patients.[10] Yalcin reported 89.7% of recurrent stroke cases had hypertension.[12] Hypertension is the strongest attributable modifiable risk factor for ischemic as well as hemorrhagic stroke. A reduction of 5.1 mmHg in systolic blood pressure (SBP) is associated with a 22% reduction in the odds of having a recurrent stroke, and a reduction of 10 mmHg is associated with a risk reduction of 31%.[13,14,15]

The second most common risk factor observed in our study was diabetes mellitus (40.8% cases). Diabetes is an important risk factor for stroke in patients with established cerebrovascular disease.[15] El-Gohary and Yalcin reported diabetes in 62.5 % and 24.4% respectively.[4,10] Risk of recurrent stroke is doubled if patient has both diabetes and hypertension.

The third risk factor being heart disease was observed in 39.2% cases. El-Gohary reported heart disease in 51.8%.[4] Yalcin observed that 32.3% patients had atrial fibrillation while El-Gohary found it in 12.8%, much higher than our observation of 7.5%.[11] Long term anticoagulation with warfarin with close monitoring of INR is strongly indicated in atrial fibrillation for secondary prophylaxis after an initial event. Many other studies have found increased long term risk of recurrent stroke after a cardiac event.[17,18]

We observed dyslipidemia in 35% cases while

Leoo found it in 56% cases.[18] Zhao L et al also found a significant association between baseline dyslipidemia and stroke recurrence in the large-artery disease stressing the need of statin and other lipid lowering treatment.[19,20,21] However, risk of hemorrhage is increased with low cholesterol levels.

Smoking was observed in 20% cases. Zhuo observed that 16.36% and Leeo reported 13% patients with recurrent stroke were smokers.[5,17] Smoking tobacco is an important risk factor for atherosclerosis directly as well as indirectly by predisposing dyslipidemia and heart disease.

Fifty three percent patients had more than one risk factors consistent with observation of Leoo. It is unfortunate that many of patients in our population despite of an initial event were either not taking treatment or were non-compliant. As most of our patients had recurrence after a duration of one year it showed that patients compliance reduces with passage of time. This emphasizes the need of long term strategies for secondary prevention. While Hardie and Elnady observed highest risk of recurrent stroke few months after initial event.[22,23]

Limitations of our studies include small sample size, only hospitalized patients were included in this study and only conventional risk factors were studied. Many of patients with recurrent stroke die before reaching hospital. A larger study with long term follow up is needed in our population.

CONCLUSION

In our population common risk factors of recurrent stroke are old age, female gender, hypertension, diabetes, ischemic heart disease, hyperlipidemia and smoking. Recurrence is more common after arterial infarction. It is crucial to intensify stroke prevention services in our patients to prevent a second event.

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1	M. Muzaffer Nawaz	Concept and study design, collection, interpretation and analysis of data, writing the paper.	
2	Zahra Nazish	Data interpretation, Critical revision of article for important intellectual content, Final approval.	
3	Fatima Tu Zahra	Interpretation, Critical revision of article, contribution of writng paper.	