The Clinical Characteristics of Patients with Embolic Strokes among Indonesian Subjects

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Abstract:
Stroke accounts for 10% of the world's deaths and causes severe long-term disabilities. Twenty-six million people worldwide experience a stroke each year. Two-thirds represents cerebral ischemia. Age, a history of stroke or transient ischemic attack, hypertension, diabetes and heart failure characterize a stroke. Early detection with a proper treatment could improve clinical outcomes in such cases.

Keywords:
clinical characteristics; stroke; patients with embolic

I. Introduction

Globally, stroke is the second leading cause of death. The incidence of stroke is around 800,000 people annually. Stroke is also the leading cause of disability. The incidence of stroke has declined, but the morbidity has increased. Due to longer life expectancy, the lifetime risk of stroke is higher in women. At least 5 million people worldwide die from strokes and millions of others remain disabled. A stroke or cerebrovascular accident is an acute compromise of the cerebral perfusion or vasculature. Stroke affects men and women equally and causes major social and economic burdens to society with direct costs above $3 billion annually in Canada. Approximately, 85% of strokes is ischemic and the rest is hemorrhagic. Ischemic etiologies can further be divided into embolic, thrombotic, and lacunar. In general, the common risk factors for stroke include hypertension, diabetes, smoking, obesity, atrial fibrillation, and drug use. Of all the above risk factors, hypertension is the most common modifiable risk factor for stroke.

The etiology of ischemic stroke is due to either a thrombotic or embolic event that causes a decrease in blood flow to the brain. According to Ekerikevwe (2020), stroke known in medical terms as Cerebrovascular Accident (CVA), is one of the leading causes of morbidity and mortality around the world and it imposes enormous economic burden on individuals and society. In a thrombotic event, the blood flowing to the brain is obstructed within the blood vessel due to the dysfunction within the vessel itself, usually secondary to atherosclerotic disease, arterial dissection, fibromuscular dysplasia, or inflammatory condition. In an embolic event, debris from certain area in the body blocks blood flow through the affected vessel. The etiology of stroke affects both prognosis and outcomes. In thrombosis, there is an obstructive process preventing the blood flow to some regions of the brain. Risk factors include atherosclerotic disease, vasculitis, or arterial dissection. Embolic events occur when there is a clot originating from another location in the body. Most commonly, the source of the clot is the valve or chambers of the heart. For example, it is when a clot is formed within the atria in atrial fibrillation and dislodges into the arterial vascular supply. Other less frequent causes include venous, septic, air, or fat emboli. Lacunar infarcts are usually discovered in the subcortical areas of the brain, occurring due to a small vessel disease. The proposed mechanism is a perforating artery in the subcortical region causing the blood vessel occlusion.
II. Research Method

This is a retrospective cross-sectional study design. The study collected data from Februari to April 2019 among patients diagnosed and treated for embolic strokes admitted in the hospital. The follow-up for clinical information, treatment, and prognosis was also analyzed.

III. Result and Discussion

3.1 Result

The researcher gathered 35 cases of embolic strokes consisting of 15 males (43%) and 20 females (57%) with an average age of >66 years. Patients’ characteristics were as follows. The main complaints were limb weakness and parese cranial nerve with 60% (21 patients) suffering a headache, and 43% (15 patients) vomiting. The major risk factors were hypertension (63%) and other with diabetes mellitus, smoking history recurrent stroke. GCS scores found during the examination were 29 patients presented with ≥ 9 and 6 patients with ≤ 8 score. Laboratory findings indicated an increase of leukocyte count (54%) and high segmented neutrophils count (57%). The radiology findings were 22 patients with MCA, 6 patients with MCA, PCA and 4 patients with ACA, MCA, and PCA. The therapy for patients was 72% with lovenox and 28% with clopidogrel as illustrated in the Figure (Table Baseline Characteristics).

