Stroke its types & risk factors: An overview

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Abstract
The objective of this review is to have an insight into economic evaluation studies in the field of stroke. Strokes are brain attacks. They occur when the blood supply to the brain gets blocked. It is a medical emergency that needs immediate medical attention. When stroke occurs, the brain does not receive enough oxygen or nutrients then causing brain cells to die. Strokes need to be diagnosed and treated as quickly as possible to minimize brain damage. Treatment is dependent on the type of stroke occurred. The most effective way to prevent strokes is through maintaining a healthy lifestyle and treating underlying conditions that could be a risk factor. Before developing new medical facilities or adapting existing facilities in the field of stroke, it is desirable to assess not only the medical, but also the economic consequences of such facilities. The more common kind, called ischemic stroke, is caused by a blood clot that blocks or plugs a blood vessel in the brain. The other kind, called hemorrhagic stroke, is caused by a blood vessel that breaks and bleeds into the brain. "Mini-strokes" or transient ischemic attacks (TIAs), occur when the blood supply to the brain is briefly interrupted. In this review a short note is mentioned about risk factors of stroke and their diagnostic tests for various types of stroke and summarizes the prevention and treatment of stroke.

Keywords: Stroke, ischemic stroke, hemorrhagic stroke, transient ischemic stroke, risk factors

Introduction
Stroke is defined by World Health Organization as “Rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting significantly more than 24 hours or leading to death, without apparent cause besides that of vascular origin”. Stroke is classically characterized as a neurological deficit attributed to an acute focal injury of central nervous system (CNS) by a vascular cause including cerebral infarction, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH). Cerebrovascular strokes are those diseases in which one or more of the blood vessels of the mind are involved in the pathologic processes. Various pathologic processes commonly implicated in cerebrovascular strokes are: thrombosis, embolism, rupture of a vessel, hypoxia, hypertensive arteriosclerosis, atherosclerosis, arthritis, trauma, aneurysm and developmental malformations.[1].

Fig 1: Brain Stroke

Types and Risk Factors
These processes may result in 3 main forms of parenchymal diseases of brainforms.
Fig 2: Types of Stroke

**Ischemic stroke**
- Occlusion of blood vessels from thrombus, embolism or conditions that produce low systemic perfusion pressure.
- It is of 2 types
  - i. Thrombotic: blood clot occur in brain itself
  - ii. Embolic: blood clot is formed in heart, it travels to brain as embolus and it blocks carotid artery.

**Hemorrhagic stroke**
- Rupture of blood vessels with abnormal bleeding into extra vascular area of brain.
- It is of 2 types
  - a) Hemorrhage in mental performance parenchyma (Intracerebral hemorrhage).
  - b) Hemorrhage in the subarachnoid space (Subarachnoid hemorrhage).

**Transient ischemic attack**
- TIA, or transient ischemic attack, is really a “minor or mini stroke” that develops each time a blood clot blocks an artery for a brief time.
- “Warning strokes” that will happen before a major stroke occur when blood flow through a brain artery is blocked.
- Symptoms are temporary but just like those of a full stroke.

Fig 3: Signs & Symptoms of Stroke

**Ischemic Stroke**: Sudden numbness or weakness of the face, arm or leg, especially involving one side of the body.
- Sudden confusion, trouble in speaking or understanding.
- Loss in vision in one single or both eyes.
- Trouble walking, dizziness, loss of balance or coordination.

**Hemorrhagic Stroke**: Sudden severe headache.
- Vision changes.
- Loss in balance or coordination.
- Becoming unable to move.
- Numbness in an arm or leg.
- Seizures.
- Loss in consciousness.

