A PROSPECTIVE STUDY OF CLINICAL PROFILE OF STROKE IN A TERTIARY CARE HOSPITAL

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Received: 22 June 2016, Revised and Accepted: 31 August 2016

ABSTRACT

Objective: The objective of the work was to study the clinical profile of stroke in a tertiary care hospital.

Methods: A prospective observational study on stroke was carried out for a period of 6-month (May 2015 to October 2015). A total of 241 inpatients from Shri Preethi Hospital were incorporated in the study. The data were collected and evaluated by reviewing case files and patient interview.

Result and Conclusion: Out of 241 patients, an incidence of ischemic stroke was found to be higher. The occurrence of stroke steeply rises with age and male predominance. The burden of stroke tends to be more in rural, illiterate, and low socioeconomic status population. The study reveals risk factors such as sedentary lifestyle, previous and family history of stroke, underlying disease like hypertension, diabetes. The circadian pattern in onset showed a significant peak in the morning (6 am-12 pm) for ischemic and afternoon (12 pm-6 pm) for hemorrhagic stroke. Topographic distribution of cerebral infarct and hemorrhage was found to be in parietal lobe and periventricular white matter, respectively. Mostly prescribed medication for ischemic and hemorrhagic patients was antihypertensive and mannitol, respectively. The contraindication for thrombolytic therapy was found to be low economic status and average delay in time of presentation to hospital. The study highlights the need for aggressive management of traditional risk factors, need for extensive work up in patient to find etiologies and need for more active interventions in community for the prevention of stroke.

Keywords: Ischemic, Hemorrhagic, Circadian pattern, Antihypertensive.

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INTRODUCTION

According to the World Health Organization (WHO), stroke is a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal, and at times global (applied to patients in deep coma and those with subarachnoid hemorrhage), loss of cerebral function, with symptoms lasting more than 24 hrs or leading to death, with no apparent cause other than that of vascular origin (Hatano, 1976). Stroke was found to be the second leading cause of death and compress the surrounding tissue [5-7]. Ischemic and hemorrhagic stroke accounts for about 87% and 13%, respectively [4]. Ischemic stroke may be due to an obstruction within the blood vessel that supplies blood to the brain. Hemorrhagic stroke occurs due to the weakening of blood vessel which would rupture and bleed into the surrounding brain tissues. This blood would accumulate and compress the surrounding tissue [5-7].

Risk factors include non-modifiable factors (age, gender, race, family and previous history, low birth weight), potentially modifiable factors (excessive alcohol, hypercoagulability, drugs, oral contraceptive use, acute infection), and modifiable factors (smoking or tobacco use, obesity, residential area, diet) [8-10]. The American Heart Association/American Stroke Association (AHA/ASA) guideline recommends neurological examination using the National Institute of Health Stroke Scale (NIHSS). The AHA/ASA recommends tissue plasminogen activator, antiplatelet (aspirin, clopidogrel), anticoagulants (heparin, warfarin), antihypertensives and lipid-lowering agents for the treatment of ischemic stroke whereas osmotherapy, neuromuscular relaxants, neuroprotection and neurorestoration therapy, reperfusion therapy and calcium channel blockers for hemorrhagic stroke [11-16]. Our study was helpful in determining the frequency and percentage of risk factors, clinical manifestations, severity assessment, and current prescription trends in stroke patients admitted to a tertiary care hospital.

METHODS

A prospective observational study was conducted with the consent from Head of Department in Neurology of Shri Preethi Hospital, Erode. The study was approved by Institutional Ethics Committee.

The study was carried out for a period of 6-month from May 2015 to October 2015 in 241 stroke patients. The patient information was collected and analyzed by reviewing case files and patient interview. Patients diagnosed with ischemic and hemorrhagic stroke with or without comorbid disease, age above 20 years and of both genders were included in the study. The demographic data such as age, gender, risk factors (lifestyle, diet, body mass index, educational and socioeconomic status, resident areas, previous and family history, co-morbid disease), onset of stroke, and neurological severity using NIHSS, contraindication of thrombolytic therapy were determined by patient interview whereas topographic distribution and prescribing trends were determined by reviewing case files.