| Variables                  | Total (n) | Percentage (%) |
|----------------------------|-----------|----------------|
| Male                       | 15        | 43             |
| Female                     | 20        | 57             |
| 30-45                      | 5         | 14             |
| 46-55                      | 8         | 23             |
| 56-65                      | 7         | 20             |
| >66 year old               | 15        | 43             |
| Unconsciousness            | 6         | 17             |
| Headache                   | 21        | 60             |
| Vomiting                   | 15        | 43             |
| Limb weakness              | 35        | 100            |
| Parese of cranial nerve    | 35        | 100            |
| Hypertension               | 22        | 63             |
| Diabetes Mellitus          | 4         | 12             |
| Smoking history            | 15        | 43             |
| Recurrent of stroke        | 8         | 23             |
| Pneumonia                  | 5         | 15             |
| Kidney disease             | 3         | 8              |
| Atrial fibrillation        | 21        | 60             |
| STEMI                      | 5         | 15             |
| Cardiomegaly               | 17        | 48             |
| Pneumonia                  | 5         | 15             |
| Normal                     | 13        | 37             |
Brain CT scanning

|                         | Total (n) | Percentage (%) |
|-------------------------|-----------|----------------|
| ACA, MCA, PCA           | 4         | 11             |
| ACA, MCA                | 1         | 3              |
| MCA, PCA                | 6         | 17             |
| MCA                     | 22        | 63             |
| PCA                     | 1         | 3              |
| Hemorrhagic transformation | 1       | 3              |

NIHSS

|       | Total (n) | Percentage (%) |
|-------|-----------|----------------|
| 1-4   | 0         | 0              |
| 5-15  | 8         | 23             |
| 16-20 | 21        | 60             |
| >21   | 6         | 17             |

Glasgow Coma Scale (GCS)

|       | Total (n) | Percentage (%) |
|-------|-----------|----------------|
| 13-15 | 25        | 72             |
| 9-12  | 4         | 12             |
| 4-8   | 5         | 14             |
| 3     | 1         | 3              |

Glasgow Outcome Scale (GOS)

|       | Total (n) | Percentage (%) |
|-------|-----------|----------------|
| 13-15 | 25        | 72             |
| 9-12  | 4         | 12             |

Table 2. Laboratory Findings

| Variables             | Total (n) | Percentage (%) |
|-----------------------|-----------|----------------|
| Anemia                | 9         | 26             |
| Normal                | 26        | 74             |

Serum Platelet

|                  | Total (n) | Percentage (%) |
|------------------|-----------|----------------|
| < 150,000        | 5         | 14             |
| 150,000-450,000  | 29        | 83             |
| > 450,000        | 1         | 3              |

Serum Haematocrit

|                  | Total (n) | Percentage (%) |
|------------------|-----------|----------------|
| < 37             | 9         | 26             |
| 37-47            | 23        | 66             |
| >47              | 3         | 8              |

Serum Erythrocyte

|                  | Total (n) | Percentage (%) |
|------------------|-----------|----------------|
| < 4,2            | 8         | 23             |
| 4,2-5,4          | 21        | 60             |
| >5,4             | 6         | 17             |

Serum Leukocyte

|                  | Total (n) | Percentage (%) |
|------------------|-----------|----------------|
| 4,5-10,5         | 16        | 46             |
| >10,5            | 19        | 54             |

Plasma Glucose (mg/dl)
|                | < 200 | 200-239 | >239 |
|----------------|-------|---------|------|
| BUN (mg/dl)    | 30    | 86      | 14   |
| 13-43          | 32    | 92      |      |
| >43            | 3     | 8       |      |
| Serum Creatinine (mg/dl) |       |         |      |
| 0,51-0,95      | 32    | 92      |      |
| >0,95          | 3     | 8       |      |
| Serum Sodium (mEq/l) |       |         |      |
| <132           | 2     | 6       |      |
| 132-146        | 27    | 77      |      |
| >146           | 6     | 17      |      |
| Serum Potassium (mEq/l) |       |         |      |
| <3,7           | 3     | 8       |      |
| 3,7-5,4        | 32    | 92      |      |
| Serum Chloride (mEq/l) |       |         |      |
| <98            | 3     | 8       |      |
| 98-106         | 25    | 72      |      |
| >106           | 7     | 20      |      |
| Serum Monocyte |       |         |      |
| 2-8            | 32    | 92      |      |
| >8             | 3     | 8       |      |
| Serum Lymphocyte |       |         |      |
| 20-40          | 34    | 97      |      |
| >40            | 1     | 3       |      |
| Serum Neutrophils Segmented |       |         |      |
| 50-70          | 15    | 43      |      |
| >70            | 20    | 57      |      |
| Serum Eosinophils |       |         |      |
| 0-6            | 33    | 94      |      |
| >6             | 2     | 6       |      |
| Serum Basophils |       |         |      |
| 0-2            | 35    | 100     |      |