**Signs & Symptoms**

Fig 4: Risk Factors and Its Types

**Non Modifiable Risk Factors**
- Age
- Childhood stroke
- Gender
- Hereditary and race

**Modifiable Risk Factors**
- High blood pressure
- Diabetes mellitus
- Hyperlipidemia
- Atrial fibrillation
- Smoking
- Alcohol
- Obesity
- Physical inactivity
- Diet
- Carotid or other artery disease
Martin J O’Donnell et al., aimed to establish the association of known and emerging risk factors with stroke and its primary subtypes and to assess the contribution of these risk factors to the burden of stroke and also explored the differences between risk factors for stroke and myocardial infarction. 78% with Ischemic stroke 22% with intracerebral haemorrhagic stroke, the combination of population-attributable risks (PAR) was found to be 90-3% for all stroke cases. Reduced blood pressure and smoking, and promoting the physical activity and a healthy diet, could substantially reduce the burden of stroke [5].

Deepadarshan Huliyappa et al., performed a study to know the factors leading to stroke in young and outcome of these cases in a tertiary care hospital. 80.8% of them were in the age group of 30-45 years. Overweight and obesity 63.4% was the most common risk factor followed by Hypertension 50% and cigarette & tobacco use 40.3%. Mortality rate was found to be 11.5% found that mortality of stroke in young cases was much less than stroke in older age group [6].

Sandhya Manorenj et al., studied the prevalence, patterns, risk factors and outcome of stroke in women. Mean age of stroke in females was 57 years. Stroke was common in older women and ischemic stroke was the predominante type of stroke. Physical inactivity was the significant risk factor in women when compared to men [7].

Tobias Kurth et al., dealt about smoking which is an established risk factor for ischemic stroke and subarachnoid hemorrhage (SAH), but the impact of smoking on intracerebral hemorrhage (ICH) is less clear. Never smokers and past smokers had equal rates of ICH and SAH. The effect of smoking on ICH is of about the same magnitude as the effect of smoking on ischemic stroke. Study suggests an increased risk of total hemorrhagic stroke, ICH, and SAH in current cigarette smokers with a graded increase in risk that depended on how many cigarettes were smoked [8].

Monodeep Biswas et al., aims to compare risk factors and etiology of ischemic stroke in patients of Indian origin with those of the White-Americans. The commonest cause of ischemic stroke was small vessel occlusive disease, rather than large artery atherosclerosis among the White-Americans. When compared to White-Americans, The Indian-American developed stroke at a younger age, despite a lower rate of alcohol and tobacco use [9].

Hossain MM et al., evaluated the distribution of common medical conditions related to stroke among Bangladeshi patients. Most of the stroke events occurred after the age of 40 and the ischemic stroke being the most common. Hypertension, smoking, diabetes, tobacco use, and ischemic heart disease were five most common conditions related to stroke [10].

Salma N. Khan et al., ascertained the frequency of risk factors for first ever stroke in patients. This study suggested that diabetes mellitus was more and underlying cardiac diseases less frequent in our patients than in the western reported series. Stroke patients consume a large part of health resources all over the world so accurate information about the incidence, risk factors, management and outcome [11].

Jayantee Kalita et al., reported the etiology and predictors of outcome of ICH in young patients from North India. The mean age of the patients was 41.6 years and 23.8% were females. Hypertensive ICH patients had frequent death or disability. Hypertension is the commonest cause of ICH in young Indian adults and its outcome is related to volume of ICH [12].

Juan de Jesús Llibre et al., estimated the prevalence of stroke and associated risk factors in adults aged ≥65 years in Havana City and Matanzas provinces, Cuba. Prevalence of stroke was 7.8%, and was higher in men. The risk profile identified includes classic risk factors plus anemia and APOE ε4 genotype [13].

Ernest Palomeras Soler et al., reviewed data on epidemiology, pathophysiology and risk factors for both entities, considering the differences and similarities that could be found in between them. CHD and cerebrovascular disease share similar pathophysiological mechanisms and, consequently, many risk factors [14].

Shaheen Ahmed Mughal et al., determined a single or multiple risk factors have a relative significance on the mortality and morbidity of stroke. Relative influence of individual risk factor or in combination was not statistically significant. The functional recovery showed no significant relative difference among patients with different risk factors [15].

