

### **Etiological patterns of stroke in young patients at a tertiary care hospital**

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#### **Abstract**

**Objective:** To observe frequency of various causes of stroke in patients of young (15-35 years) age.

**Methods:** This Descriptive case series study was conducted in all Medical Units of Liaquat University Hospital (LUH) Jamshoro, Hyderabad, from August 2006 to February 2008 and included 50 patients of stroke aged 15-35 years, irrespective of sex and community. Data of these patients was collected through a pre-designed proforma by completing a comprehensive history, detailed examination and carrying out basic and relevant investigations. Patients suffering from hypoglycaemia, space occupying lesions, transient ischaemic attack or psychosis were excluded from the study. The collected data was analyzed on SPSS version 16.0.

**Results:** Out of total number of 113 acute strokes, 50 patients fulfilling inclusion criteria were selected, comprising 30 males and 20 females. Forty-three (86%) patients suffered from ischaemic strokes while seven (14%) had haemorrhagic strokes. Infective meningitis including Tuberculosis meningitis and Bacterial meningitis was the leading cause of stroke (34%). The second most common cause was cardio-embolism (20%) comprising Valvular heart diseases (14%), Cardiomyopathies (4%) and atrial myxoma (2%). Hypertension was found in 14% cases. Pregnancy related causes (including Pregnancy induced hypertension and puerperal sepsis) were 12%. Systemic lupus erythematosus and nephritic syndrome was 4% each. Various causes which constitute 4% or less were grouped together as miscellaneous and they include hyperhomocysteinaemia, and hyperlipidaemias.

**Conclusions:** Common cause of stroke detected was infective meningitis (Tuberculosis and Bacterial). Predominant cause of haemorrhagic stroke was Hypertension. Stroke in young age occurred predominantly in males. Cardio embolism, pregnancy induced hypertension and puerperal sepsis were other major causes (JPMA 60:201; 2010).

#### **Introduction**

Diseases of the cerebral blood vessels are the third most common cause of death in the world and are responsible for a large proportion of Physical disability.<sup>1</sup>

Stroke signifies the abrupt impairment of the brain function caused by a variety of Pathological changes involving one (Focal) or several (Multifocal) intracranial or extra cranial blood vessels.<sup>2</sup> Ischaemic strokes occurring between 15 and 45 years of age, account for approximately 1% of all strokes in the community and for 4 to 12% in specialized tertiary centres.<sup>3</sup>

Approximately 80% of strokes are caused by too little blood flow (Ischaemic stroke) and the remaining 20% are nearly equally divided between haemorrhage into brain tissue (parenchymatous haemorrhage) and haemorrhage into the surrounding sub-arachnoid space (sub-arachnoid haemorrhage).<sup>3</sup>

Stroke in young adults has been related to mechanisms different to those found in older individuals. Cardio-embolism, arteritis, atherosclerosis, fibro muscular dysplasia, and pregnancy related angiopathy, migrainous arteriopathy, anaemia, antiphospholipid syndrome, arterial dissection, arterio-venous malformations, the consumption of toxic

substances and head trauma have been described.<sup>4</sup>

In patients with 15-35 years of age dissection, cardio embolism, non-atherosclerotic vasculopathies and prothrombotic states cause significant percentage of strokes.<sup>5</sup>

Young patients usually require more extensive investigations in order to determine the primary cause. It is important that a comprehensive search be made since many of the under lying disorders are treatable.<sup>6</sup>

The data on young stroke in Pakistan is fragmentary and there are very few local studies on strokes carried out on a small number of young patients.<sup>7</sup> Hence, it is essential to investigate stroke in young and determine the exact cause and take appropriate measures accordingly. The aim of this study was to determine the etiological pattern of patients presenting with stroke at the young ages between 15 to 35 years of age.

#### **Patients and Methods**

This descriptive case series study included 50 consecutive patients admitted from August 2006 to February 2008 at Liaquat University Hospital, Jamshoro Hyderabad.

Patients included were those with stroke and age between 15 to 35 years. All patients were received either from

the emergency department or outpatient department of the hospital. Patients who were suffering from transient ischaemic stroke, hypoglycaemia, space occupying lesion or psychosis were excluded.

Proforma was made consisting of Questionnaire which included demographic data, detailed history and clinical examination of every patient. It was focused for clinical assessment and for the evaluation of risk factors. Investigations such as Complete blood count, Urine DR, X-ray chest, lipid profile and blood sugar were sent to Liaquat university research laboratory. ECG, and Echocardiography was done from the cardiology department and CT Scan Brain from the radiology department of Liaquat university hospital. Lumbar puncture was done in 17 patients who presented with history of fever, neck stiffness and positive Kernigs'sign. Cerebrospinal fluid (CSF) was sent for detailed report and culture. Patients were diagnosed as tuberculosis meningitis if CSF contained predominant lymphocyte and pyogenic meningitis if CSF contained predominant polymorph leucocytes along with protein content > 40mg/dl and CSF sugar < 40mg/dl. Special investigations like Protein C and S levels, Anti ds DNA, ANA profile, VDRL, anti cardiolipin antibodies, MRI Brain and MRA were done where necessary.