3.2 Discussion

The study collected 35 cases of embolic strokes from patients admitted in the hospital from February to April 2019, consisting of 15 male (43%) and 20 females (57%) with an average age of >66 years. Stroke is the second most common cause of mortality and third most common cause of disability worldwide. Globally, 68% of all strokes are ischemic and 32% are hemorrhagic.11,12 Data regarding prevalence of stroke in India is lacking. However, it can be extrapolated from the data available from the West. In a study by Banerjee et al., in 2001, the crude prevalence rate of stroke in India was 147/100,000 and the annual incidence rate was 36/100,000. Due to longer life expectancy, the lifetime risk of stroke is higher in women. Women have a substantially higher age-adjusted prevalence rate (564/100,000 for
women vs 196/100,000 for men) and incidence rate (204/100,000 for women vs 36/100,000 for men). Overall prevalence of stroke ranges from 147–922/100,000 in various studies.

Research states that men are more susceptible to ischemic strokes, while women are more likely to develop hemorrhagic strokes with twice the risk of death than men are. Important risk factors modified in ischemic stroke are hypertension, high cholesterol, diabetes, smoking, obesity, and lack of physical activity. Data regarding risk on gender have revealed that men have a higher prevalence of risk factors, such as smoking, high cholesterol, coronary arterial disease, and peripheral arterial disease. Studies demonstrate that women experience neuroprotective effects before menopause related to the estrogen hormones, they also tend to have a lower risk of stroke when 40 to 75 years compared to men, but after 75 years, women experience about 50% greater risk for stroke than men.

According to Sari (2020) stroke is a disorder of blood vessels or rupture of blood vessels in the brain so that blood supply in the brain becomes disrupted and results in brain cells die because they do not get oxygen and nutrients. Patient’s characteristics were as follows. The main complaints were limb weakness and paralytic cranial nerve, 60% (21 patients) with a headache, and 43% (15 patients) vomiting. The major risk factors were hypertension 63% and other with diabetes mellitus, smoking history recurrent stroke. GCS scores found during the examination were 29 patients presented with ≥ 9 and 6 patients with ≤ 8 score.

Clinical symptoms of stroke are the appearance of neurological deficits with sudden onset. Symptoms depend on the anatomic area of the arteries in the affected brain. 90% of strokes occur in the supratentorial area with the following appearance of symptoms. If the lesions on the left hemisphere are aphasia, it is the right hemiparesis, the right hemianopia. In addition, if the lesions are on the right hemisphere, clinical symptoms will appear in the form of left hemiparesis, left hemispatial neglect and left hemianopia. If the lesion occurs in posterior circulation or infratentorial stroke, there will be many additional symptoms, including diplopia, bulbar muscle paralysis, dysphagia, unilateral dysmetria and incoordination, and decreased consciousness. Although headaches, facial or neck pain can be additional symptoms, strokes commonly cause no pain. The most important feature of a stroke is a sudden onset of symptoms.

A total of 25 patients with a smoking history (38.5%) had a high risk of stroke based on the Stroke Risk Scorecard, while among non-smoking patients, there were 26 high risk patients (40%). Smoking can also trigger atrial fibrillation, a heart condition known as a risk factor for stroke. Chemicals in cigarettes also more likely allow platelets to stick together and form blood clots. The above factors increase the risk of atherosclerosis, a condition of narrowing and hardening arteries. Afterwards, atherosclerosis can reduce blood flow and allow blood clots more easily to form. If a blood clot is in the arteries leading to the brain, the blood supply can be blocked resulting in an ischemic stroke.