RESULTS

The study revealed that, from a total of 241 patients, 227 patients were diagnosed with ischemic stroke and 14 patients were diagnosed with hemorrhagic stroke, the incidence of ischemic stroke (94%) was found to be higher than that of hemorrhagic stroke (6%). Cardioembolic stroke among ischemic patients was found to be 39%. The occurrence of ischemic and hemorrhagic stroke steeply rises with age and ranged between 61 and 80 years (54%) and 41 and 60 years (50%), respectively. Table 1 shows the socio-demographic characteristics of stroke. A first-degree family history of cardiovascular disease was reported by 125 patients (55%) in Ischemic stroke and 9 patients...
(64%) in hemorrhagic stroke. While accounting for the hypertension stages, most of the patients were presented with stage II Hypertension. Smoking, alcoholism, betel nut use, diet, drinking habits, hypertension, and diabetes mellitus were the most common risk factor among stroke (Tables 1 and 2). Among Ischemic stroke, onset of circadian pattern shows a significant peak in 111 patients (49%) in morning (6 am-12 pm) followed by 55 patients (24%) in afternoon. Similarly, 6 patients (43%) in afternoon (12pm-6 pm) followed by 4 patients (29%) in the late evening (6 pm-12 am) showed a significant peak in hemorrhagic stroke. The majority of patients (56% of ischemic stroke and 64% of hemorrhagic stroke) were present with 3-4 clinical manifestation during admission. Most of the ischemic patients presented symptoms such as weakness of right side (42%), slurred speech (40%), giddiness (36%), and weakness of left side (35%). Similarly, a more number of hemorrhagic patients presented the symptoms such as vomiting (50%), headache (43%), and slurred speech (36%). While considering the topographic distribution of cerebral infract, most commonly affected site was parietal lobe (35%) followed by corona region (26%), basal ganglia (19%). Whereas while considering the topographic distribution of hemorrhage, most commonly affected site was periventricular white matter (50%), basal ganglia (29%). Neurological assessment of stroke severity was assessed using NIHSS. The majority of patients shows moderate to severe neurological deficit (38% for Ischemic stroke and 57% for hemorrhagic stroke). When considering drug utilization in ischemic stroke, commonly prescribed medications were antihypertensive followed by antiplatelets, lipid lowering agent, and nootropics (Table 3). At the same time commonly prescribed antihypertensive were amlodipine (42%) followed by mannitol (37%), furosemide (36%). The drug utilization in hemorrhagic stroke was mannitol (57%) followed by nimodipine and enalapril (50%).

**DISCUSSION**

Among 241 patients presented with stroke, the incidence rate of Ischemic stroke was more than that of hemorrhagic stroke, this may due higher prevalence of clinical factors such as advanced age, male gender, sedentary lifestyle, time of varying prevalence of risk factors, hypertension, obesity, family history of cardiovascular, and cerebrovascular disease. This finding is in contrast with the finding by Koton et al. [17] Cardioembolism was one of the major causes for ischemic stroke; this constellation might be explained by increasing age, sedentary lifestyle, and associated cardiovascular disorder [18].

A gender wise distribution of stroke shows a male predominance. The possible explanation may be increased risk factors in male such as cigarette smoking and alcohol consumption; in addition, there is no vascular protection of endogenous estrogens in male. Concurrent results were obtained in study conducted by Zhao et al. [19] During the time of admission, the patients of age group 61-80 years were predominant in the Ischemic group, whereas patients of age group 41-60 years were predominant in the hemorrhagic group. This may be due to the decreased physical activity and lower educational status among elderly when compared to young.

In the study conducted, patients had a previous and family history of stroke. The overall outcome of stroke incidence on the basis of previous history was attributed to the lack of proper treatment of risk factors, poor health care and reduced awareness among the patients [20].

### Table 1: The socio-demographic characteristics of stroke

| Variable         | Category        | Frequency distribution among ischemic stroke patients (n=227) (%) | Frequency distribution among hemorrhagic stroke patients (n=14) (%) |
|------------------|-----------------|---------------------------------------------------------------|---------------------------------------------------------------|
| Gender           | Male            | 153 (67)                                                     | 9 (64)                                                       |
|                  | Female          | 76 (33)                                                      | 5 (36)                                                       |
| Food habits      | Vegetarian      | 76 (34)                                                      | 6 (43)                                                       |
|                  | Non vegetarian  | 37 (16)                                                      | 2 (14)                                                       |
|                  | Mixed diet      | 113 (50)                                                     | 6 (43)                                                       |
| Drinking habits  | Coffee          | 75 (33)                                                      | 4 (29)                                                       |
|                  | Tea             | 56 (25)                                                      | 2 (14)                                                       |
|                  | Mixed           | 96 (42)                                                      | 8 (57)                                                       |
| BMI              | Underweight     | 17 (7)                                                       | 2 (14)                                                       |
|                  | Normal weight   | 47 (21)                                                      | 2 (14)                                                       |
|                  | Over weight     | 72 (32)                                                      | 4 (29)                                                       |
|                  | Obese           | 94 (40)                                                      | 6 (43)                                                       |
| Family history   | With family history | 85 (37)                                          | 6 (43)                                                       |
|                  | Without family history | 142 (63)                                     | 8 (57)                                                       |
| Residential area | Rural           | 149 (66)                                                     | 12 (86)                                                      |
|                  | Urban           | 78 (34)                                                      | 2 (14)                                                       |
| Educational status | Illiterate      | 125 (55)                                                     | 8 (57)                                                       |
|                  | Schooling       | 84 (37)                                                      | 4 (29)                                                       |
|                  | Graduate        | 18 (8)                                                       | 2 (14)                                                       |
| Occupational status | Business       | 43 (55)                                                      | 3 (21)                                                       |
|                  | Daily worker    | 76 (33)                                                      | 5 (36)                                                       |
|                  | Agriculture     | 55 (24)                                                      | 4 (29)                                                       |
|                  | Sales and service | 23 (10)                                | -                                                            |
|                  | None            | 30 (13)                                                      | 2 (14)                                                       |

