

# **AN ASSESSMENT OF OUTCOME IN STROKE PATIENTS USING NIHSS SCALE –A CROSS-SECTIONAL INTERVENTIONAL STUDY IN A TERTIARY CARE HOSPITAL**

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## ABSTRACT

**Background:** Stroke is a leading cause of morbidity and mortality, resulting in significant societal impact. Strokes are acute brain dysfunctions caused by vascular issues, lasting more than a day. **Aim:** To perform an assessment of outcomes in stroke patients using NIHSS scale in a general medicine department at a Tertiary care teaching hospital. **Methodology:** A Cross-sectional study was conducted for a period of six months in General Medicine department of Karpagam Faculty of Medical Sciences and Research. The study data was collected using a patient data collection form from patient's treatment chart. **Results:** In a cross-sectional study involving 74 subjects aged 18 and above, the participants were divided into two groups: 40 males (54%) and 34 females (46%). Among these subjects, 85% received treatment in accordance with the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS) guidelines. The average score for patients treated under the NPCDCS guidelines at the time of admission was 21. After therapy, the average score for these patients decreased to 16.15. Conversely, the scores of another group of patients increased from 19.72 to 24.95. This data suggests that adherence to the NPCDCS guidelines may contribute to improved therapeutic outcomes. **Conclusion:** The reasons behind the decline in the score were found to be the non-adherence of therapy, inadequate monitoring of INR. These findings facilitate more individualised risk estimates in observational studies that lack prospective in-person stroke severity ascertainment.

## KEYWORDS

anti-coagulants, adherence, stroke, outcomes

## INTRODUCTION

Stroke, a major Non-Communicable Disease (NCD), is responsible for 3.5% of Disability Adjusted Life Years (DALY) in India. Apart from risk factors like hypertension, diabetes, heart diseases and positive family history, other lifestyle related factors such as unhealthy diet, obesity, lack of physical activity, stress and tobacco use account for its occurrence [1]. Changes in lifestyles, behavioural patterns, demographic profile, socio-cultural and technological advancements are leading to sharp increases in the prevalence of stroke. The disease by and large can be prevented by making simple changes in the way people live their lives or simply by making changes in the lifestyle [2].

A stroke is a neurological condition marked by the obstruction of blood vessels in the brain. This blockage often occurs due to the formation of clots, which disrupt blood flow and can lead to artery blockage or rupture, causing bleeding. Additionally, stroke can be associated with mental health issues such as depression and cognitive decline [3]. Prior to the release of the International Classification of Diseases 11 (ICD-11) in 2018, stroke was categorized as a vascular disease. This classification led to clinical data from stroke patients being grouped under cardiovascular diseases, which inaccurately represented the severity and unique burden of stroke [4].

Stroke patients and researchers faced challenges in accessing government support and grant funding specifically designated for neurological disorders. However, advocacy efforts by clinicians led to the recognition of stroke's true nature in the ICD-11, resulting in its reclassification under the neurological chapter. This reclassification has facilitated more precise documentation and statistical analysis of stroke data, consequently improved acute healthcare and fostering increased research funding for stroke [5].

Stroke presents a significant global health challenge, contributing substantially to mortality and morbidity, particularly in both developed and Low-Middle Income Countries (LMICs). A staggering 70% of strokes occur in LMICs, where the burden of the disease surpasses that of high-income nations. India with a recent increase in life expectancy exceeding 60 years, witnesses a surge in age-related, non-communicable diseases like stroke, making it the fourth leading cause of death and fifth leading cause of disability. Addressing this escalating burden necessitates reliable data on stroke incidence, prevalence, and outcomes to shape healthcare policies, organize stroke services, and monitor the effectiveness of interventions. The National Institutes of Health Stroke Scale (NIHSS) serves as a standardized tool that physicians can use to assess the severity of a patient's stroke and predict potential outcomes [6,7].

