



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

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**A PROSPECTIVE EVALUATION OF DRUG TREATMENT PATTERN
IN ISCHEMIC STROKE PATIENTS WITH A FOCUS ON CLINICAL
RISK SCORE FOR PREDICTING VASCULAR DEMENTIA**

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Received 15th Feb. 2024; Revised 19th March 2024; Accepted 6th Aug. 2024; Available online 1st June 2025

<https://doi.org/10.31032/IJBPAS/2025/14.6.9099>

ABSTRACT

Background: Stroke is a major public health problem and second leading cause for death. Early diagnosis and proper treatment along with controlling of modifiable risk factors, post stroke complications and rehabilitation can enhance patient's outcomes. Pharmacotherapy plays an important role in prevention of first-ever stroke as well as secondary cerebrovascular accident. Therefore the present study aims to evaluate the drug treatment pattern in ischemic stroke along with the risk prediction for future vascular dementia in post stroke patients.

Methods: A prospective observational study was conducted in the Department of Neuro medicine at Pushpagiri Medical College Hospital, Thiruvalla, Kerala for a period of six months. The study was carried out in 82 subjects above 18 years of age diagnosed with ischemic stroke based on the inclusion and exclusion criteria.

Results: Among 82 study subjects, 50 were males (59.52%) and 32 were females (38.10%). Antiplatelet was given in 13.92% of the patients, antihypertensives in 13.12%, dyslipidemics in 12.96%, antidiabetics in 12.64%, gastrointestinal drugs in 11.20%. Among antiplatelets, combination of

clopidogrel and aspirin was given in 79.31% patients. Vascular dementia was more prevalent among old age, low education, previous history of stroke, atrial fibrillation and in physically inactive patients. The non-modifiable factors associated with vascular dementia was old age, low education and previous history of stroke. The modifiable factors found were atrial fibrillation and physical inactivity. In risk prediction there was a moderate risk for developing future vascular dementia in 37.10% patients.

Conclusion: Stroke are the third most common disease all over the world with increased morbidity and mortality. CAIDE dementia risk score appears to effectively predict the likelihood of vascular dementia following a stroke. Such a forecast could assist in the creation of more specialized management evaluations and helps to identify risk groups for the primary prevention of vascular dementia.

Key words: Ischemic stroke, vascular dementia (VaD), Prevalence, Risk factors, Risk prediction, Cardiovascular Aging and Incidence of Dementia (CAIDE), Awareness rate, Mini Mental State Examination (MMSE), National Institute of Health Stroke Scale (NIHSS)

INTRODUCTION

Stroke is a major cause of mortality worldwide and commonly occurs in elderly patients [1]. It is one of the major important cerebrovascular-accident that often leads to death or permanent disability that affects the quality of life of both patients and their caretakers. Stroke is a brain attack that occurs either due to the blockage of blood supply to certain areas of the brain or when the blood vessels ruptures. Stroke are classified into two types mainly Ischemic stroke (87%) and Hemorrhagic stroke (13%) [2]. Vascular dementia (VaD), the second most frequent type of dementia, is a serious health issue for people all over the worldwide. Vascular dementia that appears within six months of having a stroke is termed as post-stroke dementia (PSD). In general, 1 in 10 individuals have dementia prior to their stroke, and 1 in 10 get new dementia in the first year after their first stroke, with reduced odds in the years that

follows [3]. The two main types of stroke are Ischemic stroke and Hemorrhagic stroke. Ischemic stroke occurs when the blood flow to a section of the brain tissue is curtailed, causing tissue hypoperfusion. Atherosclerosis, or fatty deposits lining the vessel walls, is the dominant driver in ischemic stroke. Hemorrhagic stroke occurs when a weakened blood artery ruptures that bleeds profusely into the brain. It is further classified into Intracerebral hemorrhage (ICH) and Subarachnoid hemorrhage (SAH) [4, 6]. Stroke is a diverse, complex disease that is influenced by risk factors that may be changed and those that cannot. A history of high blood pressure, diabetes mellitus, coronary heart disease, and social history such as alcoholism, smoking are all modifiable risk factors. Age, gender, and race are non-modifiable parameters. Even small changes to one's lifestyle could prevent about 80% of stroke episodes. The

specific deficiencies are dictated by the area of the brain that is affected, and patients typically exhibit a variety of symptoms of neurological dysfunctions according to it. Vascular dementia refers to a deterioration in cognitive abilities brought on by illnesses that blocks or limit blood flow to different part of the brain, depriving them of oxygen and nutrition, especially in people with diabetes or obesity who have a high risk of stroke. After a stroke, the risk of dementia nearly doubles, and preventing recurrent strokes is still the single most important step in preventing vascular dementia [7]. The best measures to prevent a stroke are being aware of the stroke risk factors, and living a healthy lifestyle. These precautions could assist in preventing another stroke if the person had already experienced one or a transient ischemic attack. By handling vascular risk factors, such as blood pressure control, nutrition, physical exercise, and smoking cessation, up to 90% of strokes may be avoidable.

