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A prospective observational study on occurrence and recurrence of Ischemic Stroke in patient on treatment with Anti-hypertensives

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ABSTRACT

Stroke represents a leading cause of mortality and the first cause of functional disability. Nearly a 1.8million person suffers from stroke every year in India. The major risk factors of strokes include Hypertension, Diabetes Mellitus, Alcohol and Smoking. Modified Rankin Scale (mRS) measures the degree of disability.To find out Stroke Occurrence and Recurrence in patients on treatment with Anti- Hypertensive with their disability score.The patients were included based on the inclusion and exclusion criteria. An informed consent was prepared. Patient history and clinical data were collected. The data collected was documented and the results were analysed based on the outcome measures.The Age category of 45-65years had the most incidences to ischemic stroke with 40.5% and 47.8%, involving male population of 67.4% and 69.57% of occurrent and recurrent stroke. Tobacco consumption was the leading social history involved. Diabetes with hypertension was the major co-morbidity associated. CCBs were the most frequently prescribed antihypertensive with 26.19% & 37.5% incidence in occurrence and recurrence stroke respectively. The study shows that CCBs are the highly prescribed class of anti-hypertensives followed by CCB+DIURETICS and Beta blockers for prevention of hypertension. Diabetes with hypertension, tobacco usage are the various factors influencing risk for ischemic stroke. mRS score of 3 is the common disability seen in the stroke patients in this study.

INTRODUCTION

About 5 million people die from strokes each year, making it the second greatest cause of mortality. An estimated 15 million individuals worldwide get non-fatal strokes, and as a result, one third of the population is incapacitated. Those who have experienced a previous transient ischemic attack or stroke are at an extremely high risk of having another one. Stroke risk is high for one in six persons within the next five years. [1]

The term "stroke" refers to a disruption of brain function (focal or generalized), lasting longer than 24 hours, with no obvious non-vascular etiology. Patients who presented with subarachnoid hemorrhage, intracerebral hemorrhage, thrombosis, or embolism were included in the criteria. Ischemic stroke is characterized by thrombosis or embolism-induced obstruction of a blood artery providing blood to the brain. When a blood vessel in the brain bursts, it is known as a hemorrhagic stroke, also known as an intracerebral or subarachnoid hemorrhage. Stroke events were separated between fatal and nonfatal occurrences based on the survivorship status. [2]

Blood pressure is regarded as an essential determinant for the risk of stroke in both non-hypertensive and hypertensive individuals due to the direct relationship between blood pressure levels and the early development of ischemic stroke and cerebral haemorrhage.

A linear correlation between blood pressure, mortality, and stroke-related morbidity is visible at blood pressure readings higher than 115/75 mmHg. It has been demonstrated that a rise in systolic and diastolic blood pressure of 20 mmHg and 10 mmHg, respectively, in persons aged 40 to 70 years doubles the risk of stroke. Therefore, lowering blood pressure reduces the risk of stroke and its fatality. [1-3]

There are few direct comparisons between various antihypertensive classes that aim to lower stroke risk. Due to an increase in angiotensin II production, angiotensin-1 receptor blockers (ARBs), calcium channel blockers (CCBs), and diuretics are antihypertensive medications with neuro protective benefits against ischemic stroke. Following consistent results of a decreased risk of stroke with ARBs, CCBs, and diuretics in several clinical studies, and similarities in these medications' Angiotensin II production mechanisms, Fournier et al. put out this notion.[4-5]

Scales that are often used to evaluate outcomes include the Barthel Index (BI) and the Modified Rankin Scale (MRS). The BI is a scoring method that evaluates a patient's performance in daily living. It was initially created in 1961 and then refined by Granger and his coworkers. The MRS evaluates independence rather than the accomplishment of specific predetermined activities that take into account both mental and physical responses to neurological impairments. The scale has six categories that range from 0 to 5, where 0 denotes no symptoms and 5 denotes a significant disability. [6]

The mRS not only assesses a patient's overall level of independence and enables comparisons between patients with various neurologic deficits, but it also compares by referencing the patient's prior activities because even though a patient may be independent, they may not be happy with the limitations of their previous lifestyle. On the other hand, due to matching symptoms like arthritis or intermittent claudication that existed before their stroke occurrence, patients may be limited in their activities. [7]

The current study was conducted to assess the occurrence and recurrence of stroke in patients on different anti-hypertensive therapy.

