

# Prescribing pattern of drugs in stroke patients: A prospective study

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## ABSTRACT

**Objectives:** The population-based estimates confirm a rising trend in both incidence and prevalence of stroke in India. The main objective is to assess the prescribing pattern of drugs in hospitalized stroke patients.

**Materials and Methods:** A Prospective observational study was carried out for a period of 6 months in the inpatient department. The inclusion criteria of the present study are patients of either sex aged  $\geq 18$  years, patients who were diagnosed as a stroke patient, and admitted in the intensive care unit of the hospital.

**Results:** A total of 102 prescriptions were analyzed during the 6-month study period. This was found to be higher in men 68 (33.33%). A total of 69 (67.64%) were having habits of smoking and alcohol consumption. In the study of 102 patients, 69 (32%) were identified as ischemic stroke patients and 33 (32%) suffered hemorrhagic stroke. The major co-morbidities identified were hypertension and diabetics mellitus, which were seen in 34 (33.33%) and 18 (17.64%), respectively. Among the 102 patients, 77 (75.49%) were administered cerebral activators. In this study of prescriptions of drugs in stroke, majority of the patients were treated with neurotonics drugs. Among the 102 patients, 85 (83.33%) were administered neurotonics drugs. In this study, we observed that the most popular antiplatelet was clopidogrel, which was prescribed to 48 (47.05%). In anticoagulants, only enoxaprain was used in our hospital for stroke patients. This medication was administered to 27 (26.47%) patients.

**Conclusion:** The prescribing pattern of drugs should be based on severity of stroke, associated co-morbid conditions, and currently available evidences in order to promote the quality use of drugs.

**Key words:** Drugs, prescribing pattern, prospective study, stroke

## INTRODUCTION

Stroke is a major cause of mortality worldwide and commonly occurs in elderly patients.<sup>[1]</sup> Indian population is relatively young compared with the Western countries but India has already attained epidemic proportions of annual incidence of stroke

145/100,000 per year during 2003–06.<sup>[2]</sup> Stroke mortality rate in India is 22 times that of malaria and 1.4 times that of tuberculosis.<sup>[3]</sup> There are certain risk factors that are rare but known to occur among Indians (like hypertension and diabetes). The common risk factors are diabetes, hypertension, smoking, and obesity.<sup>[4]</sup> The population-based estimates confirm a rising trend in both incidence and prevalence of stroke in India.<sup>[5]</sup> The prophylaxis drugs has remained an important drug for hypertensive and diabetes mellitus patients to avoid any stroke in future.<sup>[6]</sup>

The physicians are often making the decision as to which agent to choose in a patient-by-patient basis. In the present study, we sought to look at the

Access this article online	
<b>Quick Response Code:</b> 	<b>Website:</b> <a href="http://www.archivepp.com">www.archivepp.com</a>
	<b>DOI:</b> 10.4103/2045-080X.106253

prescribing patterns of neurologists and physicians to identify the choice of a specific agent over another and what changes are made when a stroke occurs in these patients. Other than risk factor management, antithrombotic agents have a well-established and important role in secondary prevention of ischemic stroke. By 2025, four out of five stroke events will occur in people living in India. The prevalence of stroke in India varies in different regions of the country and, ranges from 40 to 270 for every 100,000 population. Approximately 12% of all strokes occur in the population < 40 years of age. Major risk factors identified in India are hypertension (blood pressure > 95 mmHg diastolic), hyperglycemia, tobacco use, and low hemoglobin levels. In this study, we concentrate on the use of different kind of drugs to treat the sign and symptoms of stroke.

The drug treatment strategy also involved with selecting drugs like thrombolytics anticoagulants, antihypertensives (angiotensin converting enzyme-inhibitors, angiotensin II receptor blockers, and diuretics), blood lipid lowering agents (statins), antiplatelet drugs (aspirin and clopidogrel), and cerebral activators. It is also recommended to select, a route, and dosage form of drugs to have optimal therapeutic effects to manage Cerebrovascular Accident.<sup>[7,8]</sup>

## MATERIALS AND METHODS

This study was carried out at Super-specialty Hospital, located at the heart of the city of Warangal. This hospital has a 300-bed facility along with all advanced instruments.