MATERIALS AND METHODS

The study was a Single centered, Hospital based, Prospective observational study. The proposed study was conducted in Department of Neuro medicine, Pushpagiri Medical College Hospital, Thiruvalla for a period of 6 months. The study population included all patients diagnosed with ischemic stroke of age above 18 years admitted to Neuro medicine department

based on the inclusion criteria. Patients who are not willing to give the consent to participate in the study, patients with mental retardation, pregnant and lactating women were excluded from the study. Assuming 95% confidence interval and 10% absolute precision the sample size as calculated using the Cochran's formula;

$$\text{Sample size } n = (Z\alpha/2)^2 \times pq/d^2$$

Sample size(n) was found to be 82

Data collection tools include data collection proforma, NIHSS (National Institute of Health Stroke Scale), MMSE (Mini Mental State Examination), CAIDE Dementia risk score.

BRIEF STUDY PROCEDURE

Patients diagnosed with Acute Ischemic Stroke were identified based on the inclusion and exclusion criteria. A written informed consent form was obtained from the patient or caregiver after giving a brief introduction about the study. Data collection form was used for recording the demographic details, past medical history, family history, social history and other data needed for the study. Information about the drug prescribed for ischemic stroke was collected from the medication chart. Drug treatment pattern of drugs used in ischemic stroke was collected from patient medication chart and evaluated the rationality of the treatment practises using WHO prescribing indicators. Ischemic stroke patients are then categorised into

dementia and non-dementia patients based on their cognitive function assessed by using Mini Mental State of Examination (MMSE) questionnaire and stroke severity assessed using Nation Institute of Health Stroke Scale (NIHSS). In dementia patients the prevalence and risk factors associated with dementia are monitored. In non-dementia patients the risk for developing future dementia is assessed using Cardiovascular Aging and Incidence of Dementia (CAIDE) scoring system.

STATISTICAL ANALYSIS

Analysis of data was done using SPSS statistical software and significance were determined using Chi-Square Test. A 'P' value of <0.05 is considered as statistically significant.

RESULTS AND DISCUSSION

The present study aimed to evaluate the drug treatment pattern in ischemic stroke and to predict the occurrence of vascular dementia after ischemic stroke.

1. DRUG TREATMENT PATTERN IN ISCHEMIC STROKE

From the 82 prescriptions it was found that the total number of prescriptions was 625, average number of drugs per prescription was 7.62. The percentage of drug prescribed by generic name was 11.84%. The percentage of encounters with an injection prescribed was 15.84%. The percentage of drug with an antibiotic prescribed was 2.88% (Table 1). From the drugs analyzed,

antiplatelet drugs were mostly prescribed (13.92%), followed by antihypertensive drugs (13.12%) and dyslipidemic drugs (12.96%) (Table 2, Figure 1). These findings are consistent with the study conducted by Tariq, M., Akhtar, F., & Babar, M. A, (2018) which reported that the mostly prescribed drug in ischemic stroke are antiplatelets.

2. PREVALENCE OF VASCULAR DEMENTIA IN ISCHEMIC STROKE

Vascular Dementia after Ischemic Stroke were developed in 24.39% of subjects whereas 75.61% is free of dementia (Table 3, Figure 2). Based on patients demographics vascular dementia was significantly prevalent in older age, patients with low education and increased severity of stroke (p-value <0.05), (Table 4). Based on previous illness vascular dementia was significantly prevalent in patients with previous history of stroke and atrial fibrillation (p-value <0.05), (Table 5). Most of the studies also suggest that 25-30% of ischemic stroke survivors develop immediate or delayed vascular dementia. These findings are consistent with the study conducted by J Surawan *et al* (2018), which suggest that vascular dementia is prevalent among old age, low education and in thrombotic stroke, based on previous illness it was prevalent in patients with prior stroke and atrial fibrillation.