The clinical severity of stroke and outcomes at the time of admission and post stroke therapy is measured using NIHSS score. The process of restoring neurological deficit in stroke patients is a dynamic, complex, and multifactorial processor in which the interactions between socio demographic factors, clinical and genetic factors determine the recovery process [8,9]. Indian government has provided the certain guidelines named as National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS) guideline to treat stroke patient as per individual concern. Anti-stroke

medications were used to treat these patients however it was observed that patients developed some kind of negative outcomes such as swelling and oedema post stroke depression, peripheral vascular disease, difficulty swallowing, insensitivity [10]. Failure to adhere to guidelines when prescribing can lead to various negative outcomes, as mentioned above, which can be measured using the NIHSS [11]. The objective of the present study is to perform an assessment of outcomes in stroke patients using NIHSS scale in a general medicine department at a Tertiary care teaching hospital.

## **MATERIALS AND METHODS**

After obtaining approval from the Institutional Ethical Committee, the present cross-sectional interventional study was carried out in the department of general medicine, Karpagam Faculty of Medical Science and Research, Coimbatore. This study was conducted for a period of 6 months from March to August 2024. All patients who were admitted into the general medicine department diagnosed with stroke were included in this study. The study included all stroke patients of age group more than 18 years, sudden onset neurologic deficit of more than 24 hours confirmed by radio imaging/laboratory investigations and patients who gave consent.

### **Inclusion criteria**

- Patients admitted in General medicine department with Cerebrovascular Accident of irrespective gender.
- Patients with comorbidities.
- Patients receiving antiplatelets, anticoagulant, thrombolytics and/or statins.
- Patient of all age group above 18.
- Patients with or without health literacy.

### **Exclusion Criteria**

- Pregnant patients.
- Patients who gets discharged within 48 hours of admission to the hospital.
- Against Medical Advice (AMA) patients.
- Incomplete medical records.

### **Methodology**

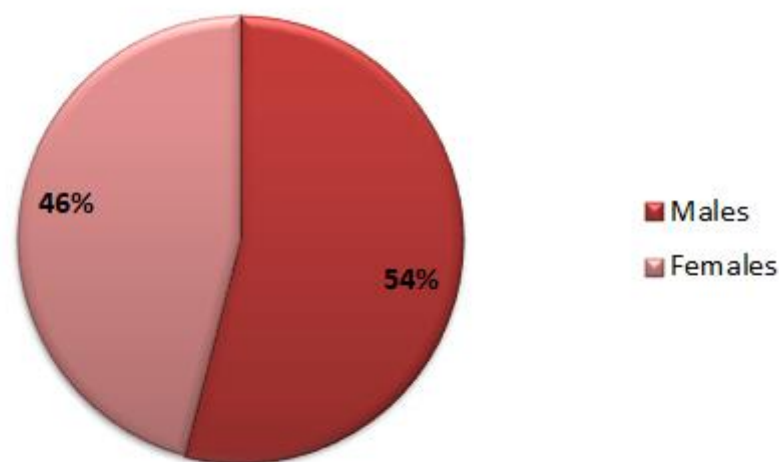
This is a cross sectional study to find outcomes of stroke patients through accurate NIHSS using NPCDCS guideline. The study was performed at the Karpagam Faculty of Medical Science and Research as 6 months study. During the study period 74 patients who were diagnosed with stroke, were included. The study conducted with direct conversations with the patients to gather their demographic information, which was later integrated into the data collection form. Patients were asked to complete the tasks outlined in the NIHSS, and their scores were recorded based on their performance [12]. This evaluation was conducted both at the time of admission and before discharged [13-16]. The severity of the stroke was assessed using the NIHSS score [17-19]. Results were interpreted using Microsoft excel, and statistical analysis were performed using SPSS software.

## Statistical Analysis

Data was described in terms of range, mean  $\pm$  SD, frequencies and percentage as appropriate. A probability value  $p$  less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS 21.

## RESULTS

The present study was cross sectional research with 74 participants aged 18 to 90 as shown in table 1. The data revealed that the largest proportion of patients (35.1%) fell within the 56-65 age range, followed by 31.08% in the 66-75 age groups. The smallest percentage of affected patients was observed in those over 85 and below 36 years of age. The study consisted of 54% males and 46% females as shown in fig 1.