### Table 2: Common risk factor for stroke

| Variable   | Category       | Frequency distribution among ischemic stroke patients (n=227) (%) | Frequency distribution among hemorrhagic stroke patients (n=14) (%) |
|------------|----------------|----------------------------------------------------------------|----------------------------------------------------------------|
|            | Male (%)       | Female (%)                                                      | Male (%)             | Female (%)            |
| Social habits | Smoking       | 113 (73)                                                      | -                                                                     |
|            | Alcoholic      | 94 (61)                                                       | -                                                                     |
|            | Betel nut user | 88 (58)                                                      | 43 (43)                                                            |

Asian J Pharm Clin Res, Vol 9, Suppl. 3, 2016, 178-181
Table 3: Prescribing pattern in stroke

| Category               | Drugs                          | Frequency distribution among Ischemic stroke patients (n=227) (%) | Frequency distribution among hemorrhagic stroke patients (n=14) (%) |
|------------------------|--------------------------------|---------------------------------------------------------------|------------------------------------------------------------------|
| Antiplatelets          | Aspirin                        | 132 (58)                                                      | -                                                               |
|                        | Clopidogrel                    | 123 (54)                                                      | -                                                               |
|                        | Aspirin + dipyridamole         | 6 (3)                                                         | -                                                               |
|                        | Aspirin + clopidogrel          | 25 (11)                                                       | -                                                               |
| Anticoagulants         | Heparin                        | 103 (45)                                                      | -                                                               |
|                        | Enoxaparin                     | 7 (3)                                                         | -                                                               |
| Nootropics             | Citicoline                     | 116 (51)                                                      | -                                                               |
|                        | Methylcobalmine                | 96 (43)                                                       | -                                                               |
|                        | Pinacetam                      | 24 (11)                                                       | -                                                               |
| Lipid lowering agent   | Atorvastatin                   | 166 (73)                                                      | -                                                               |
| Beta blockers          | Atenolol                       | 29 (13)                                                       | 6 (43)                                                          |
|                        | Bisoprol                       | 6 (3)                                                         | 2 (14)                                                          |
|                        | Carvediol                      | -                                                             | 1 (7)                                                           |
|                        | Metoprol                       | -                                                             | 7 (50)                                                          |
| Calcium channel blocker| Amlodipine                     | 96 (42)                                                       | 6 (43)                                                          |
|                        | Nifedipine                     | -                                                             | 4 (29)                                                          |
|                        | Nimodipine                     | -                                                             | 7 (50)                                                          |
| Alpha blockers         | Prazosin                       | 5 (2)                                                         | 4 (29)                                                          |
|                        | Clonidine                      | 5 (2)                                                         | 7 (50)                                                          |
| ACE inhibitors         | Enalapril                      | 51 (22)                                                       | 8 (57)                                                          |
| Osmotic diuretics      | Mannitol                       | 83 (37)                                                       | 3 (21)                                                          |
| Loop diuretics         | Furosemide                     | 82 (36)                                                       | -                                                               |
| ARB                    | Telmisartan                    | 20 (9)                                                        | -                                                               |
| Potassium sparing diuretics | Aldactone                   | 6 (3)                                                         | -                                                               |

First degree family history of cardiovascular disorder had a moderate familial risk on Stroke. This could be explained by hereditary relationship [21]. The burden of stroke tends to be more in rural population than that of urban population which may be attributed to reduced awareness in rural areas along with the consequent lack of monitoring which may probably lead to under-reporting or under-diagnosis by general physicians [22].