3. RISK FACTORS ASSOCIATED WITH VASCULAR DEMENTIA IN ISCHEMIC STROKE

Significant non-modifiable risk factors associated with vascular dementia were older age, low education and prior stroke ($p < 0.05$), (Table 6) and the modifiable factors were atrial fibrillation and physical inactivity ($p < 0.05$), (Table 7). The study line were similar to that conducted by J Surawan *et al* (2018) on Prevalence and factors associated with memory disturbance and dementia after acute ischemic stroke.

4. CLINICAL RISK SCORE FOR PREDICTING VASCULAR DEMENTIA

Risk prediction for vascular dementia was assessed among ischemic stroke patients without having vascular dementia using various risk predictors. Based on that the risk is categorized as mild, moderate, mild-moderate, high, very high risk. From the study it was found that majority of patients without vascular dementia have moderate risk (37.10%) for developing future vascular dementia (Table 8, Figure 3). The study was in same line to that conducted by Low A, *et al* (2022) which suggest that higher CAIDE risk scores indicate greater risk of dementia and predicts future progression of systemic inflammation.

Table 1: Analysis of prescription in ischemic stroke

PRESCRIBING INDICATORS	NUMBER
Prescription analyzed	82
Total number of drugs per encounter	625
Average number of drugs per encounter	7.62
Percentage of drugs prescribed by generic name	11.84%
Percentage of encounters with an antibiotic prescribed	2.88%
Percentage of encounters with an injection prescribed	15.84%

Table 2: Classes of drugs prescribed in ischemic stroke

CLASSES OF DRUGS	FREQUENCY (n=625)	PERCENTAGE (%)
ANTIPLATELET	87	13.92%
ANTIHYPERTENSIVES	82	13.12%
DYSLIPIDEMIC DRUGS	81	12.96%
ANTIDIABETIC DRUGS	79	12.64%
GI DRUGS	70	11.20%
ANTICONSULSANTS	29	4.64%
THROMBOLYTICS	27	4.32%
ANTI-DEMENTIA DRUGS	23	3.68%
ANTIASTHMATIC DRUGS	21	3.36%
ANTIMICROBIALS	18	2.88%
NEUROPROTECTIVE AGENTS	16	2.56%
ANTIEMETICS	15	2.40%
LAXATIVES	15	2.40%
ANALGESICS	13	2.08%
ANTI-PSYCHOTROPICS	11	1.76%
ANTICOAGULANTS	10	1.60%
ANTI-PARKINSONISM	10	1.60%
DIURETICS	9	1.44%
CALCIUM SUPPLEMENTS	4	0.64%
ANTIARRHYTHMIC	3	0.48%
ANTITHYROID DRUGS	2	0.32%
TOTAL	625	100.00%