METHODOLOGY

This prospective observational study was conducted in Neurology department of Sri Ramakrishna Hospital, Coimbatore for the period of 6 months. An informed consent form was prepared in order to obtain the appropriate consent from the patient or the care taker for the study. The participants were selected based on the inclusion and exclusion criteria. Patients over the age of 18 years who were on treatment with anti-hypertensive with newly diagnosed stroke, and patients admitted on recurrence of stroke with anti-hypertensive therapy were included in the study. Patients not compliant with anti-hypertensive regimen as they are more prone to develop hemorrhagic stroke, having stroke due to complication of surgery or procedure or any brain tumor which is also a cause of hemorrhagic stroke and not ischemic stroke were excluded from the study. The demographic and the clinical data of the patient based on both these criteria (i.e. age, gender, height, weight, IP number, date of admission and date of discharge, past medical and medication history, smoking, alcohol) were collected. The data collected was documented and the results are analyzed based on the outcome measures such as systolic and diastolic blood pressure, modified Rankin scale, which is used to describe the disability of the patient based on their symptoms, co morbid condition and the anti- hypertensive drugs therapy. The data's are collected and statistically analyzed. Using SPSS software the statistical results were obtained using Chi square test and multiple polynomial regressions was used to find out the association between the variables. The results obtained from the study were discussed and the conclusion of the results recorded from the study was reported to the clinician.

RESULTS

A total number of 80 patients were screened out of which 65 were included in the study based on the inclusion and exclusion criteria. 42 cases had new occurrence of stroke and 25 cases had recurrence of stroke. 5 cases were dropped out in occurrence population and 2 cases were dropped out in recurrence due to poor patient follow up. In the end we had 42 cases included in occurrence stroke population and 23 cases in recurrent stroke

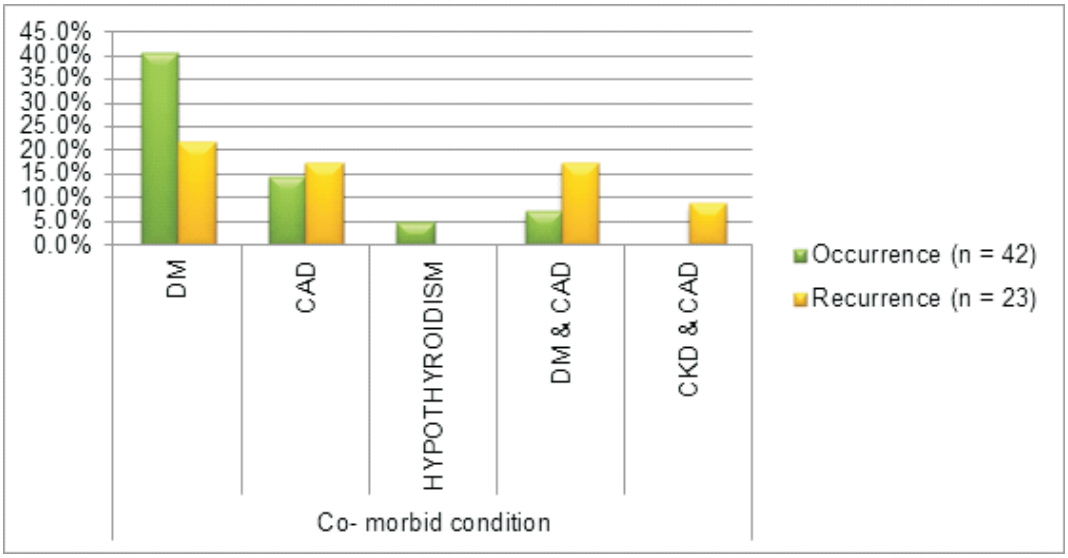

Fig. 1 : Type of incidence vs percentage patient population of different Co-morbid conditions

