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Research Article

ROLE OF CLINICAL PHARMACIST IN MANAGEMENT OF NEUROLOGICAL DISORDER (STROKE)

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Abstract:

Objectives: To assess the nature and incidence of Drug Related Problems and to improve patient's adherence towards medication.

Methods: A prospective observational study was carried out for a period of 6 months in both ischemic and hemorrhagic stroke patients with age group between 18 – 90 years. Patient demographic and other data's were collected using data collection form and moriskey medication adherence scale 8 (MMAS 8) was used to measure patient medication adherence. All data were analyzed using SPSS version 20 and statistical significance for our study was analyzed by chi-square test.

Key findings: In our study population (n=100) 75% were ischemic stroke and 25% were hemorrhagic stroke in that 76% were males and 24% were females. From the eight classes of DRPs a total of 146 DRPs were identified in 84 patients. Among this mostly observed drug related problem was drug interactions (44.5%) followed by drug use without indication (43.15%), improper drug selection (3.42%), untreated indication (3.42%), adverse drug reactions (2.73%), medication error (2.05%) and over dosage (0.68%). The finding shows most of the patients had medium medication adherence (76%) followed by poor adherence (15%) and high adherence (9%). A statistically significant relationship was found between DRP and type of stroke ($p = 0.016$) and medication adherence with type of stroke ($p = 0.001$).

Conclusion: Clinical pharmacists can contribute improved patient outcomes by monitoring the drug therapy and can also promote rational use of drugs. The pharmacists could offer effective patient care by means of their intervention in pharmaceutical care and hence improved therapeutic outcome could be reached.

Keywords: Clinical pharmacist; stroke; Moriskey medication adherence scale; drug related problems

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INTRODUCTION:

Stroke is a clinical syndrome characterized by rapidly developing clinical symptoms or signs of focal and global loss of brain function with symptoms lasting more than 24 hours or leading to earlier death, and with no apparent cause other than that of vascular origin. Stroke is the major increasing public health concern throughout the world. The pathophysiology leading to stroke includes any abnormality of the blood vessel flow. Abnormalities of blood vessel include developmental defects, aneurysm, hypertensive disease, arteritis, vasoconstriction and atherosclerosis. After coronary heart disease and all types of cancer; it is the third commonest cause of death in worldwide and is the leading cause of long-term disability. The proportion of stroke death increased with age, and the oldest age group (>70 years of age) stroke contributed to 2.4% of all deaths. According to the Asian Acute Stroke Advisory Panel, India is still ranked among the countries where the information on stroke is minimal.

Drug therapy is getting more complex, thus making it more challenging for physicians to prescribe appropriate drug therapy. Accordingly, in clinical practice, a wide range of drug-related problems (DRPs) may rise; they are common in hospitalized patients and can result in patient morbidity and mortality and increased costs. Identifying, preventing, and resolving DRPs are an important issue in the pharmaceutical care process. DRP, defined as an event or circumstance that actually or potentially interferes with desired health outcomes, can lead to ineffective pharmacotherapy and may cause drug-related morbidity and mortality. Pharmacists have paramount importance in identifying DRPs, treating actual DRPs, and preventing potential DRPs using methods of pharmaceutical care practices. Several studies revealed that patient suffering from a stroke are at high risk for the possible occurrence of DRPs due to polypharmacy, elderly age, and comorbidities. Hence, identifying DRPs are an important priority for healthcare professionals for improving the health-related quality of life in stroke patients. A Drug related problem (DRP) is defined as an any event or circumstance involving drug treatment that interferes or potentially interferes with the patient achieving an optimum outcome of medical care. Pharmacists can play an important role in identifying drug related problems (DRPs), resolving actual DRPs and

preventing potential DRPs through pharmaceutical care practices. Eight categories of drug-related problems (DRPs) were outlined by Charles Hepler and Linda Strand are Adverse drug reactions, Drug interactions, Untreated indication, Improper drug selection, Sub therapeutic dose, over dosage, Failure to receive drugs and Drug use without indication. Most DRPs are avoidable and clinical pharmacists are assuming an active role in preventing and solving DRPs. Drug-related problems (DRPs) such as inappropriate prescription, clinically relevant drug-drug interactions, non-adherence, adverse drug reactions, are the most commonly encountered DRPs. These problems could be well prevented or minimized by initiating changes in the drug therapy through clinical pharmacy services. Pharmacists as an integral part of the health care team can play a significant role in improving patient's awareness and knowledge and are in a key position to track adherence to drug therapy. Pharmacist involvement can improve disease and disability prevention, leading to fewer physician visits, decrease the need for medical treatment, lower health care costs and most important, improve patient's quality of life.