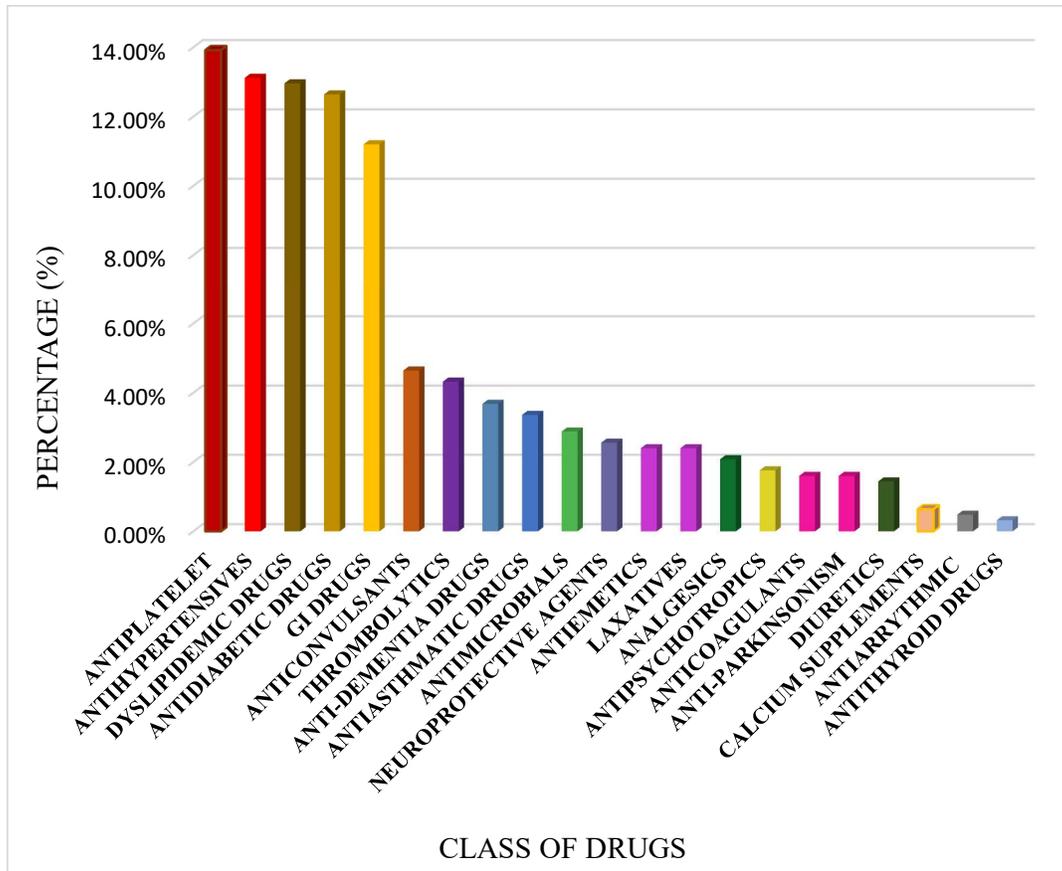


Figure 1: Classes of drugs prescribed in ischemic stroke

Table 3: Distribution of patients based on prevalence of vascular dementia

PREVALENCE	FREQUENCY (n=82)	PERCENTAGE (%)
DEMENTIA	20	24.39%
NON-DEMENTIA	62	75.61%
TOTAL	82	100.00%

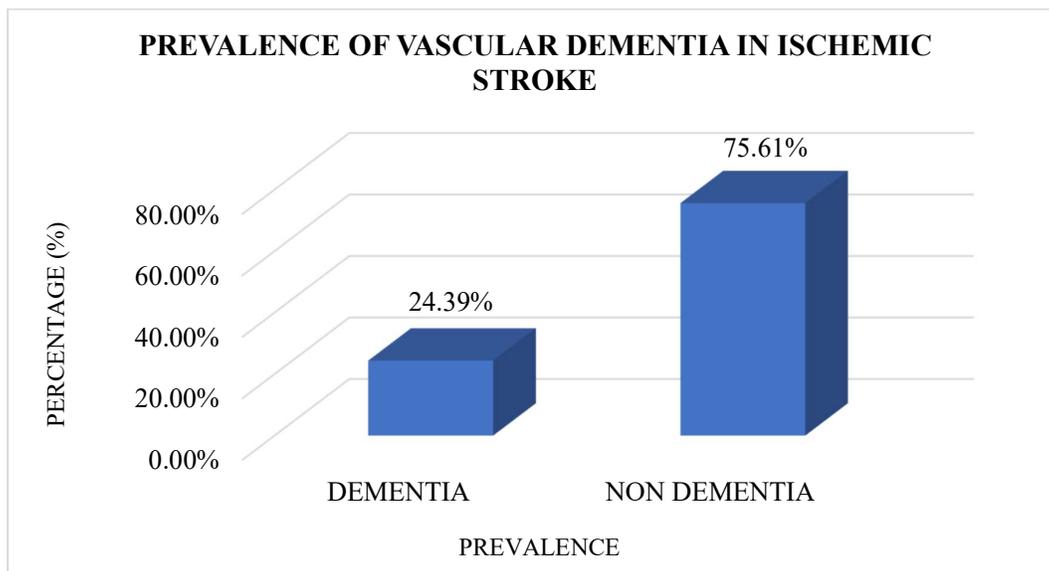


Figure 2: Prevalence of vascular dementia in ischemic stroke

Table 4: Prevalence based on demographics

DEMOGRAPHICS		DEMENTIA (n=20)	NON-DEMENTIA (n=62)	P-VALUE
GENDER	Male	13 (65%)	37 (59.68%)	0.671
	Female	7 (35%)	25 (40.32%)	
	Total	20 (100%)	62 (100%)	
AGE (Years)	<60	0 (0%)	18 (29.03%)	0.003*
	60-69	6 (30%)	24 (38.70%)	
	≥70	14 (70%)	20 (32.26%)	
	Total	20 (100%)	62 (100%)	
EDUCATION	Illiterate/primary	18 (90%)	25 (40.32%)	<0.001
	Secondary/higher	2 (10%)	37 (59.68%)	
	Total	20 (100%)	62 (100%)	
SOCIAL HISTORY	Smoking	1 (5%)	7 (11.29%)	0.442
	Alcohol	3 (15%)	6 (9.68%)	
	Both	6 (30%)	10 (16.13%)	
	None	10 (50%)	39 (62.90%)	
	Total	20 (100%)	62 (100%)	
STROKE LOCATION	Left	10 (50%)	28 (45.16%)	0.059
	Right	4 (20%)	27 (43.55%)	
	Both	6 (30%)	7 (11.29%)	
	Total	20 (100%)	62 (100%)	
STROKE SEVERITY	>4	20 (100%)	29 (46.77%)	<0.001
	<4	0 (0%)	33 (53.22%)	
	Total	20 (100%)	62 (100%)	

Table 5: Prevalence based on previous illness

PREVIOUS ILLNESS		DEMENTIA (n=20)	NON-DEMENTIA (n=62)	P-VALUE
PRIOR STROKE	Yes	20 (100%)	11 (17.74%)	<0.001
	No	0 (0%)	51 (82.26%)	
	Total	20 (100%)	62 (100%)	
ATRIAL FIBRILLATION	Yes	14 (70%)	7 (11.29%)	<0.001
	No	6 (30%)	55 (88.71%)	
	Total	20 (100%)	62 (100%)	
HYPERTENSION	Yes	17 (85%)	47 (75.81%)	0.387
	No	3 (15%)	15 (24.91%)	
	Total	20 (100%)	62 (100%)	
DIABETES MELLITUS	Yes	13 (65%)	39 (62.90%)	0.865
	No	7 (35%)	23 (37.10%)	