The available data show that the majority of patients were illiterate and daily workers. Illiteracy and low socioeconomic status are high-risk population with increased work load and stress, on the other hand, moderate and highly educated population along with high socioeconomic status have improved medication adherence with proper utilization of health-care system and health behavior counseling, this reduces recurrent stroke [23]. Body mass index >25 kg/m² had a strong association with the occurrence of stroke. Compared to normal weight patients, obese and overweight patients tend to develop a high risk for stroke. This may be associated with increased risk factors, obstructive sleep apnea, insulin resistance, pro-thrombotic state (higher presence of thrombotic cofactor), and sympathetic nervous system activation status which are related to thrombotic adverse events thereby reducing the functional outcome and may result in catabolic imbalance. At the same time, immobilization in obese patients can impair the post Stroke recovery. The suggestive evidence was found in study conducted by Wang et al. [24]

Hypertension is one of the risk factors in ischemic and hemorrhagic stroke. Hypertension results in hyaline degeneration of smaller cerebral vessels, atherosclerosis in large cerebral vessel, alteration of cerebral perfusion, imbalance in the cerebrovascular autoregulation, hypertrophy and remodeling of cerebral vessels which may be attributed to illiteracy, limited awareness of hypertension, food habits and sedentary lifestyle [25]. The confounding variables such as current smoking, alcoholics, and betel nut use are independently associated with stroke risk. The majority of smokers developed stroke due to the reason that smoking may predispose to cerebral thrombosis possibly by causing an imbalance between brain vascular coagulation and abnormal Fibrinolysis at the same time it might alter the function of blood brain barrier and disrupt normal endothelial cell function [26]. The plausible relation between alcoholism and risk factor of stroke is more susceptible to triggering effect which causes cardiogenic brain embolism and hypertension thereby increases the risk of ischemic stroke. At the same time, it may be antithrombotic and atherogenic, leading to increased high-density lipoprotein, decreased platelet aggregation, clot formation, and increased fibrinolysis thereby increasing risk of hemorrhagic stroke [27]. Betel nut user developed stroke due to the reason that arecoline, content of betel nut, induces COX-2 up-regulation, which may result in cerebrovascular abnormalities [28].

The relation between risk of stroke and diet may be an increased daily total fat intake, especially above 65 g. significantly increases risk of stroke, whereas vegetarian foods have low saturated fat and are high in unsaturated fat [29]. Habitual coffee consumption may raise the blood pressure [30]. Our results deviate from study conducted by Larsson et al. [31] and Zhang et al. [32]

The Circadian pattern in onset of ischemic and hemorrhagic stroke showed a significant peak in morning (6 am-12 pm) and afternoon (12 pm-6 pm), respectively. The could be correlated to biological factors such as blood pressure (with physiological nocturnal decrease and morning increase), hemostatic balance (with increased platelet aggregability, increased level of hematocrit with hyperviscosity of blood in morning hypercoagulability, hypofibrinolysis) autonomic systemic activity (with activation of sympathetic nervous system after wake up movement with consequence on vascular tone, blood pressure, heart rate). The endogenous factors also depend partially by the day-night cycle of the physical activity and assumption of the up-right posture (as exogenous factors) associated with awaking movement [33].

The prescribing trends found in Ischemic stroke patients were antihypertensive (amlodipine, manitol, furosemide, and enalapril) followed by antiplatelets, lipid lowering agent, and nootropics. These results show remarkable coincidence with study conducted by Geetha et al. [34] and White et al. [35]. While considering drug utilization in hemorrhagic stroke patients, commonly prescribed drugs were manitol followed by Preethi [36].

According to AHA/ASA guidelines, the prescribing trends for ischemic stroke were antiplatelet therapy like aspirin, clopidogrel followed by antihypertensive like angiotensin converting enzyme and diuretics. And for hemorrhagic stroke was found to be calcium channel blocker...
Stroke incidence and mortality trends in US

CONCLUSION

The study was helpful in determining the incidence, risk factors, clinical manifestation, circadian pattern in onset, and prescribing trends among Stroke patients admitted to a tertiary care hospital. The incidence of ischemic stroke was found to be higher. The study reveals that there exists a strong correlation between age and gender in developing stroke. Sedentary lifestyle, diet, obesity, residential area, previous and family history of stroke, hypertension and diabetes may be contributor to stroke risk. Manual tracing methods like CT scan, MRI remain the standard technique for determining topographic distribution and delineating damaged brain regions. The results confirm the presence of circadian variation among stroke, predominately in the early morning and afternoon. The drug utilization review was based on AHA/ASA, and most of the prescriptions were found to be rational. The study provides a framework for continuous evaluation of prescription pattern among stroke patients.

This study conducted to create awareness among public, thereby providing information on symptoms, risk, and treatment. The study also paves a way to change the behavioral pattern and prevent early recurrent stroke. Our study helps to determine adherence on the standard clinical guidelines for management of stroke and as evidence for future research.

Limitation of the study includes relatively smaller sample size, the study was attributed to a single hospital, information on menopausal status, and use of hormone replacement therapy were not available. Another limiting factor could be non-responding of smoking among females who may tend to hide this habit due to socio-cultural reasons. Relation between second-hand smokers and past smokers as a risk for stroke was not studied. Prescribing trends in combination therapy were not analyzed.

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