

Original Article

## DRUG UTILISATION STUDY OF STROKE AND OTHER PATIENTS ADMITTED TO GENERAL WARD OF NEUROLOGY UNIT AT QUATERNARY CARE PRIVATE HOSPITAL

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### ABSTRACT

**Objective:** To study the profile of the patient, the pattern of their illness and their drug use patterns attending to general ward of quaternary care hospital.

**Methods:** Prospective observational study of 2 mo was performed at neurology unit of the quaternary care private hospital, India. Patients aged above 20 y with at least one neurological drug in prescription were included to observe their demographic profile, illness pattern and drug use. The data was analysed and summarised as frequency and percentage using microsoft excel and presented as tables.

**Results:** Among 60 patient that were enrolled, more were males (N=33, 55%) than females (N=27, 45%) and within the age group of 60-70 y (N=22, 36.67%). The majority of patients were diagnosed with strokes (N= 48, 80%) where the cerebrovascular accident was most common (N=16, 26.66%). Males (N=29, 60.4%) were more prone to get stroke than females (N=19,39.6%). An average number of drugs per prescription was 5.7, the percentage of antibiotics, generic drugs and injections were 36.6%, 0.05% and 44.14% respectively. A total of 28 different drug classes with 61 different drugs was utilised. Fourteen drug classes had been accounted for 90% of drugs utilisation. Clopidogrol+Aspirin have frequently used the drug.

**Conclusion:** Most people attending neurology unit were elderly. Stroke occupies 1<sup>st</sup> list for the burden. Average drugs for neurology visit remain high. Wide types of drug classes are utilised in neurological wards.

**Keywords:** Neurology department, Drug utilisation, Profile of stroke patients

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### INTRODUCTION

The overall global burden of neurologic disease is approximately 20%, the majority being in the developing countries causing morbidity, mortality and adversely affecting the quality of life [1, 2]. Major neurological disorders include stroke, dementia epilepsy, headache disorders, multiple sclerosis, Parkinson's disease, traumatic brain injuries, neuroinfectious, pain associated with neurological disorders and neurological disorder associated with malnutrition. Pharmacotherapy is an important aspect for the management of neurological diseases [3]. Common drug class utilized in neurological disorders include cholinesterase inhibitors, antiparkinson, antiplatelets, anticoagulants and thrombolytic, anti-epileptics, sedatives and hypnotics, antidepressants, antipsychotics, non-steroidal anti-inflammatory drugs, triptans, steroids, vitamin supplements, specific biological therapies etc [4]. The increased interest of drug utilisation research in neurology has resulted from the increased marketing of new drugs, the wide variation in the pattern of drug prescribing and consumption and increasing concern about the cost of neurological drugs. The studies related to drug utilization in neurology is limited in India [2]. Drug utilisation research (DUR) was defined by 'World Health Organisation' (WHO) in 1977 as 'Marketing, distribution, prescription and use of drugs in society with special emphasis on resulting medical, social and economic implication [5]. Such studies have to be carried out from time to time. Drug utilisation study, especially at neurology department in India, is very less. Keeping these things in mind we conducted single centred prospective study in neurological inpatient department at the quaternary hospital with objectives to study the profile of patients admitting to the neurological department, to study the prescriptions based on WHO prescribing indicator and to identify utilisation pattern of drugs.

### MATERIALS AND METHODS

#### Study design

Prospective, observational and one centre study.

#### Source of data and materials

Patient prescriptions, patient case sheets, data collection form.

#### Inclusion criteria

Patients of either sex suffering from neurological disorder coming to general wards of neurological inpatient department who aged above 20 y and having at least one neurological drug in prescription.

#### Exclusion criteria

Pregnant and lactating women, a paediatric patient, outpatients.

#### Method of collection of data

Following data was collected in customised data collection form like patient demographic details, patient diagnosis, prescription details like: date, prescription number, number of drugs in prescription, name of individual drug, its route, dosage form, dosing schedule or frequency and duration of therapy, number of drugs prescribed by generic name, number of drugs prescribed from 'National essential medicine list' and number of injectable drugs prescribed.