### Study design

The design of study type was prospective cross sectional among 102 in-patients who were diagnosed as stroke.

### Data collection

A data collection form was designed to collect patients data including patients personal details (name, age, and sex) family history and past medical history, complications and lifestyle medication, laboratory data, therapeutic management, drug data (brand and generic name of all drugs prescribed to treat stroke, dose frequency, route of administration, and dose of drugs), and discharge summary. The required information was collected from the case sheets of individual patients in the designed data collection form. The patients were interviewed to collect all

the relevant data regarding patient care. The patient selection criterion was depending upon fulfillment of inclusion criteria. The informed consent/permission was taken from patient or from his/her attenders. All the necessary information was provided to them about this study. The collected data was transferred to the Excel Sheet software of Microsoft Office. This data was categorized and tables were prepared. As per need, various calculations were done to find out standard mean deviations and percentages. All mandatory ethical issues were discussed and carried out according to the permission granted by the ethical committee of the Hospital.

### Inclusion criteria

- Patients of either sex aged ≥ 18 years.
- Patients who were diagnosed as a stroke patient and admitted in intensive care unit of hospital.

### Duration of study and analysis

This study was carried out in the intensive medical care department of the hospital. This study period was for 6 months from January to June 2011 and analysis of data was done in the month of August 2011.

## RESULTS

In the study, it was found that, a total of 102 patients were admitted to the ward during the study period. Of the total admissions, 68 (33.33%) and 34 (66.66%) patients were male and female, respectively [Table 1]. Out of the 102 patients, 69 (67.64%) were having habits of smoking and alcohol consumption [Table 2]. In this study of 102 patients, 69 (32%) were identified as ischemic stroke patients and 33 (32%) suffered hemorrhagic stroke Blood pressure was high in 73 (71.56%) at the time of admission to the

**Table 1: Age of patients**

Group (years)	Male (N=102 (%))	Female (N=102 (%))
25-40	5 (7.35)	4 (11.76)
41-55	24 (35.29)	9 (26.47)
56-70	28 (41.17)	15 (44.11)
≥71	11 (16.07)	6 (17.64)
Mean±SD	59±12.022	58.94±12.032

**Table 2: Patients characteristics**

Characteristics	Gender N=102(%)	
	Male	Female
Smoking (28)	22 (21.56)	6 (5.88)
Alcoholics (39)	39 (38.23)	2 (1.96)
Ischemic stroke (69)	48 (47.05)	21 (20.58)
Hemorrhagic stroke (33)	20 (19.60)	20 (19.60)

hospital. The major co-morbidities identified were hypertension and diabetics mellitus, which were seen in 34 (33.33%) and 18 (17.64%), respectively, among the stroke patients [Table 3]. Among stroke complication, right and left hemiplegia 50 (49.01%) were attacked equally in population but right hemiplegia produced aphasia in 52 (50.98%) and blurred vision in 3 (2.94%). Among the 102 patients of stroke, 77 (75.49%) were administered cerebral activators. In this study, patients with hypertension were treated with different classes of antihypertensive. These kinds of drugs are less prescribed; Ramipril was prescribed to 3 (2.94%) patients. In this study, stroke patients also suffered seizures, hence Phenytoin was prescribed to 24 (23.52%) patients. Out of the 102 stroke patients, Mannitol was administered to reduce intracranial edema and this was prescribed to 100 (98.03%) patients. In this 102 stroke patients study, Dyslipidemics was administered to 22 (21.56%) patients. In this study of prescriptions of drugs in stroke, majority of the people were treated with neurotonics drugs. Among the 102 patients, 85 (83.33%) were administered neurotonics drugs. In this study, we observed that the most popular antiplatelet was clopidogrel, which was prescribed to 48 (47.05%) patients. In anticoagulants, only Enoxaprain was used in our hospital for stroke patients. This medication was given to 27 (26.47%) patients [Table 4].