*Fig 1. Gender distribution among study population*

**Table 1. Age distribution among study population**

AGE (years)	No. of Patients	Percentage
36-45	9	12.1%
46-55	9	12.1%
56-65	26	35.13%
66-75	23	31.08%
76-85	6	8.10%
>85	1	1.35%

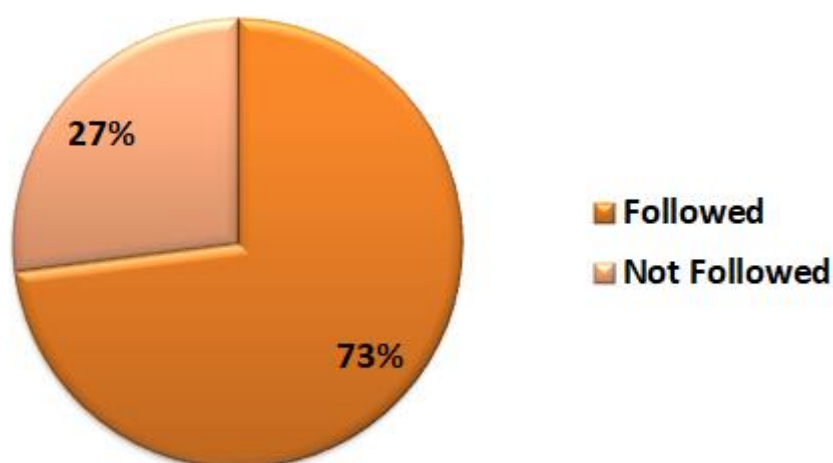
International Normalized Ratio (INR) is a standardized measure used to assess how long it takes for a person's blood to clot. It is primarily used to monitor patients who are on

anticoagulant medications, such as warfarin, to ensure their blood is not too thin or too thick. For individuals not on anticoagulants, the normal INR range is around 0.8 to 1.2 although this can vary based on the medical condition being treated. All the patients prescribed with anti-stroke medicines have to take INR as per NPCDCS guidelines. Table 2 depicts that the number of patients who were taken INR was 22 and who had been rejected to take INR were 52. Although INR was measured for only 22 patients, 19 of them had values greater than 1, which is a significant factor to consider when treating stroke patients.

**Table 2. INR Monitoring ratio in the study population**

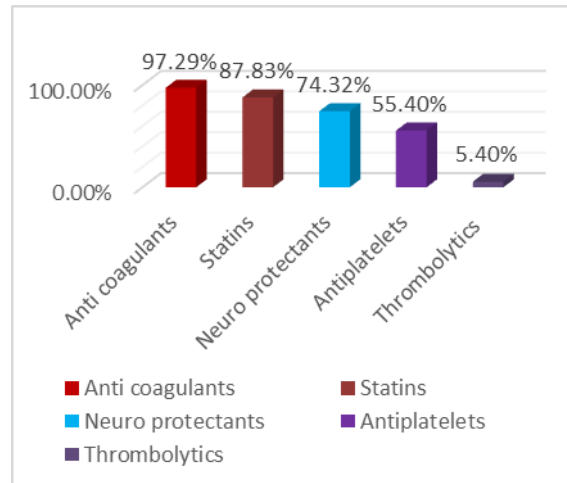
INR MONITOR	INR RANGE	POPULATION	PERCENTAGE
MONITORED	>1	19	25.67%
	<1	3	4.05%
NOT MONITORED	1-2	52	70.27%

The NPCDCS guidelines play a crucial role in the prevention, detection, and management of strokes in India. Given the high prevalence of stroke the NPCDCS guidelines provide a structured approach to address stroke as part of a broader strategy to reduce the incidence and burden of stroke by their holistic approach integrates prevention, treatment, and rehabilitation services, ultimately helping to decrease stroke-related mortality and disability in the population. The present study also focused on the prescription adherence of NPCDCS guidelines. General prescription of anti-stroke medicines concentrating individualized drug regimen was followed in 72.97% and 27.02% have been neglected from the adherence as represented by Fig 2.