#### Study procedure and data analysis

A patient who met above inclusion and exclusion criteria were only enrolled. Details regarding demographics, diagnosis, treatment etc were collected from the case sheet/prescription in suitably designed data collection form. WHO prescribing indicators were used in the study to assess drug use which included an average number of drugs per prescription, the percentage of drug prescribed by generic name, the percentage of a prescription containing at least one generic, the percentage of injections prescribed, the percentage of antibiotic prescribed. Drugs were classified first and reported as frequency and percentage to show extent (frequent and infrequent) of their utilisation. For drug interaction, drug information resources like 'Medscape Drug Interaction Checker', 'Stockley's Drug Interaction'

was reviewed. Only major and significant interactions were mentioned. The data were analysed using suitable descriptive statistics and represented in tables with the aid of microsoft excel.

#### Does the study require any investigation or interventions to be conducted on the patients?

No. It did not require any investigation/intervention to the patient.

#### Study sample

60 patients were enrolled during the study period.

#### Study period

This study was conducted for a period of 2 mo (December 2015 to January (2016)

#### Study site

Study was conducted in the neurology department of Quaternary care private hospital, India, Bangalore.

### RESULTS

#### Profile of patient demographics

We observed males (N=33, 55%) were more than females (N=27, 45%).

Stratification based on age showed patients admitting to general neurological ward were frequently within the age group of 60-70 y (N=32,36.6%) followed by 20-30 y (N=10,16.66%), 40-50 (N=8,13.33%) and 50-60 y (N=8,13.33%), 70-80 y (N=6,10%), 30-40 y (N=4,6.66%) and 80-90 y (N=2, 3.33%) respectively as shown in table 1(a). We found more stroke cases (N=48, 80%) in comparison to other illness (N=12, 12%).

For stroke 60-70 y (mean age group 61.52±16.2) was most common to happen as shown in table 1(b). We found that in stroke cases (N=48), males (N=29, 60.4%) were more than females (N=19, 39.6%) whereas in illness other than stroke (N=12) females were more (N=8,66.67%) to males (N=4, 33.33%) as shown in table 1(c).

#### Profile of patient diagnosis visiting neurological ward

Among 60 patients studied, stroke was the most common reason for admission in 80% of cases followed by patients without stroke (20%). Cerebrovascular accident was the most common (N=16, 26.66%) diagnosis of a stroke followed by acute left middle carotid artery infarct (N=8, 13.33%), transient ischemic attack (N=6, 10%), right basal ganglia infarct (N=6, 10%) and others as shown in table 2. In illness other than stroke seizure (10%) followed by multiple sclerosis (3.33%), migraine (3.33%) and herpes zoster infection (3.33%) were the different diagnosis.

Table 1(a): Profile of patient demographics: age and sex distribution

Sex/Age (y)	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Total (%)
Male	6	4	2	2	15	4	0	33 (55%)
Female	4	0	6	6	7	2	2	27 (45%)
Total (N, %)	10 (16.66%)	4 (6.66%)	8 (13.33%)	8 (13.33%)	22 (36.67%)	6 (10%)	2 (3.33%)	60 (100%)

Table 1(b): Profile of patient demographics: diagnosis and age distribution

Diagnosis/Age (y)	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Mean age (years)	Total (%)
Stroke	3	3	7	8	20	5	2	61.52±16.2	48(80%)
Non stroke	7	1	1	0	2	1	0	40.77±19.38	12(20%)

Table 1(c): Profile of patient demographics: diagnosis and sex distribution

Diagnosis	Male (N, %)	Female (N, %)	Total (%)
Stroke	29(60.4%)	19(39.6%)	48 (80%)
Non stroke	4(33.33%)	8(66.67%)	12 (20%)

Table 2: Profile of patient diagnosis visiting neurological ward

Diagnosis	Frequency	Percentage (%)
Stroke	48	80%
Corona radiata infarct	2	3.333%
Right front parietal limb infarct	2	3.33%
Right basal ganglia infarct	6	10%
Cerebrovascular accident	16	26.66%
Cerebral venous sinus thrombosis	4	6.666%
Acute left middle carotid artery infarct	8	13.33%
Lateral medullary syndrome	2	3.33%
Left hemiparesis	2	3.33%
Transient ischaemic attack	6	10%
<b>Diagnosis other than stroke</b>	12	20%
Herpes zoaster infection	2	3.33%
Migrane	2	3.33%
Multiple sclerosis	2	3.33%
Seizure	6	10%
Total	60	100%

#### Assessment of WHO prescribing indicators

We observed 342 medicines were prescribed in 60 prescriptions. Average number of drugs in prescription was 5.7.