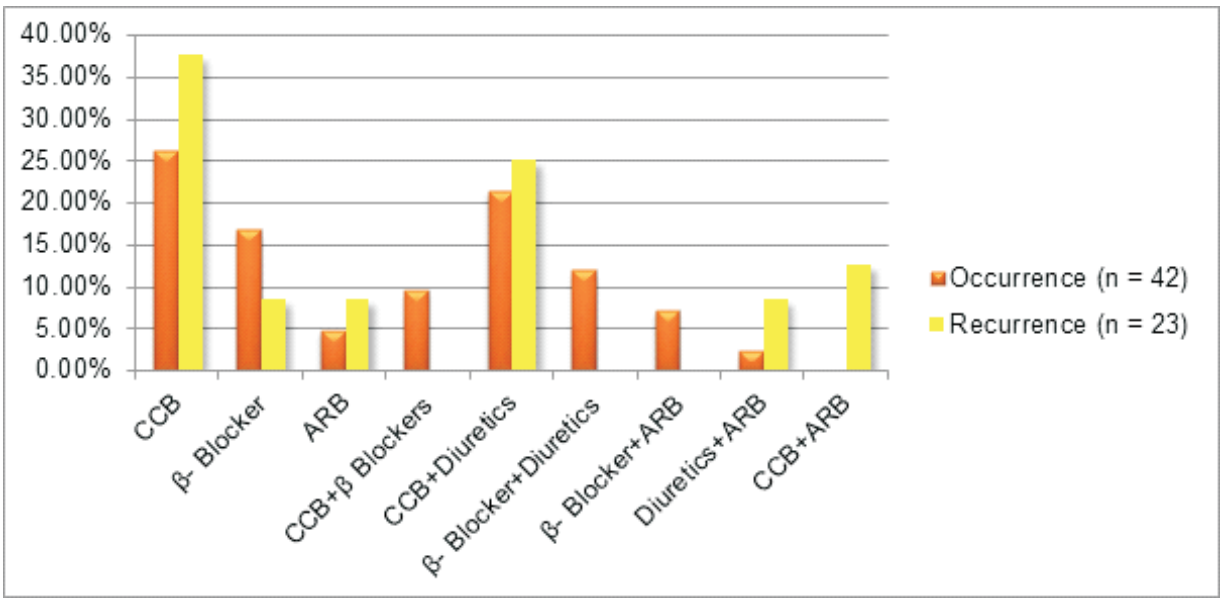

Fig. 2 : Type of incidence vs percentage patient population of different anti-hypertensives