Sapna E. Sridharan et al., intended to assess incidence, types, risk factors, and outcome of stroke among urban and rural
dwellers of a South Indian community. One or more modifiable risk factors were identified in 90% patients. More rural male patients smoked tobacco. The case fatality rate was 24.5% for urban and 37.1% for rural populations. Compared to urban stroke patients, rural ones are less likely to be optimally investigated and treated [17].

Javed Akhter Rathore et al., aimed to identify these risks factors for stroke. Various clinical variables have been investigated as risks factors of stroke. Study signifies the association of risks factors with acute stroke. Targeted interventions that reduce these risk factors could substantially reduce the burden of stroke [18]. Sabir Ali et al., determined the frequency of risk factors in patients with acute stroke at tertiary care hospital Bahawalpur. Mean age of patients was 56.79±13.943 years and was found that hypertension, diabetes mellitus, smoking and high cholesterol level were major modifiable risk factors in the development of stroke. Controlling of these risk factors might reduce the risk of stroke [19].

Suhail Ahmed Almani et al., determined the frequency of various risk factors for stroke and its sub-types among males and females. In-hospital mortality was 09(09%). Mean age of patients was 56.89 years. Hypertension and smoking were the major risk factors for males, while diabetes mellitus and IHD were more common in females [20].

### Table 1: Types of Stroke and Its Risk Factors Identified

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type</th>
<th>Risk Factors Identified as per the study</th>
<th>Investigations ordered</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ischemic stroke and Intracerebral hemorrhagic stroke</td>
<td>Hypertension, Current smoking, Regular physical activity, Diabetes mellitus, Alcohol intake, Psychosocial stress, Depression, Cardiac causes, Apolipoproteins B to A1</td>
<td>Computed tomography (CT), Magnetic Resonance Imaging (MRI)</td>
<td>[1]</td>
</tr>
<tr>
<td>2</td>
<td>Ischemic stroke and Hemorrhagic stroke</td>
<td>Age, Weight &amp; obesity (63.4%), Hypertension (50%), Cigarette smoking &amp; tobacco chewing (40.38%), Alcohol consumption (36.5%), Diabetes mellitus (19.2%), Family history (13.5%), Dyslipidemia (9.6%), Cardiac diseases (9.6%), Smoking (66.4%, 62.31%M), Lipid profile (80%F, 84%M), Physical inactivity (54%F, 15%M), Diabetes (38%F, 31%M), Prior stroke (12%F, 11%M), Co-morbid illness (25%F, 17%M)</td>
<td>Computed tomography (CT), Modified Rankin Scale, Magnetic Resonance Imaging (MRI) Brain</td>
<td>[2]</td>
</tr>
<tr>
<td>3</td>
<td>Ischemic stroke</td>
<td>Age, Blood pressure, Hypertension, Body mass index, Exercise, Alcohol consumption, Diabetes, History of high cholesterol, Family history of MI</td>
<td>Computed tomography (CT)</td>
<td>[3]</td>
</tr>
<tr>
<td>4</td>
<td>Intracerebral hemorrhagic and subarachnoid hemorrhagic stroke</td>