Percentage of injections prescribed was found to be 44.14%. Percentage of patients with antibiotics was more i.e. 36.6%. Percentage of generic drugs prescribed was very less (0.05%).

Table 3: WHO prescribing indicators

WHO prescribing indicators	Total
Number of patient cases reviewed	60
Number of drugs utilised	342
Average number of drugs per prescription	5.7
% of generic drugs prescribed	0.05%
% of drugs in injections prescribed	44.14%
% of patients with antibiotics	36.6%

#### Utilisation pattern of drugs: classification

The utilisation of various drugs and its classification was presented in table 4(a) and 4(b). Total of 28 different drug classes was used with 61 different drugs. Fourteen different classes i.e. only half of the classes that were utilised had been accounted for 90% of drugs utilisation which included antiplatelets (N=48, 14.61%), anticoagulant (N=34, 9.94%), supplements (N=32, 9.35%), antihypertensives (N=32, 9.35%), antiepileptics (N=28, 8.18%),

proton pump inhibitors (N=26, 7.6%), nootropics (N=24, 7.01%), antibiotics (N=22, 6.43%), hypolipidemic (N=20, 5.84%), antipyretics (N=18, 5.26%), bronchodilators (N=8, 2.33%), antidiabetics (N=6, 1.75%), steroids (N=6, 1.75%), antidepressants (N=4, 1.16%) respectively. Very infrequently used a class of drugs included analgesic, alkaliser, antidiarrheal, antiemetics, antipsychotics, antiviral, cardiac inotropic, central acetylcholinesterase inhibitor, eugeroic agent, laxative, sedative and leukotriene receptor antagonist.

Table 4(a): Utilisation pattern of drugs: classification

S. No.	Class of drug	Frequency (N)	Percentage (%)	Indication (stroke or other than stroke?)
1.	Antiplatelets	48	14.61%	Stroke
2.	Anticoagulants	34	9.94%	Stroke
3.	Antihypertensives	32	9.35%	Stroke
4.	Supplements	32	9.35%	Non Stroke=4 Stroke=28
5.	Antiepileptic	28	8.18%	Non stroke=6 Stroke=22
6.	Proton pump inhibitors	26	7.60%	Non stroke =2 Stroke=24
7.	Nootropic	24	7.01%	Stoke
8.	Antibiotics	22	6.43%	Stroke=20 Non stroke=2
9.	Hypolipidemics	20	5.84%	Stroke
10.	Antipyretic	18	5.26%	Stroke
11.	Bronchodilators	8	2.33%	Stroke
12.	Antidiabetic	6	1.75%	Stroke
13.	Steroids	6	1.75%	Non stroke =2 Stroke=4
14.	Antidepressants	4	1.16%	Stroke
15.	Muscle relaxants	4	1.16%	Non-stroke
16.	Potassium-sparing agent	4	1.16%	Stroke
17.	Analgesic	2	0.58%	Nonstroke
18.	Alkaliser	2	0.58%	Nonstroke
19.	Antidiarrheal	2	0.58%	Stroke
20.	Antiemetics	2	0.58%	Stroke
21.	Antipsychotic	2	0.58%	Nonstroke
22.	Antiviral	2	0.58%	Nonstroke
23.	Cardiac inotropic	2	0.58%	Stroke
24.	Central acetylcholinesterase inhibitor	2	0.58%	Nonstroke
25.	Eugeroic agent	2	0.58%	Stroke
26.	Laxative	2	0.58%	Stroke
27.	Sedative	2	0.58%	Nonstroke
28.	Leukotriene receptor antagonist	2	0.58%	Stroke
29.	Total	342	100%	