METHODS:**Study design and data collection**

A Prospective Observational Study, was carried out after receiving approval from the Ethical Committee of the hospital. Patients are eligible if they had either acute ischemic or hemorrhagic stroke and were admitted in the hospital within 24 hours of onset. 100 patients were studied within the time period of 7 months. The patient demographics and other essential data's were collected using a data collection form as well as by direct interaction with the patients. The Morisky medication adherence scale 8 was used to measure the patient's adherence to the medication and risk of problems respectively. Patient counselling was also provided to individual patients in order to provide a better quality of life for the patients. An extensive literature survey was conducted on pharmaceutical care program in stroke patients and about 48 literatures related to the same were collected. The literatures supporting the study was gathered from various Indian and international journals.

Statistical analysis

The statistical analysis was performed by using IBM SPSS version 20.0. Individual variables were expressed in percentages. Mainly Chi-Square Test and T-test was used. Significance of individual variables was found out using Chi-Square test.

RESULTS:

In this prospective observational study, a total of 100 patients out of which 75% were ischemic stroke and 25% were haemorrhagic stroke. This shows that the incidence rate of ischemic stroke is more compared to haemorrhagic stroke. Among study population 76% patients were male, 24% were female. In this 72% of males and 28% of females had ischemic stroke and 88% of males and 12% of females had haemorrhagic stroke. This indicates higher risk of stroke in male population than females.

Based on the age, patients were categorized into six groups (<40, 41-50, 51-60, 61-70, 71-80, 81-90). Among study population the proportion of 61-70 age group (34%) was prominent followed by 51-60 age group (22%) and 81-90 age group (21%) least number of patients were affected in the 41-50 age group (9%).

Based on occupation, among study population the patients currently doing business (41%) was prominent followed by retired patients and home makers (34%) and farmers (22%).

The risk factors in the study population were categorized in to DM, HTN, Dyslipidemia, HTN+DM, DM + Dyslipidemia, HTN + Dyslipidemia, DM + HTN + Dyslipidemia and Nil. The most prominent risk factor in ischemic stroke patients (n=75) was HTN+DM and in hemorrhagic stroke patients (n=25) was hypertension.

Types of drug-related problems identified across study

In our study we screened 100 patients for drug related problem based on Charles Hepler and Linda Strand classification. Based on the listed DRPs in the classification, we observed 146 drug related

problems. Drugs involved in drug related problem are shown in Table 1. In ischemic patients (n=75), 2 patients (2.6%) developed ADR alone, Drug interaction were in 15 patients (20%), improper drug selection were in 1 patient (1.3%), drug use without indication were in 4 patients (5.3%), medication error plus drug interaction were in 1 patient (1.3%), drug interaction plus drug use without indication were in 39 patients (52%), untreated indication plus drug use without indication were in 2 patients (2.6%), ADR plus drug use without indication plus drug interaction were in 2 patients (2.6%), drug interaction plus medication error plus drug use without indication were in 2 patients (2.6%), drug interaction plus improper drug selection plus drug use without indication in 4 patients (5.3%) and 3 patients (4%) do not showed any drug related problem.

In Hemorrhagic stroke patients (n=25) 1 patient (4%) had drug interaction alone, drug use without indication were in 8 patients (32%), drug interaction plus drug use without indication were in 1 patients (4%), untreated indication plus drug use without indication were in 1 patients (4%) and 14 patients (56%) do not showed any drug related problem. As a result by comparing drug related problem with type of stroke using chi-square test there is a significant relation between drug related problem and type of stroke ($p=0.016$).

The medication adherences in the study population were categorized in to three types (high adherence, medium adherence, poor adherence). (figure 1) In ischemic stroke patients (n=75) 9 patients (12%) had high adherence, 60 patients (80%) had medium adherence 6 patients (8%) had poor adherence. In hemorrhagic stroke patients (n=25) 16 (64%) had medium adherence 9 patients (36%) had poor adherence. As a result, by comparing medication adherence with type of stroke using chi-square test, there was a significant relation between medication adherence and type of stroke ($p=0.001$).