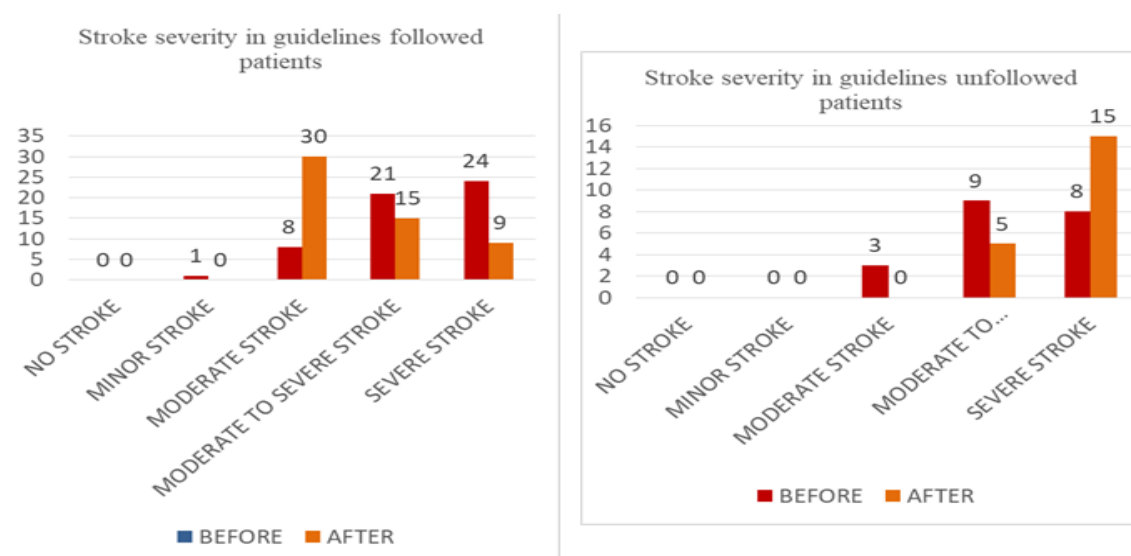
**Fig 2. Ratio of Adherence to NPCDCS guidelines among study population**

General Prescription pattern of anti-stroke therapy prescribed in general medicine department was reviewed. The Fig 3 explained the maximum number of drugs were given to the patients belongs to anti-coagulants 97.29% (Heparin, Enoxaparin, Vitamin-K, LMWH, Warfarin) followed by Statins 87.83% (Atorvastatin, Rosuvastatin, Simvastatin), Neuro protectants 74.32% (Citicoline, Piracetam) and minimum belongs to the category of Thrombolytics 5.40% (Tenecteplase, Alteplase, Streptokinase, Urokinase).



**Fig 3. Distribution of anti-stroke medications among study population**

The current study revealed the stroke types among study population before and after therapy. Fig 4 represents that by observing the overall average NIHSS scores of both patient’s adhered guidelines and non-adhered patients, it could be able to understand that severity declined in the guideline-adhered group compared to the other. This is proven by the fact that the number of patients with severe stroke decreased in the group following guidelines-adhered therapy with 65.21% and the number of patients with severe stroke increased in the group following non-adhered therapy with 11.11%.



**Fig 4. Difference between severities of stroke in guidelines adhered and non-adhered patients**

The current study analysed the negative outcome that arise as a direct or indirect result of the stroke therapy or stroke itself. These complications can worsen a patient's health, prolong recovery, or increase the risk of further issues. In the study population, 9 patients were developed negative outcome in NPCDCS guidelines non followed category such as swelling and oedema, difficulty in swallowing, seizure and pneumonia, post stroke depression, insensitivity.

**Table 3. Statistical data using students t Test of study population**

Levene's test for equality of variances		t test for equality of means					
F	Sig.	T	Difference	One sided p	Two-Sided p	Mean Difference	Std.Error Difference
0.006	0.940	-5.758	72	<0.001	<0.001	-8.548	1.485

The table 3 showed the p value of less than 0.01 observed from the study groups that is NPCDCS guidelines adhered and non-adhered patients showed significant association between NPCDCS GUIDELINES and NIHSS SCORES. It was found that obtained results were statistically significant as per statistical analysis.

**DISCUSSION**

Stroke is a global epidemic and an important cause of mortality and morbidity. It is currently the second most common cause of death and may soon become the leading cause of death globally. It can be caused by permanent neurological damage, result of trauma, injury to head, high blood pressure, Heart valve disease, and atrial fibrillation [20]. This helps in setting therapeutic goals, initiating early rehabilitation, planning home adjustments, providing community support tailored to the patient's needs, and informing patients about their prognosis and prospects. The clinical outcome of a stroke is variable and dependent on numerous variables. Due to advances in medical knowledge and technology, the objective assessment of disease severity in stroke patient can provide a premise for prognostic patients and medical decision making [21].