Qualitative variables such as sex, type of stroke, risk factors, cause of stroke was expressed as percentage, frequency and quantitative data such as age was expressed as mean ± SD. The collected data was analyzed on SPSS version 16.0.

## Results

This study included 50 patients with mean age of 25 ± 7 years. There were 30(60%) males and 20(40%) females. Forty three (86%) patients suffered from ischaemic strokes while 7 (14 %) had Haemorrhagic strokes. The Table shows the baseline characteristics of the patients.

Infective meningitis including Tuberculosis meningitis and Bacterial meningitis was the leading cause of stroke being present in 17 (34%) cases of which 12 were

**Table: Baseline characteristics of young patients with stroke at a tertiary care hospital.**

Quantitative Variables	N	Mean	Std. Deviation
Age	50	25.7200	6.5622
<b>Qualitative Variables</b>	<b>Frequency</b>	<b>Percentage</b>	
Sex			
Male	30	60	
Female	20	40	
Type of Stroke			
Ischemic	43	86	
Haemorrhagic	7	14	

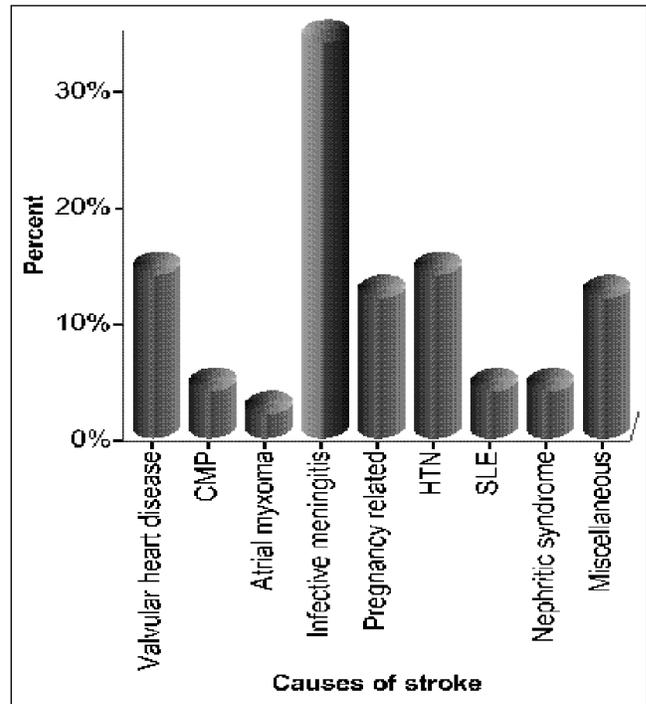


Figure: Causes of stroke in young patients at a tertiary care hospital.

tuberculous meningitis. The second most common cause was cardio-embolism, 10 (20%) comprising Valvular heart diseases 7 (14%), Cardiomyopathies 2 (4%) and atrial myxoma 1 (2%). Hypertension was found in 7 (14%) cases. Pregnancy related causes (including Pregnancy induced hypertension and puerperal sepsis) were 6 (12%). Systemic lupus erythematosus and nephritic syndrome were 2 (4%) each. Various causes which constituted 2 (4%) or less were grouped together as miscellaneous and they included Hyperhomocysteinaemia, and hyperlipidaemias. The causes of stroke are summarized in Figure.

## Discussion

Stroke is a frequently encountered neurological disease.<sup>3</sup> This study focused on causes of stroke in young patients and it was carried out in a tertiary care hospital. A large number of patients presented with stroke but less than one fourth of them were under the age of 35 years. Fifty patients of stroke under the age of 35 years were selected irrespective of sex, religion or geographical belonging. Thirty patients were male while 20 were female. The higher frequency of males has also been shown in other studies.<sup>7,8</sup>

There are two major types of stroke i.e. Ischaemic and haemorrhagic. Ischaemic stroke was the predominant type in the present study as 86% suffered from Ischaemic while 14% from Haemorrhagic stroke. This finding is comparable with other studies.<sup>2,7</sup>

The highest percentage of ischaemic stroke was seen in 17 patients (34%) due to infective meningitis. This is an unusual finding because although infection is a recognized cause of stroke<sup>7</sup> it has not been reported as the prime dominant cause of this ailment in studies conducted earlier. This may be due to more increased prevalence of infectious diseases in Pakistan.