<td>Age, Sex, Hypertension (57.6%), Diabetes mellitus (23%), IHD (17.1%), Obesity (10.6%), Smoking (44.6%), Tobacco use (24.3%), Dyslipidemia (5.3%), OCP use (8.7%)</td>
<td>Computed tomography (CT), MRI, MRA, Carotid duplex, Holter monitoring, 2D transthoracic Echocardiogram</td>
<td>[4]</td>
</tr>
<tr>
<td>5</td>
<td>Ischemic stroke</td>
<td>Age, Smoking (9.7% IASP, 22.8% AWSP), Alcohol intake (0.1% IASP, 11.8% AWSP), Physical inactivity (93.6% IASP, 61.1% AWSP), Diabetes mellitus (64.5% IASP, 35.2% AWSP), Atrial fibrillation (9.7% IASP, 22.5% AWSP), Hypertension (87.1% IASP, 79.3% AWSP), LDL cholesterol ≥ 130mg/dl (38.7% IASP, 30.6% AWSP), CAD (35.5% IASP, 37.5% AWSP), PVD (3.2% IASP, 6.6% AWSP), Carotid stenosis &gt; 70% (25.8% IASP, 20.5% WSP)</td>
<td>Computed tomography (CT), Imaging (MRI), CT scan, Magnetic Resonance Imaging (MRI)</td>
<td>[5]</td>
</tr>
<tr>
<td>6</td>
<td>Ischemic stroke and Hemorrhagic stroke</td>
<td>Age, Sex, Hypertension (57.6%), Diabetes mellitus (23%), IHD (17.1%), Obesity (10.6%), Smoking (44.6%), Tobacco use (24.3%), Dyslipidemia (5.3%), OCP use (8.7%)</td>
<td>Computed tomography (CT)</td>
<td>[6]</td>
</tr>
<tr>
<td>7</td>
<td>Ischemic stroke and Hemorrhagic stroke</td>
<td>Hypertension (63.8%), Smoking (43%), Diabetes (41.3%), Heart diseases (29.1%), Family history (26.7%), High cholesterol (25.5%), TIA history (24.9%)</td>
<td>Computed tomography (CT)</td>
<td>[7]</td>
</tr>
<tr>
<td>8</td>
<td>Intracerebral hemorrhagic stroke</td>
<td>Age, Hypertension (77%), Use of coagulants (2%), SBP at admission (4%), DBP at admission (53), Brain stem ICH (6%), Blood sugar on admission (38%), Serum creatinine on admission (0.5%), Lobar ICH (18%) Large supratentorial ICH (14%)</td>
<td>Magnetic Resonance Imaging (MRI), Computed tomography (CT), Magnetic Resonance Imaging (MRI), CT, Digital Subtraction Angiography (DSA)</td>
<td>[8]</td>
</tr>
<tr>
<td>9</td>
<td>Ischemic stroke and Hemorrhagic stroke</td>
<td>Age, Sex (65%F, 35%M), Education (56 grades 24.9%, ≥7 grades 75.1%), Smoker (45.1%) or Ex-smoker (54.1%), History of alcoholism (7.5%), High blood pressure (55.2%), Diabetes (18.6%), Ischemic heart disease (30.3%), Dementia (10.9%), Anaemia (19.3%)</td>
<td>Magnetic Resonance Imaging (MRI), Computed Tomography (CT)</td>
<td>[9]</td>
</tr>
<tr>
<td>10</td>
<td>Ischemic stroke and Hemorrhagic stroke</td>
<td>Age, Sex, Ethnicity, Genetic heredity, Uncommon related factor, Hypertension, Diabetes, Dyslipidemia, Smoking, Alcohol, Obesity, Physical activity, Diet, Atrial fibrillation, Other risk factors: Hyperhomocysteinemia, Hypercoagulability, Lipoproteins, Inflammatory markers, Obstructive sleep-apnea syndrome</td>
<td>Computed tomography (CT)</td>
<td>[10]</td>
</tr>
<tr>
<td>11</td>
<td>Ischemic stroke and Hemorrhagic stroke</td>
<td>Age, Hypertension</td>
<td>Computed tomography (CT), National Health Institute of Stroke Scale (NIHSS), Modified Rankin Scale (MRS)</td>
<td>[11]</td>
</tr>
<tr>
<td>12</td>
<td>Ischemic stroke</td>
<td>Age, Hypertension, Diabetes mellitus, Hyper tension (58.3%), Diabetes mellitus (5%)</td>
<td>Computed tomography (CT)</td>
<td>[12]</td>
</tr>
</tbody>
</table>