Table 1: Drug involved in drug related problem

S.No.	DRUG RELATED PRIBLEMS(n=146)	NUMBER OF EVENTS	PERCENTAGE (%)
1	Untreated Indication Cough Inflammation (Increased ESR, CRP) Anemia (decreased hemoglobin level) Headache Vomiting	5	3.4%
2	Improper Drug Selection Rabeprazole Metoclopramide	5	3.4%
3	Medication Error Paracetamol infusion 100ml was infused within 6 minutes. As per manufacture leaflet information it should be infused over 15 minutes Pantoprazole which was prescribed by physician as injection was given as tablet for two days. Administration error (Instead of giving Tab. Storvas at 9 PM it was given in 9 AM)	3	2
4	Overdose Lercanidipine 20 mg was given instead of 10mg	1	0.7
5	Drug use without indication Pantoprazole Ondansetron Augmentin Amitryptline Paracetamol	63	43.15
6	Adverse drug reaction Ibuprofen Atorvastatin Halperidol Amitryptline	4	2.7
7	Drug-drug interaction Aspirin Clopidogrel Fluconazole Amitryptline Ondansetron Heparin Ceftriaxone Budesonide Haloperidol Tolvaptan	65	44.5

Table 2: Comparison statistics of DRP and Medication Adherence with type of study population

CLINICAL OUTCOME	TYPE OF STROKE	(n=100)	MEAN±SD	STD. ERROR MEAN	P VALUE
Drug Related Problem	Ischemic stroke	75	8.58±4.09	0.4723	0.016*
	Hemorrhagic stroke	25	10.76±2.94	0.5896	
Medication Adherence	Ischemic stroke	75	1.96±0.44	0.05178	0.001*
	Hemorrhagic stroke	25	2.36±0.48	0.09798	

* Statistical significant *p*value < 0.05, DRP – Drug related problem

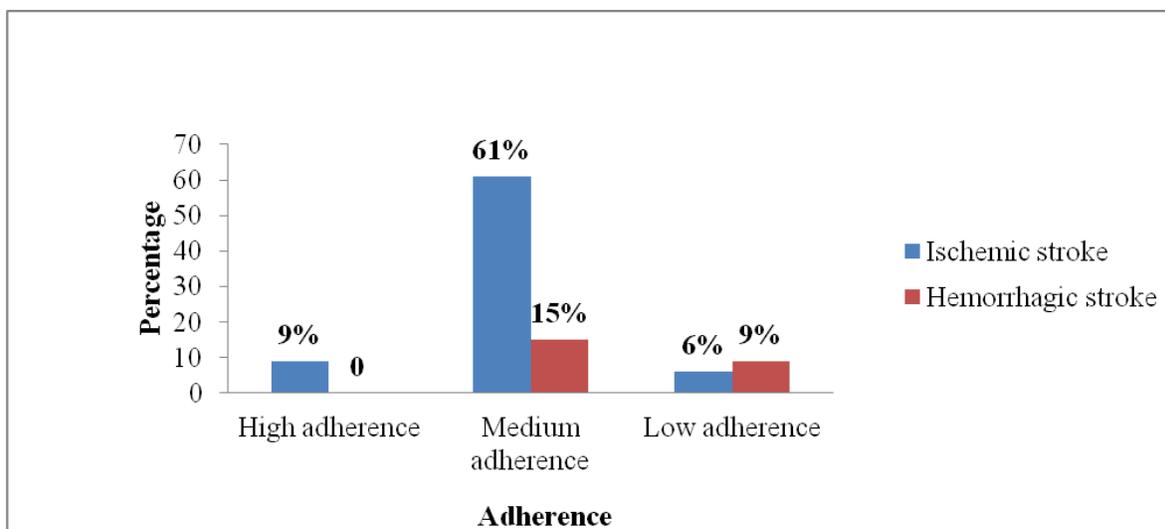


Fig 1: Medication Adherence among study population (n = 100)

DISCUSSION:

Among study population (n=100), Ischemic stroke (75%) is the major type of stroke suffered than haemorrhagic stroke (25%). This indicates that the incidence rate of ischemic stroke is more compared to haemorrhagic stroke. This finding was similar to the study done by **Celin et al.** was said that the incidence rate of ischemic stroke (86%) is more compared to haemorrhagic stroke (13.9%).

In this study, the risk factors of combination of both hypertension and diabetes (31%) were prone to cause incidence of stroke followed by hypertension alone (24%), diabetes alone (8%) and dyslipidemia alone (2%). This finding was similar to the study done by **Peter Appelros et al.**,

In this present study, most of the patients were prescribed with anticoagulants (enoxaparin 56 patients, heparin 11 patients) and antiplatelets

(aspirin 68 patients, clopidogrel 43 patients) and dyslipidemics (atorvastatin 76 patients). A study done by **Abbasi et al.**,³³ show enoxaparin was prescribed to 27 patients, aspirin and clopidogrel to 44 patients, atorvastatin to 22 patients, which correlate with our study.