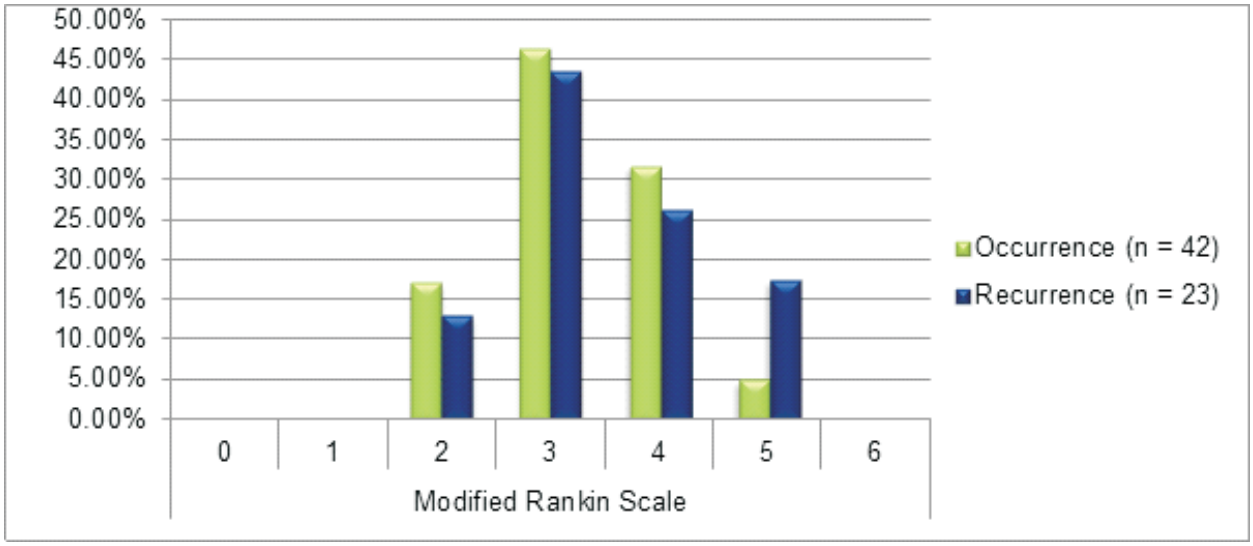

Fig. 3 : Type of incidence vs percentage patient population of different Modified Rankin scale scores

population.

On observing the data collected from 65 patients, 40-65 years were having both occurrence (40.5%) and recurrence (47.8%) population. We find that 31.0% and 30.4% of the cases belongs to the age group of 31-45 years in occurrence and recurrence population respectively, which is followed by the age group greater than 65 years with occurrence (28.6%) and recurrence (21.7%). the male gender was observed to have higher incidence of both occurrence (67.44%) and recurrence (69.57%) stroke when compared with female gender of occurrence (32.56%) and recurrence (30.43%), stroke respectively. People on use of tobacco were found to have higher incidence of occurrence (41.46%) and recurrence (39.13%) stroke (CI- 95%, P value- 0.039). Categorizing the patient population based on the co-morbid conditions along with hypertension, we find that Diabetes was the most prevalent in both occurrence (40.5%) and recurrence (21.7%) population. On grouping various conditions such as Atherosclerosis, Myocardial Infract (MI), and Ischemic disease under CAD, We observed that 14.3% and 17.4% of the population had CAD in occurrence and recurrence population respectively, 4.8% of occurrence population had hypothyroidism, in occurrence and recurrence population, CAD with DM was found to be 7.1% and 17.4% respectively, 8.7% of population with CKD and CAD was found to have recurrence stroke *(Figure*

Table 1 : Consolidated table for sample popultaion (n = 65; Occurrence stroke population = 42; Recurrence stroke population = 23)

S. No.	Parameters	Occurrence of Stroke (n=42)	Recurrence of Stroke (n=23)	P Value
1	Age,Y	54.7 ± 14	54.52 ± 12	0.571
2	Male, %	67.44	69.57	0.997
3	Female, %	32.56	30.43	0.997
4	Years of hypertension	3.78 ± 1.2	3.17 ± 0.8	0.843
5	Smoking, %	7.32	-	0.706
6	Alcohol, %	2.44	8.7	0.215
7	Tobacco,%	41.46	39.13	0.039
8	Tobacco + Alcohol,%	4.88	8.7	0.372
9	Smoking+ Alcohol, %	14.63	-	0.057
10	Smoking + Tobacco,%	19.51	17.39	0.423
11	Smoking + Tobacco+ Alcohol,%	9.76	26.09	0.706
12	Treatment with CCB, %	26.19	37.5	0.027
13	Treatment with β- Blockers, %	16.67	8.33	0.118
14	Treatment with ARB, %	4.76	8.33	0.657
15	Treatment with CCB + β- Blockers, %	9.52	-	0.423
16	Treatment with CCB + Diurctics, %	21.43	25	0.054
17	Treatment with CCB + ARB, %	-	12.5	0.147
18	Treatment with β - Blockers + Diuretics, %	11.9	-	0.273
19	Treatment with β - Blockers + ARB, %	7.14	-	0.657
20	Treatment with Diuretics + ARB, %	2.38	8.33	0.571
21	Modified Rankin Scale (mRS)	3	3	0.002

1). We observe that CCB were most commonly prescribed with 26.19% and 37.50% of occurrence and recurrence stroke respectively (CI- 95%, P value- 0.027) *(Figure 2)*. 46.34% and 43.5% of occurrence and recurrence stroke with disability score of 3(CI- 95%, P value- 0.002) (moderately disable) was found to be the highest average score followed by disability score of 4 (31.71%) in occurrence stroke patient and 26.1% in recurrence stroke patient *(Figure 3)*. The obtained results were statistically significant.