#### Utilisation pattern of drugs: nature and extent of drug use

61 different drugs were utilised in total of 60 patients which was as shown in table 4(b). Most frequently Clopidogrel+Aspirin (13.45%) was used followed by Enoxaparin Sodium (8.77%), Citicholine (7.01%), Supplement Drugs (6.43%), Pantoprazole (6.43%), Atorvastatin (5.84%), Paracetamol (5.26%), Levetiracetam (3.5%), Salbutamol+Ipratropium (2.33%), Telmisartan (1.7%), Amlodipine (1.7%), Amoxicillin+Clavulanate (1.7%), Piperacillin+Tazobactam (1.16%), Ceftriaxone (1.16%), Vancomycin (1.16%), Warfarin (1.16%), Phenytoin (1.16%), Clobazam (1.16%), Gabapentin (1.16%), Prazocin (1.16%), Carvedilol (1.16%), Aspirin (1.16%), Baclofen (1.16%), Spirinolactone (1.16%), Sodium Bicarbonate (0.58%), Diclofenac (0.58%), Doxycycline, (0.58%), Levofloacin

(0.58%), Amitriptyline+Chlordiazepoxide (0.58%), Amitriptyline (0.58%), Metformin+Glimepiride (0.58%), Insulin (0.58%), Metformin (0.58%), Metronidazole (0.58%), Ondansetron (0.58%), Fosphenytoin (0.58%), Escitalopram (0.58%), Atenolol (0.58%), Metoprolol (0.58%), Furosemide (0.58%), Furosemide +Spirinolactone (0.58%), Telmisartan+Hydrochlorothiazide (0.58%), Verapamil (0.58%), Quetiapine Fumarate (0.58%), Acyclovir (0.58%), Digoxin (0.58%), Donepezil (0.58%), Modafinil (0.58%), Lactulose (0.58%), Potassium Chloride (0.58%), Rabepazole (0.58%), Rabepazole+Domperidone (0.58%), Zolpidem (0.58%), Montelukast (0.58%), Methylprednisolone (0.58%), Budesonide (0.58%), Dexamethasone (0.58%), Ferrous Salt (0.58%), Calcium+Calcitriol (0.58%), Homocysteine (0.58%), Levothyroxin (0.58%).

Table 4 (b): Utilisation pattern of drugs: nature and extent of drug use

Name of utilised drug	Frequency of drug (%)
Clopidogrel+Aspirin	46(13.45%)
Enoxaparin Sodium	30(8.77%)
Citicoline	24(7.01%)
Pantoprazole	22(6.43%)
Other Combination preparations	22(6.43%)
Atorvastatin	20(5.84%)
Paracetamol	18(5.26%)
Levetiracetam	12(3.5%)
Salbutamol+Ipratropium	8(2.33%)
Amoxicillin+Clavulanate	6(1.7%)
Amlodipine	6(1.7%)
Telmisatan	6(1.7%)
Piperacillin+Tazobactam	4(1.16%)
Ceftriaxone	4(1.16%)
Vancomycin	4(1.16%)
Warfarin	4(1.16%)
Phenytoin	4(1.16%)
Clobazam	4(1.16%)
Gabapentin	4(1.16%)
Prazosin	4(1.16%)
Carvedilol	4(1.16%)
Aspirin	4(1.16%)
Baclofen	4(1.16%)
Spirinolactone	4(1.16%)
Sodium Bicarbonate	2(0.58%)
Diclofenac	2(0.58%)
Doxycycline	2(0.58%)
Levofloxacin	2(0.58%)
Amitriptyline+Chlordiazepoide	2(0.58%)
Amitriptyline	2(0.58%)
Glimepiride+Metformin	2(0.58%)
Insulin	2(0.58%)
Metformin	2(0.58%)
Metronidazole	2(0.58%)
Odansetron	2(0.58%)
Fosphenytoin	2(0.58%)
Escitalopram	2(0.58%)
Atenolol	2(0.58%)
Metoprolol	2(0.58%)
Furosemide	2(0.58%)
Furosemide+Spirinolactone	2(0.58%)
Telmisartan+Hydrochlorthiazide	2(0.58%)
Verapamil	2(0.58%)
Quetiapine Fumarate	2(0.58%)
Acyclovir	2(0.58%)
Digoxin	2(0.58%)
Donepezil	2(0.58%)
Modafinil	2(0.58%)
Lactulose	2(0.58%)
Potassium Chloride	2(0.58%)
Rabeprazole	2(0.58%)
Rabeprazole+Domperidone	2(0.58%)
Zolpidem	2(0.58%)
Monteleukast	2(0.58%)
Methylprednisolone	2(0.58%)
Budesonide	2(0.58%)
Dexamethasone	2(0.58%)
Ferrous Salt	2(0.58%)
Calcium+Calcitriol	2(0.58%)
Homocysteine	2(0.58%)
Levothyroxin	2(0.58%)
Total	342(100%)