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**Note:** The table above lists the risk factors identified in patients with stroke, along with the investigations ordered for their identification. The references are numbered to correspond with the bibliography at the end of the text. This table highlights the importance of recognizing modifiable risk factors in stroke prevention and management.
| 13.  | Ischemic stroke, intracerebral hemorrhage stroke & SA stroke | Hypertension (81.6%U, 89.0%R), Diabetes mellitus (48.7%U, 55.7%R), Smoking (22.8%U, 39.3%R), Dyslipidemia (25.3) 29 (26.7), Atrial fibrillation (8.7%U, 4.9%R) | Computed Tomography (CT) [17] |
| 14.  | Ischemic stroke and hemorrhagic stroke | Hypertension (56.3%CI, 70.6%CH, 40%SAH), Diabetes mellitus (21.9%CI, 20.6%CH, 20%SAH), Smoking (21.9%CI, 16.2%CH, 10%SAH), Ischemic heart disease (7.8%CI, 5.9%CH), Previous stroke (17.2%CI, 4.4%CH, 0%SAH), High cholesterol (10.9%CI, 17.6%CH.) | Computed Tomography (CT) [18] |
| 15.  | Ischemic stroke And Hemorrhagic stroke | Hypertension (35% M, 24%F), Diabetes Mellitus (13%M, 16% F), Hypercholesteremia (9%M, 10% F), Smoking (18%M, 1%F), Sedentary Life Style (8%M, 9%F), Ischemic Heart Disease (6%M, 10%F), Previous Stroke (6%M, 6%F) | Computed Tomography (CT) [19] |
| 16.  | Ischemic stroke and Hemorrhagic stroke | Hypertension (32.22%), Diabetes mellitus (11.37%), Hyperlipidemia (7.10%), Smoking (4.73%), Ischemic heart diseases (9%), Hypertension + Diabetes (12.79%), Hypertension+Hyperlipidemia (6.16%) Diabetes + Smoking (2.36%), Diabetes + Hyperlipidemia (5.68%) Hypertension + Smoking (3.76%) Atrial fibrillation (3.31%) Hypertension+Diabetes+Hyperlipidemia (0.47%) History of warfarin/heparin (0.00%) | Computed Tomography (CT) [20] |
| 17.  | Ischemic stroke And Hemorrhagic stroke |  |

### Conclusion

Stroke is frequent, recurring, and is more often disabling than fatal. The importance of preventive measures for a disease that has identifiable and modifiable risk factors must be emphasized. A large international epidemiological study of stroke that requires routine neuro imaging is feasible in countries of low and middle income. Targeted interventions that reduce blood pressure, smoking, promote physical activity and a healthy diet, could substantially reduce the global burden of stroke. This article demonstrated the substantial role of risk factors like overweight & obesity, hypertension, cigarette smoking / tobacco consumption and alcohol consumption in stroke in young and its causes. In India and other developing countries, an alarming increase in the incidence of stroke has been observed owing to an increase in expected life with rising trends of those risk factors. Previous studies have shown a poor understanding of stroke among patients with established risk factors for stroke and in community at large. The stroke due to risk factors may be reduced but requires proper management and counseling of patients. Stroke can be prevented by maintaining healthy lifestyle and medications. Lifestyle recommendations include: Controlling high blood pressure (hypertension), Lowering the amount of cholesterol and saturated fat in your diet, Quitting tobacco use, Controlling diabetes, Maintaining a healthy weight, Eating a diet rich in fruits and vegetables, Exercising regularly, Drinking alcohol in moderation, Treating obstructive sleep apnea. Medications include: Anti-platelet drugs (aspirin), Anticoagulants (heparin and warfarin, Coumadin, Jantoven). As study subjects were not aware regarding common risk factors and warning apparent symptoms of stroke, there is a need to develop health education modules, programs to improve the awareness of stroke both at primary and secondary healthcare levels, elimination of poverty, regular use of medication and changes in life style.

### References