## DISCUSSION

Males are very susceptible to stroke compared with females, this may be due to risk factors and habits. It showed in this study, the numbers of male patients were comparatively more than the numbers of female patients. One survey reported that male to female ratio of stroke to be 1.7.<sup>[9]</sup> Another study done in Taiwan by Wu *et al.*, revealed that 736 and 425 were male and female, respectively.<sup>[10]</sup> Similarly, one study done in Turkey by Nuray and Mehtap, estimated 40 (57.14%) males and 28 (40%) females.<sup>[11]</sup> Similar findings correlates with the study at Pondicherry, where 39 (60.93%) and 25 (39.06%) were males and females, respectively.<sup>[12]</sup> The mean age of the patients in this study was 58.98 ± 12.27 years. In the present study, we found similar results as reported by Po *et al.* in Taiwan.<sup>[13]</sup>

Most of the patients who were victim of stroke come under the age group of 56–70 years. This study also gives uniform result as shown by previous study, which found that age was the risk factor for stroke and it enhances the probability of stroke even more;

**Table 3: Co-morbid and stroke complication**

Co-morbid disease	Numbers N=102 (%)
Hypertension	64 (62.74)
Diabetes mellitus	26 (25.49)
Old stroke	9 (8.82)
Coronary artery disease	3 (2.94)
Right hemiplegia	50 (49.01)
Left hemiplegia	50 (49.01)
Bilateral hemiplegia	2 (1.96)
Aphasia	52 (50.98)
Blurred vision	3 (2.94)

**Table 4: Drugs prescribed in stroke patients**

Drugs category	Number N=102(%)
Anticoagulant drugs	
Enoxaprain	44 (43.13)
Cerebral activator drugs	
Piracetam	49 (48.03)
Nimodipine	10 (9.8)
Piracetam+Nimodipine	18 (17.64)
Beta blockers	
Metoprolol	7 (6.86)
Atenolol	4 (3.92)
Calcium channel blockers	
Amlodipine	26 (25.49)
Nifedipine	22 (21.55)
ACE Inhibitors	
Ramipril	3 (2.94)
Angiotensin antagonist	
Olmisertan	3 (2.94)
Telmisertan	3 (2.94)
Antihypertensive combination therapy	
Amlodipine+Atenolol	9 (8.82)
Telmisertan+Hydrochlorthiazides	11 (10.78)
Antiepileptic drugs	
Phenytoin	24 (23.52)
Dyslipidimic drugs	
Atorvastatin	20 (19.6)
Rosuvastatin	2 (1.96)
Neurotonics drugs	
Citicholine	36 (35.29)
Mecobalamine	5 (4.9)
Multivitamins	44 (33.33)
Citicholine+Multivitamins	5 (4.9)
Citicholine+Mecobalamine	5 (4.9)
Antiplatelet drugs	
Aspirin	2 (1.96)
Clopidogrel	48 (47.05)
Aspirin+Clopidogrel	44 (43.13)

this study was carried out by Wu in 2011, which showed that the age group of 50–75 years suffered optimum of 702 (60.5%) patients.<sup>[9]</sup> It was also studied that the mean age of stroke patients were 55.5(Male) year and 57.9 (Female)years.<sup>[12]</sup> Nuray and Mehtap



also reported similar results that the age group of 61–71 years were more prone to stroke and there were an estimated 28 (40%) patients in the study.<sup>[11]</sup> In this study, it was shown that 36 (35.29%) were of stage II hypertension. Nagaraj *et al.* from Chennai also reported similar results, they observed hypertension in 115 (46%) patients with stroke.<sup>[14]</sup> A study conducted by Meschia *et al.*, also reported that 359 (71%) patients were having hypertension.<sup>[15]</sup> This result also co-relates with the study of Guo *et al.*, who reported 69 (65.7%) hospitalized stroke patients having hypertension.<sup>[15]</sup>