Laboratory findings showed increase of leukocyte count (54%) and high segmented neutrophils count (57%). Radiology findings were 22 patients with MCA, 6 patients with MCA, PCA and 4 patients ACA, MCA, and PCA. Therapy for patients were 72% with enoxaparin sodium injection and 28% with Clopidogrel.

As there is an important inflammatory response during stroke events, the cells implicated in the immune system are likely to be associated with the stroke outcome. In addition, it is reported that neutrophils are related with the blood brain barrier breakdown and
their infiltration seems to be associated with a higher inflammation and with a role in cerebral ischemia, and higher neutrophil counts before thrombolysis have been associated with worse 3-month outcomes. However, there are few studies analyzing the relation of leukocytes (including neutrophils and lymphocytes) with acute stroke outcome. In leukocyte count affects early stroke outcome. A total of 811 ischemic stroke patients were included in the study. NIHSS score was measured at baseline and after 72 hours, as well as at discharge, and leukocytes counts were measured within 12 hours post-stroke onset. Higher leukocytes counts were independently associated with high NIHSS scores at baseline and 72 hours, and with poor functional outcome at discharge. Therefore, leukocyte counts have an impact on subacute outcome independently of age or NIHSS at baseline.

Blood platelet counts (BPC) were previously associated with ischemic stroke risk, although their influence on outcome is poorly described. The study by Furlan et al. described the association of abnormal BPC (such as thrombocytopenia or thrombocytosis) is associated with a long term, but not with the acute outcome. However, further studies are required to confirm these findings.

Red blood cell counts and hemoglobin levels could influence the reoxygenation during acute ischemic stroke and, in turn, the degree of neurological damage occurred. Furlan et al. analyzed the influence of blood hemoglobin concentration (HGB) on stroke severity and outcome after ischemic stroke in a large cohort of 9,230 ischemic stroke patients. They found that high HGB, not the low one, was an independent predictor of an increased 7-day mortality compared to the normal HGB. In summary, high oxygen availability in acute phase of stroke can be associated with the worse acute and subacute outcome, although more research is required.

The success of the management of acute ischemic stroke is currently based on two strategies of recanalization of blood vessels: anti-platelet agents and thrombolysis. Because most strokes are caused by thromboembolic occlusion from intracranial arteries, restoration or increased perfusion to the ischemic area is the main therapeutic strategy. The concept of "ischemic penumbra," a potentially recoverable brain tissue, allows early intervention to improve neurological symptoms, and reduce functional disability after an attack. There are many strategies suggested for the acute stroke treatment, but oral aspirin and intravenous rTPA are the only two drugs currently recommended for the treatment of acute stroke.

Aspirin administration with an initial dose of 325 mg in 24 to 48 hours after the onset of a stroke is recommended for any acute ischemic stroke (AHA/ASA, Class I, Level of evidence A). Procedure on applying therapy administration for thrombolysis with rTPA on acute ischemic stroke is recommended for stroke medication on the difference between the benefits and disadvantages in the management provided. Fibrinolytics with rTPA generally provide reperfusion benefit from thrombus lysis and significant repair of cerebral cells. Fibrinolytic administration is a strong recommendation as soon as possible after the diagnosis of an acute ischemic stroke is established (onset of 3 hours on intravenous administration within 6 hours of intraarterial administration).

In Boehme et al., the authors analyzed the influence of infections on acute outcome of ischemic stroke patients for the first time, with END being the primary outcome (NIHSS score increase of ≥2 within 24 hours). They used a cohort of 334 patients, with 77 infected, and classified the infections as present on admission (POA, infection diagnosed within the first 24 hours) and hospital-acquired infections (HAIs, infection diagnosed after 24 hours).
IV. Conclusion

The study reported 35 cases of embolic strokes. Patients when arriving in the hospital were reported with the clinical profile, clinical manifestation, GCS score, brain imaging, risk factor, laboratory and outcome. However, further research is required in this field. Analysis of acute and subacute outcome is important to understand the molecular mechanisms behind the acute and long-term recovery. Eventually, the treatment to prevent the worsening after stroke is realized.

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