	Total	20 (100%)	62 (100%)	
HYPERLIPIDEMIA	Yes	8 (40%)	21 (33.87%)	0.618
	No	12 (60%)	41 (66.13%)	
	Total	20 (100%)	62 (100%)	
FAMILY HISTORY	Yes	4 (20%)	11 (17.74%)	0.820
	No	16 (80%)	51 (82.26%)	
	Total	20 (100%)	62 (100%)	

Table 6: Non-modifiable risk factors of vascular dementia

DEMOGRAPHICS		DEMENTIA (n=20)	NONDEMENTIA (n=62)	P-VALUE
GENDER	Male	13 (65%)	37 (59.68%)	0.671
	Female	7 (35%)	25 (40.32%)	
	Total	20 (100%)	62 (100%)	
AGE (Years)	<60	0 (0%)	18 (29.03%)	0.003*
	60-69	6 (30%)	24 (38.70%)	
	≥70	14 (70%)	20 (32.26%)	
	Total	20 (100%)	62 (100%)	
EDUCATION	Illiterate /primary	18 (90%)	25 (40.32%)	<0.001
	Secondary/higher	2 (10%)	37 (59.68%)	

FAMILY HISTORY	Total	20 (100%)	62 (100%)	0.820
	Yes	4 (20%)	11 (17.74%)	
	No	16 (80%)	51 (82.25%)	
PRIOR STROKE	Total	20 (100%)	62 (100%)	<0.001
	Yes	20 (100%)	11 (17.74%)	
	No	0 (0%)	51 (82.25%)	
	Total	20 (100%)	62 (100%)	

Table 7: Modifiable risk-factors of vascular dementia

MODIFIABLE FACTORS		DEMENTIA (n=20)	NONDEMENTIA (n=62)	P-VALUE
HYPERTENSION	Yes	17 (85%)	47 (75.81%)	0.387
	No	3 (15%)	15 (24.19%)	
	Total	20 (100%)	62 (100%)	
DIABETES MELLITUS	Yes	13 (65%)	39 (62.90%)	0.865
	No	7 (35%)	23 (37.10%)	
	Total	20 (100%)	62 (100%)	
HYPERLIPIDEMIA	Yes	8 (40%)	21 (33.87%)	0.618
	No	12 (60%)	41 (66.13%)	
	Total	20 (100%)	62 (100%)	
ATRIAL FIBRILLATION	Yes	14 (70%)	7 (11.29%)	<0.001
	No	6 (30%)	55 (88.71%)	
	Total	20 (100%)	62 (100%)	
SOCIAL HISTORY	Smoking	1 (5%)	7 (11.29%)	0.442
	Alcohol	3 (15%)	6 (9.68%)	
	Both	6 (30%)	10 (16.13%)	
	None	10 (50%)	39 (62.90%)	
	Total	20 (100%)	62 (100%)	
PHYSICAL ACTIVITY	Active	4 (20%)	40 (64.51%)	<0.001
	Inactive	16 (80%)	22 (35.48%)	
	Total	20 (100%)	62 (100%)	