In our research, it has been found that 28 (27.45%) patients were smokers and 41 (40.19%) patients consumed alcohol. An Indian-based study by Sharma and Sharma reported that 31.2% smokers were at risk of stroke.<sup>[16]</sup> Kim *et al.* reported that 367 (32.4%) patients were having habit of smoking.<sup>[13]</sup> Sacco *et al.* categorized risk for recurrent stroke as 285 out of 3013 were moderate alcoholic.<sup>[17]</sup> Wu reported that cigarette and alcohol consumption account to stroke by 57.7% and 30.8%, respectively.<sup>[9]</sup> Among the 102 patients of stroke in this study, 69 (32%) were identified as ischemic stroke patients and 33 (32%) suffered hemorrhagic strokes. Bharucha and Kuruvilla in Mumbai recorded a larger number of ischemic to hemorrhagic strokes as 57.3–89.7% and 13.6–37.9%, respectively, in Western countries.

This study also gives uniform result as the study by Nuray and Mehtap in Turkey. It was reported that ischemic stroke is the major type suffered in Turkey, ischemic stroke 52 (74.28%) and hemorrhagic stroke 18 (25.71%), respectively.<sup>[11]</sup> Kalita *et al.* concluded that ischemic patients were more in number compared with hemorrhage stroke.<sup>[18]</sup> Nandigam *et al.* also reported 44 (68.75%) and 20 (31.25%) patients of ischemic and hemorrhagic, respectively.<sup>[12]</sup> All stroke patients showed stroke-related complications; 50 (49.01%) with right hemiplegia, 50 (49.01%) with left hemiplegia, 2 (1.96%) with both side hemiplegia, 52 (50.98%) suffered from Aphasia and 3 (2.94%) suffered of blurred vision. A study by Kenneth and Cheng reported the prevalence of stroke complications as 69% hemiparesis, 61% leg paresis, 57% Aphasia, and 51% vision-related problems.<sup>[19]</sup> Nuray and Mehtap from Turkey reported that stroke complication among patients as 30 (42.85%) left hemiparesis and 40 (57.14%) right hemiparesis.<sup>[11]</sup> Gall reported that 63 (35.6%) patients suffered from visual field defect due to stroke.<sup>[20]</sup> The major co-morbidities were identified as hypertension and diabetics mellitus, which were seen in 34 (33.33%) and 18 (17.64%) among the stroke

patients. Wu *et al.* reported about co-morbidities of stroke; hypertension was identified in 65.2% male and 68.2% female, respectively. Likewise for diabetes, 29.9% male and 34.4% female, respectively.<sup>[14]</sup>

A study reported by Meschia *et al.*, found 71% and 27% patients having past history of hypertension and diabetes mellitus, respectively. Guo *et al.* reported in their study about past medical history of patients having 65.7% of hypertension and 43.8% of diabetes.<sup>[21]</sup> Hypertension was the major co-morbidity of stroke patients and it was estimated to be 82.4% as reported by Helen *et al.*<sup>[22]</sup> In the present study, we found that 77 (75.49%) patients were administered cerebral activators. The preferred cerebral activator was Piracetam, which was administered to 49 (48.03%) stroke patients, this was followed by Nimodipine 10 (9.8%), and few patients were simultaneously co-administered both, Piracetam and Nimodipine 18 (17.64%).

Similarly, Ricci *et al.* reported that Piracetam has neuroprotective and antithrombotic effects that may help to reduce death and disability in people with acute stroke. Eleven (10.78%) patients were prescribed for beta blocker drugs for management of hypertension and hemorrhagic conditions. Metoprolol was prescribed for 7 (6.86%) patients and Atenolol 50 mg was administered to 4 (3.92%) stroke patients.