DISCUSSION

The majority of the global stroke burden is from low- and middle income countries. Despite this, there is a paucity of epidemiologic studies of stroke in India regarding the incidence and the effect of age and gender on the same.

Prevalence of stroke increases with increasing age, but in our population it peaked in the highly productive age group of 46-65 years. The risk of stroke was lower in women as compared to men under the age of 45, where it was becoming equal in the age group of 46-65. As the age increases, both cerebral micro and macro circulations undergo structural and functional alterations which lead to impaired cerebral auto regulation causing ischemic stroke.

We have observed that male patient had more possibility of getting both occurrence and recurrence stroke when compared with the female population. Similar results were seen in the study

conducted by *Pawan T Ojha et al.* This may be due to fact that the males in the population are prone to stress and various other familial issues imposed than the female population lead them to increased smoking, alcohol and tobacco usage. The presence of Y chromosome is expressed in males which also could be one of the contributors for ischemic stroke. [8-9]

Meta-analysis of 31 RCTs measuring the effect of CCB on stroke done by *Gui Jv Chen & Mao Sheng Yang* reported that CCB reduces stroke more than placebo and Beta blockers. Similarly in our study the prevention of occurrence and recurrence stroke were seen more in population prescribed with CCB (P value = 0.027). [10]

Our study shows that, diabetes was the major co morbid condition accompanied with hypertension indicating uncontrollable diabetes puts subjects at risk for ischemic stroke in both occurrence and recurrence population. The presence of diabetes causes changes in the metabolism leading to obesity and atherosclerosis which triggers the development of Deep Vein Thrombosis that causes the formation of embolus and ischemic stroke. *Karapanayiotides et al.* had mentioned in his study that the diabetic stroke patients are associated with specific patterns of stroke type, etiology and topography. [11]

The usage of tobacco (P value = 0.039) has the higher prevalence of both occurrence and recurrence stroke when compared with usage of smoking and alcohol. On smoking, the nicotine and carbon monoxide are released. The carbon monoxide enters the blood stream that reduces the amount of oxygen. Nicotine causes tachycardia and this in turn leads to increased blood pressure which maybe one of the reason that triggers the risk of stroke incidence. Similar results have been concluded in the study by *Reena S Shah et al.* [12]

On the time of discharge, the disability score has been measured using the Modified Rankin scale. It was observed that the most of the patients were moderately disabled i.e. Disability score of 3 in both occurrence and recurrence stroke.

The patients on treatment with the anti- hypertensives for 3 years had the disability score of 3 was the most observed prevalence in occurrence and recurrence stroke population.

The patients on age group between 46-65 years were observed to have the disability score of 3 in occurrence stroke population, and the disability score of 3 & 4 is seen in the age group between 46-65 years in recurrence stroke population.

CONCLUSION

The prospective observational study points out that the patient with the age of 45-65 years and those who are male were more prone to develop Ischemic stroke because of the poor life style changes. Diabetes also found to be the major risk factor in developing ischemic stroke. In this study we observed that Calcium Channel Blocker were highly prescribed among the selected patient population but we need detailed study in this area to conclude that Calcium Channel Blocker has the highest potential to prevent stroke in comparison with other anti hypertensive therapy which is because of the neuro protective activity of CCB's. While other anti-hypertensive therapy (Dual or triple therapy) was not found to be having greater efficacy in the patient who developed stroke. The screened patients were found to be having disability score of 3 which indicates that they were able to walk without assistance at the time of discharge. Furthermore study is required in this area with large population size.

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DECLARATION OF CONFLICTING INTERESTS

The author(s) declare no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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