Table 8: Distribution of non-dementia patients based on the risk for developing vascular dementia after ischemic stroke

RISK RANGE	FREQUENCY (n=62)	PERCENTAGE (%)
LOW RISK	19	30.65%
MILD RISK	13	20.97%
MODERATE RISK	23	37.10%
HIGH RISK	6	9.68%
VERY HIGH RISK	1	1.61%
TOTAL	62	100.00%

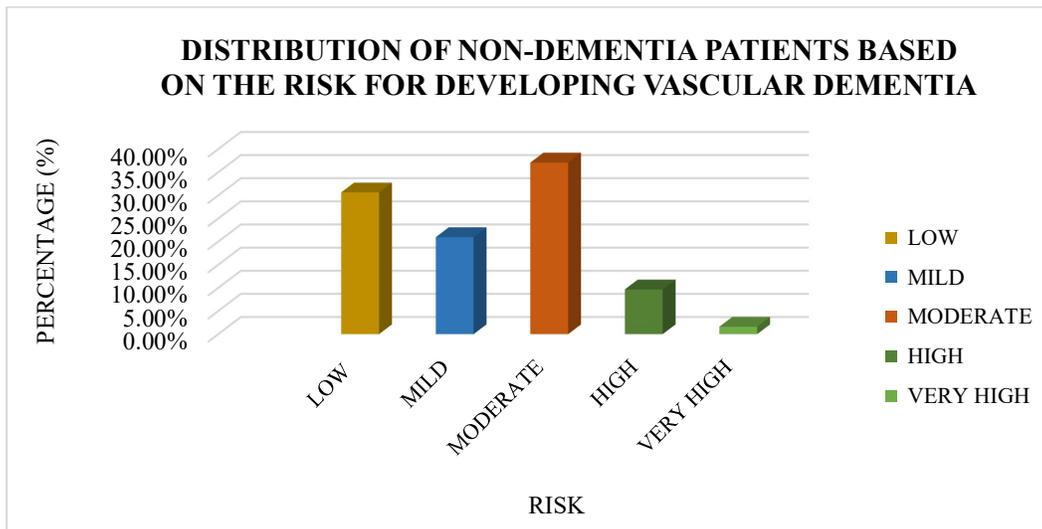


Figure 3: Distribution of non-dementia patients based on the risk for developing vascular dementia

CONCLUSION

Stroke are the third most common disease all over the world with increased morbidity and mortality. Vascular dementia is an important complication of stroke. CAIDE dementia risk score appears to effectively predict the likelihood of vascular dementia following a stroke. Such a forecast could assist in the creation of more specialized management evaluations and helps to identify risk groups for the primary prevention of vascular dementia.

ACKNOWLEDGEMENT

We owe a debt of heartfelt thanks to our esteemed research guide Mrs. Rani Manju, M. Pharm, Associate Professor, Department of Pharmacy Practice, Pushpagiri College of Pharmacy, Thiruvalla for her invaluable support, encouragement and supervision. We are fortunate and extremely grateful to have Mrs. Pheba Susan Thomas, Assistant Professor, Department of Pharmacy Practice, Pushpagiri College of Pharmacy, Thiruvalla as our co-guide. Her timely suggestions and corrections are indeed worth mentioning. We respect and thank Dr. Reji Thomas, MD, DM, Professor and HOD, Department of Neurology, Pushpagiri Medical College Hospital, Thiruvalla for willingly giving us the access to the Department of Neuro medicine to do our study and for his sincere support as a co-guide and his for his willingness to clarify our doubts. We extend our sincere thanks to

our Principal Dr. Santhosh M Mathews, M. Pharm, PhD, Department of Pharmacy Practice, Pushpagiri College of Pharmacy, Thiruvalla for guiding us through this entire year systematically and providing all the facilities necessary for the completion of our thesis.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/ publication of this article.

Funding

The authors received no financial support for the research, authorship and/ publication of this article.

Ethical consideration

Institutional Research/ Human Ethics Committee approval was obtained with IEC no:

- PCP/IEC-02B/9/PD-2022
- PCP/IEC-02B/10/PD-2022
- PCP/IEC-02B/11/PD-2022

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