In all category of antihypertensive calcium channel blockers were used in majority of 48 (47.05%) prescriptions. Amlodipine was prescribed with preference as 26 (25.49%), the next drug in this category was Nifedipine, which was prescribed to 22 (21.65%) patients. The angiotensin converting enzyme inhibitors (ACE inhibitors) drugs were less prescribed, Ramipril was prescribed to 3 (2.94%) patients. Among angiotension receptor blockers (ARB's), Olmisertan were administered to 3 (2.94%) patients and Telmisertan were administered to 3 (2.94%) patients. Twenty (19.6%) patients were administered fixed dose combination therapy. The combination of Amlodipine and Atenolol was administered to 9 (8.825%) patients, whereas Telmisertan and hydrochlorothiazide combination was administered to 11 (10.78%) patients. Eva *et al.* also reported that 7843 patients were prescribed by ACE inhibitors and angiotensin antagonist, 9025 and 4459 patients were prescribed by beta blockers and calcium channel inhibitors, respectively.<sup>[23]</sup> Phenytoin was prescribed to 24 (23.52%) patients, Phenytoin was used as prophylaxis. In the study by Silverman, he reported that 17.6% patients were prescribed Phenytoin.<sup>[24]</sup>

Misra and Ranjan reported similar results in their study of prescription practice by physicians of antiedema therapy for stroke patients, it was observed that 117 physicians out of 129, preferred Mannitol as antiedema therapy for stroke patients.<sup>[18]</sup> In this study, 100 (98.03%) patients were administered Mannitol. In this 102 stroke patients study, Dyslipidemics were administered to 22 (21.56%) patients; among them, 20 (19.6%) patients were administered Atorvastatin 10 mg and the other 2 (1.96%) patients Rosuvastatin 10 mg were administered. In stroke, majority of people were treated with Neurotonics. Among the 102 patients, 85 (83.33%) were administered Neurotonics drugs. Citicholine was the commonly prescribed Neurotonics. Other drugs like Mecobalamin 5 (4.9%), multivitamins 44 (33.33%), combinations of citicholine and multivitamins 5 (4.9%), and combination of citicholine and Mecobalamin 5 (4.9%). In this study, we observed that the most popular antiplatelet is Clopidogrel, which is prescribed to 48 (47.05%), and followed by combination of Aspirin and Clopidogrel drugs to 44 (43.13%) patients. The least prescribed antiplatelet to stroke patients was Aspirin in our hospital, which was administered to 2 (1.96%) patients. In anticoagulants, only Enoxaparin was used in our hospital for stroke patients. This medication was administered to 27 (26.47%) patients.

## CONCLUSION

The complete study shows that the uses of medication in stroke are cerebral activators as Piracetam and Nimodipine. Various antihypertensives were used, as Calcium Channel Blockers, Beta Blockers, ACE Inhibitors, Angiotensin Antagonists, and various Combinations. Some stroke patients were also prescribed Antiepileptic as Phenytoin. Most of the patients were administered Mannitol to reduce intracranial edema. In this study, various patients were administered Atorvastatin as Dyslipidemics to reduce higher cholesterol. Aspirin and Clopidogrel were only used as Antiplatelet. The drug Enoxaparin is only used as Anticoagulant. The obtained data is only specific to the site of study. But the usage of drugs in stroke may be different at different Indian Hospitals, due to physician's choice and preferences. This study initiating that, there should be a Standard Stroke Pharmacotherapy guidelines in India and this may be possible in future.

## ACKNOWLEDGMENT

The authors gratefully acknowledge Dr. J. Sudhakar Reddy, Superintendent of Rohini Super Specialty hospital,

Warangal, for his consecutive support and suggestions during data collecting from the hospital.

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**How to cite this article:** Abbasi MY, Ali MA. Prescribing pattern of drugs in stroke patients: A prospective study. *Arch Pharma Pract* 2012;3:283-8.

**Source of Support:** Nil. **Conflict of Interest:** None declared.



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