Among the 100 patients followed during study period, a total of 146 DRPs were identified in 84 patients. The total number of DRPs was obtained more in the male population. This observation is supported with the demographic reports of the study conducted by **Ganachari M S et al.**, cited

predominance in male gender over female gender. The incidence of DRPs were high (34%) in patients aged between 61-70 years. Among the potential contributing factors of DRPs, the association between poly pharmacy and the incidence of DRPs has been

studied and documented by **YvonneKoh et al.**, In 95.0% of cases DRPs were seen in patients receiving more than 6 drugs. This observation is supported with a **2002 national survey** which indicated that 50% of the overall population took 5 or more medications and developed DRPs **Chumney EC et al.**,

In another study conducted by **H.A.M. Vinks**, it was found that DRPs may be frequently occur in adults over 65 years of age using six or more drugs concomitantly. This clearly indicates that geriatric age and poly pharmacy are the potential risk factors for developing DRPs in Stroke patients. The more frequent use of drugs by the elderly can be explained by the high prevalence of multiple morbidities and the increased availability of pharmacotherapeutic options. Most of the DRPs observed in the study resulted from drug interactions (44.8%) followed by drug use without indication (43.4%), improper drug selection (3.4%) and adverse drug reaction (2.7%). This observation is supported with the study conducted by **Yvonne Koh et al.**, in which potential drug-drug interactions accounted for a substantial amount of potential drug toxicity (34.8%).

This study is contrasted with the study conducted by **H.A.M. Vinks** found that the most frequently occurring potential DRPs were drug use without indications. Drug use without indication was defined if the indication for a certain prescription was disputable or not evidence-based anymore.

In the present study the therapeutic agents most implicated were anticoagulant (Enoxaparin), and antiplatelet agents (Aspirin and Clopidogrel). This is consistent with the published study conducted by **Yvonne Koh et al.**, citing that the average number of drug-drug interactions involving anticoagulants and antiplatelets were higher than other drug groups. As drug-drug interactions can affect patient's clinical outcomes, quality of life and contribute to unnecessary health care costs. This study would make this an important area requiring further investigation and the future pharmacist should focus on reviewing patients' medication charts and checking for potential drug interactions regularly. In a German study, conducted by **Langerbake C et al.**, drug use without indication' was found to be second highest which is again comparable with our results.

The study conducted by **Madhan Ramesh et al.**, has also shown a high incidence (18%) of drug use without indication. Probable reasons for these DRPs may be due to prophylactic reasons or lack of therapeutic guidelines in the hospital indicating a need for the initiation of clinical pharmacy services and development of therapeutic guidelines.

This study found a very high percentage of medium adherences followed by low adherence. This means

that the medication adherence needs to improve. In this study, factors affecting medication adherence are age group (61-70 years), illiterate, male gender and primary education, low income, poly pharmacy and forgetfulness.

According to **Kim et al.**, the cause of low adherence has to take multiple medications when taking drugs prescribed by more than two medical institutions. Forgetting to take medication was the main reason for low adherence in this study similar to other studies. In our study, 76% patients have medium adherence followed by 15% with poor adherence and 9% with high adherence. Better communication with prescriber and pharmacist might solve this problem.

CONCLUSION:

A total of 100 patients were studied in this prospective observational study with the objectives of assessing the risk factors associated with drug related problems, the nature and incidence of Drug Related Problem, and to assess the medication adherence for both Ischemic and Haemorrhagic stroke patients and monitoring the clinical outcomes and prescribing pattern in both stroke patients. Most of the DRPs observed in the study resulted from drug interactions (44.8%) followed by beer criteria drug use without indication (43.4%), improper drug selection (3.4%) and adverse drug reaction (2.7%). In our study, 76% patients have medium adherence followed by 15% with poor adherence and 9% with high adherence. Better communication with prescriber and pharmacist might solve this problem. The main reasons for non-adherence were found to be due to lack of adherence to recommendation, difficulties for administration and lack of understanding of therapy.

A physician –pharmacist collaborative practice can help to improve the patient health and functioning by providing good patient counselling. By taking into consideration the individual patient's present conditions, the pharmacist can help them take necessary step towards a better lifestyle and improved medication use.

The pharmacists could offer effective patient care by means of their intervention in pharmaceutical care and hence improved therapeutic outcome could be reached.

DECLARATIONS

Conflict of interest

The Author(s) declare(s) that they have no conflict of interest to disclose.

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Authors' contribution

All authors state that they had complete access to the study data that support the publication. All authors conceive the study and participated in its design and read and approved the final manuscript.

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