## DISCUSSION

Our study means that as age advances there is frequent chance to have a neurological illness which is in conjunction with other result findings [6, 7]. Our research also means that males were more prone to be admitted. Probably the age and sex related increase in cerebrovascular event have made the neurological problems a

common ailment in many studies including our research [8]. Our study reveals that stroke is being a major burden to neurological illness. Stroke as the common diagnosis was also observed in the study by Rajiv Narayan Chaudary where he observed stroke in 47.5% cases followed by seizure in 9.3% cases and other illness out of 335 different neurological cases [6]. In diagnosis other than stroke; seizure was also the common illness (10%) in our study

which shows the similarity of findings. In our centre, the cerebrovascular accident was a most common diagnosis of stroke but it can vary from region to region. Most people with stroke were between 60-70 y in the age group which is similar to study by Mohammad Yaseen Abbasi [9]. In contrast manner, other study found common age group for experiencing stroke were between 41-60 y (50%) followed by 61-80 y (37.33%) [10]. Other related study was done by R P Eapen [11] and Naik M [12] found the mean age as 57 and 58.27 y respectively which is similar (61.52±16.2) to our study. Our study also shows that being a male has more chances of stroke in conjuncture with a couple of other similar research [9, 13]. One reason may be due to different sex steroid hormones, notably estrogens and testosterone. Estrogens have terribly potent effects on endothelia that promote dilation and blood flow whereas testosterone has opposing effect indicating women are protecting with endogenous estrogens [14]. Stroke causes 0.6 million death in India and annual incidence was being 145/100,000 per year during 2003 to 2006 [15] is increasing on an alarming rate. The situation is slightly different in European countries (except for the Irish) where studies had reported epilepsy as a major cause of neurology visit and then stroke [16, 17]. These differences may be attributed to lifestyle and health consciousness level of peoples of the developed world. In one similar study at Nepal, The most common neurological disorders admitted in their setup were cerebrovascular diseases, seizure disorders, inflammatory and infective diseases; stroke being the major cause of consultation. It also shows the similarities to our findings [7]. In order of frequency the most common reason for referral in another similar study was stroke (131 cases (22.7%)), seizures unrelated to alcohol (59 cases (10.2%)), alcohol-related neurological problems (55 cases (9.5%)), movement disorders (41 cases (7.1%)), neuromuscular (40 cases (6.9%)), coma (35 cases (6%)), disorders of cognition (31 cases (5.3%)), acute headache (28 case (4.8%)) and functional neurological syndromes (26 cases (4.5%)) [8].

Prescribing indicators assess the drug use problems in prescriptions from rationality standpoint. Among different indicators drugs per prescription is high (5.7). This number is high in relation to get drug-drug interaction. In fact we observed prescription which can theoretically cause effects of drug interaction like Telmisartan+Aspirin, Enoxaparin+Telmisartan, Pantoprazole+ Clopidogrel, Telmisartan+Atorvastatin, Spironolactone+Atorvastatin, Aspirin+Metoprolol, Enoxaparin+Diclofenac, Metoprolol+ Spironolactone, Spironolactone+Aspirin, Spironolactone+Diclofenac, Aspirin+ Diclofenac, Verapamil+Aorvastatin+Verapamil+Clopidogrel, Verapamil+ Atorvastatin, Amlodipine+Verapamil, Verapamil+Aspirin, Aspirin+ Clopidogrel and Enoxaparin+Warfarin. Close and careful monitoring was done to these patients to optimise therapy. Athira Jith and colleagues performed drug-drug interaction study among stroke patients in tertiary care hospital at Tamil Nadu, India where they observed 698 potential drug-drug interactions out of which 18 were clinically significant [18]. Our research has also highlighted less generic name prescribing by physicians. WHO recommends a prescription to write in generic name format to increase patient compliance but is not happening. One reason is a lack of hospital formulary concept in hospitals.