The National Institutes of Health Stroke Scale (NIHSS) serves as a standardized tool that physicians can use to assess the severity of a patient's stroke and predict potential outcomes [22]. The clinical severity of stroke and outcomes at the time of admission and post stroke therapy is measured using NIHSS score. The process of restoring neurological deficit in stroke patients is a dynamic, complex, and multifactorial processor in which the



interactions between socio demographic factors, clinical and genetic factors determine the recovery process,

A cross-sectional study conducted by zhuo *et al.*, 2023 showed that NIHSS is a reliable scale for evaluating patient's neurological outcomes and determine the association between acute stroke severity and cognitive functioning [23]. In the present study, 74 patients who met inclusion criteria were included in the study, age group above 18 years, with mean age group  $64.34 \pm 11.8$  were participated in the study. Stroke is common in men than in women this correlated with the study conducted by Shakil *et al* 2019 [24].

Our Indian government has provided the certain guidelines named as NPCDCS guideline to treat stroke patient as per individual concern. The present study was carried out to find out the possible outcomes in patients prescribed with antiplatelet, anticoagulants, statins, fibrinolytics, thrombolytics, neuroprotectants for the treatment of stroke. In this study the patients diagnosed with stroke are further divided into minor, moderate, moderate to severe and severe stroke based on baseline NIHSS score [25]. Accordingly, 1.3% had minor stroke, 14.86% had moderate stroke, 40.5% had moderate to severe stroke and 68.08% had severe stroke at the time of admission and it changed into 9.4% had minor stroke, 40.5% to moderate stroke, 27.20% had moderate to severe stroke and 12.16% had severe stroke. Here, NPCDCS guidelines play a major role in reduction of NIHSS score thereby increasing therapeutic outcomes of the patients.

Anti-stroke medications were used to treat these patients however it was observed that patients developed some kind of negative outcomes such as swelling and oedema post stroke depression, peripheral vascular disease, difficulty swallowing, insensitivity. Failure to adhere to guidelines when prescribing can lead to various negative outcomes, as mentioned above, which can be measured using the NIHSS. The average scores of patients who were prescribed according to NPCDCS guidelines were found to be decreased it was similar to the study conducted by sanjeeth *et al.*, 2020 [26]. The negative outcomes were found only in the patients who were not prescribed according to guidelines.

From several studies on stroke patients, the most common neurological deficit found in a motor deficit that can negatively impact mobility and quality of life. Approximately 52 patients (70.27%) diagnosed with stroke were not monitored for INR levels, potentially leading to complications such as internal bleeding, hearing impairment, and vascular issues. Thus, we aimed to improve adherence of NPCDCS guidelines for the prevention of negative outcomes in stroke patients [27-29].

The mandatory implementation of the NPCDCS guidelines presents a significant opportunity for enhancing the quality of care in stroke units. The Negative outcomes can be overcome by prescribing individualized drug dosing regimen as per guidelines, INR monitoring, NIHSS assessment, enhanced intercommunication between patients and health care professionals. NPCDCS guidelines adherence increased the therapeutic outcomes as it categorizes the patients to provide individualized prescription. INR monitoring reduced the chance of occurrence of internal bleeding and communication enhanced the chance to notify possible negative outcomes. NIHSS score helped the physicians to understand the need of the

patient and tailor treatment based on their urgency. These above-mentioned steps lead to the early recognition and management thereby reducing morbidity and prevent mortality in management of stroke.

## CONCLUSION

The present study showed that there is a significant increase in incidence of positive outcomes induced by adhering to NPCDCS guidelines. Those who showed increased NIHSS are the one who were not prescribed according to NPCDCS guidelines. Adherence to therapies is primary determinant of treatment success and education is a key component in achieving high level of medication adherence. In our study, the level of adherence was increased after educating the patients about disease and its management as stated by NPCDCS guidelines. Thus, we concluded there is a need of monitoring INR in all patients receiving anti-coagulants. Physicians need to be aware of the importance of the NPCDCS guidelines and adhere to them to provide better therapeutic outcomes for patients. Clinical pharmacists also play a crucial role in creating awareness about the NPCDCS guidelines and proper counselling to patients will improve patient care in stroke management.

## CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest for this work.

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