Infective meningitis includes tuberculous as well as bacterial meningitis. Nine out of 17 patients (53%) suffered from tuberculous meningitis (TBM) while remaining 8 (47%) from bacterial meningitis. TB is the most common infectious disease in developing countries of the world.<sup>9</sup> This may be the reason why TBM related stroke outnumbered the Bacterial meningitis related stroke. The reported incidence of cerebral infarction in TBM is between 6-41% and is usually related to a necrotizing arteritis of vessels of circle of Willis, involved in the basal meningitis.<sup>10</sup> TBM develops most commonly shortly after a primary infection in childhood or as a part of miliary TB.<sup>11</sup> In our study organisms found responsible for bacterial meningitis were meningococci and haemophilus influenza. Meningococcal meningitis has a well defined relationship with stroke in young patients. In one large study 28% of the patients of bacterial meningitis were found to suffer from one or more of neurological complications.<sup>12</sup> In another study 21% out of 277 patients of bacterial meningitis had cerebrovascular complications.<sup>13</sup>

In our study the second most frequent cause was cardioembolism i.e. 10 (20%) patients. It comprises 7 (14%) patients of valvular heart disease (VHD), 2 (4%) patients of dilated cardiomyopathy and 1 (2%) patient of cardiac myxoma. Cardioembolism was the leading cause of stroke in young in most of the studies nationally and internationally.<sup>4,7,13,14</sup> In our study VHD was the most frequent cause of cardioembolism. This is also the finding of studies conducted in Iran.<sup>14,15</sup> Findings of a local study indicate that rheumatic heart disease (RHD) was the most common cause followed by prosthetic valves infective endocarditis and Ischaemic heart diseases.<sup>7</sup> This may be attributed to higher prevalence of RHD in the population of underdeveloped countries.<sup>14</sup> It highlighted the fact that although cardioembolism is a leading cause of stroke in young people, its etiology is different in Asians compared to the developed world or other countries. In developed countries paradoxical embolism is now diagnosed as a leading cause of stroke in young adults.<sup>14</sup> In Europe and America RHD is much less common, mitral value prolapse (MVP) and patent foramen ovale (PFO) have been considered as most common cardiac causes associated with stroke in young adults.<sup>7</sup> In this study 58% of patients of VHD suffered from combined mitral stenosis and mitral

regurgitation while in 30% of patients mitral stenosis alone and in 12% mitral regurgitation alone was the cause. Rheumatic heart disease was the main culprit of these valvular lesions. Another cause which leads to cardioembolism was cardiomyopathies. Both of our patients were female and were diagnosed as the case of postpartum dilated cardiomyopathy. One of our patients was a case of left Atrial Myxoma. This is the most common cardiac tumour and is believed to cause 1% of stroke in young individuals.<sup>16</sup>

Hypertension (HTN) is the most common and most important risk factor for stroke whether primary or secondary.<sup>17</sup> One recommendation is that a long term (5 years) 5 to 6 mmHg decrease in the usual diastolic blood pressure was associated with a 35-40% reduction in stroke.<sup>8</sup> In this study 7 (14%) patients had hypertension as a cause of stroke. Four (8%) of them suffered from haemorrhagic stroke while 3 (6%) had ischaemic stroke. In 3 patients, no cause of hypertension was found though family history of hypertension was present two. HTN occurring in teenagers and young adults is uncommon, though the most common form is still essential hypertension. Secondary causes are more commonly found here than in older adults.<sup>18</sup> In this study nephritic syndrome and pregnancy induced hypertension are discussed separately, however, together over all there were 24% of patients suffering from hypertensive complications, hence this suggests that HTN is one of the major culprits leading to stroke not only in elderly people but also in young ones.<sup>14</sup>

Stroke is a recognized complication of pregnancy contributing to more than 12% of all maternal deaths.<sup>19</sup> Our 6 patients (12%) suffered from stroke due to pregnancy related complications. These results correlate with various earlier studies.<sup>20-22</sup> Among them 3 patients suffered from pregnancy induced hypertension while remaining 3 from puerperal sepsis.

Among less frequent causes, 2 patients (4%) suffered from systemic lupus erythematosus (SLE), 2 patients from nephritic syndrome while other causes included thrombocytosis (4%), hyperlipidaemia (2%) and hyperhomocystinaemia (4%). Stroke is a well defined complication of SLE.<sup>23</sup> It is shown in different studies that hyper-homocystinaemia, thrombocytosis and dyslipidaemias are associated with stroke in young patients.<sup>24,25</sup>

MRI and MRA of brain could have given better information about the vascularity and extension of lesion as CT scan brain can only locate the lesion above posterior fossa. Most of times CT scan brain can give the required information as MRI and MRA are costly

investigations.

## Conclusion

In young patients (15-35 years predominantly male) the major type of stroke encountered is due to cerebral Ischaemia, while common cause of Ischaemic stroke is infective meningitis including both Tuberculous Meningitis and Bacterial Meningitis. The ratio of TBM was higher than Bacterial Meningitis. Predominant cause of Haemorrhagic stroke was Hypertension whether primary or secondary.

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