There is few drug utilisation study conducted in the neurology department at quaternary care hospitals in India to compare with other studies. Sangram Vurumadla and co-workers had observed prescribing pattern focusing on stroke where they observed utilisation of drugs like Mannitol, Aspirin, Clopidogrel, Atorvastatin, Nifedipine, Multivitamin, Enoxaparin, Phenytoin, Atenolol, Losartan, Heparin, Ramipril and Ramipril+Telmisartan+hydrochlorothiazide in descending frequencies [10]. Unlike their study, we observed the use of a combination of Clopidogrel+Aspirin instead of clopidogrel only for stroke in our study. Apart from this combination, we found the use of drugs like Enoxaparin sodium, Citicholine, Warfarin and aspirin in descending frequencies for stroke. Antihypertensives like B-blockers, diuretics and calcium channel blockers were used to reduce target BP for these patients. Kuriakose and co-authors from Tamil Nadu, India found an antihypertensive drug to be utilised more commonly besides antiplatelets therapy [19]. It shows the fact that antihypertensives were frequently used agents for stroke patients. In another study by Silverman, various drugs were

prescribed in stroke patients such as anticoagulants, antiplatelet drugs, dyslipidemics, anti-hypertensives, neurotonics. Drugs to be administered for conditions occurring after the initial event (depression, dementia, and epilepsy) like antiepileptics, antipsychotics, CNS stimulants were also prescribed for the patients [20-22]. Our result is in conjuncture to these findings. Primary management of stroke includes antiplatelet therapy with aspirin, statin therapy and blood pressure management. Primary prevention interventions are expected to target at behavior modification such as reduced smoking, alcohol and salt consumption patterns and increased physical activity. Increasing fruit and vegetable consumption (for each 1-serving per day) is considered to reduce the risk of stroke by 6%. In one study by Andhuvan G and colleagues found that most participants had poor knowledge about modifiable risk factors and concluded that it could increase their chance of cardiovascular risk in future [23]. Secondary prevention is through the pharmacological therapy. Tertiary prevention is attributed to maintain their ability to carry out daily activities if they receive rehabilitation services at home. Stroke rehabilitation is expected to begin as soon as possible after a person has a stroke and continue for as long as it is clinically appropriate [20]. Treatment pattern of illness other than stroke involved specific pharmacological agents like central cholinesterase inhibitors for multiple sclerosis, antiepileptics like Levetiracetam, Gabapentin, Phenytoin, Phosphenytoin, Clobazam for seizures related to stroke or epilepsy. For migraine Diclofenac was the drug of choice and for herpes zoaster infection, steroids like Dexamethasone and Methyl Prednisolone were used primarily. Other agents were for symptomatic treatment like antibiotics, alkalisers, supplements, antipyretics, laxatives, sedative-hypnotics, antidepressants, antidiabetics etc.

Our study provides drug exposure data of inpatients visting neurological department for a different illness. Small sample size and short duration remained the limitation of our study.

## CONCLUSION

Most of the patient attending neurology unit were senior citizens. Stroke occupies top most burdens. We observed high drugs per prescription for neurology visits and very less generic prescribing. Various types of drugs were used depending on the illness. In a stroke, Clopidogrel and Aspirin combination was utilised most commonly. A primary prevention strategy to reduce highly prevalent neurological cases like stroke is needed.

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## AUTHORS CONTRIBUTION

It was a collaborative work between all the authors listed. Dr. Abel Abraham Thomas (PharmD), Dr. Sunil Shrestha (PharmD; Post Baccalaureate) and Dr. Laxman Wagle (PharmD; Post Baccalaureate) were responsible for literature review, proposal writing, data collection and data entry. Dr. Laxman Wagle was responsible for data analysis, manuscript writing and communication.

## CONFLICT OF INTERESTS

Declare none

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