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Original Research Article

CHA_2DS_2-VAS_C Score in Emergency Department: A Prospective Observational Study

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Abstract

Background: The CHA_2DS_2-VASc score (Congestive Heart Failure, Hypertension, Age ≥75 years, Diabetes Mellitus, Stroke/Transient Ischemic Attack, Vascular Disease, Age 65–74 years, and Sex Category [female]) is a validated, evidence-based tool used to estimate the risk of stroke in patients with non-valvular atrial fibrillation (AF). It serves as an essential bedside assessment in the emergency department, particularly in patients presenting with new-onset AF, uncontrolled AF, or AF with an uncertain history of anticoagulation.

Objective: To estimate the usefulness of the CHA_2DS_2-VASc score in patients of atrial fibrillation in the emergency department.

Methods: This prospective observational study included adult patients presenting to the emergency department with atrial fibrillation confirmed by electrocardiogram. CHA_2DS_2-VASc scores were calculated at presentation and correlated with anticoagulation use and outcomes.

Results: Higher CHA_2DS_2-VASc scores were associated with increased cerebral infarction and mortality. Anticoagulant therapy was underutilized despite high-risk scores.

Conclusion: CHA_2DS_2-VASc score is useful for risk stratification and outcome prediction in emergency department patients with atrial fibrillation.

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Introduction

The CHA_2DS_2-VASc score (Congestive Heart Failure, Hypertension, Age ≥75 years, Diabetes Mellitus, Stroke/Transient Ischemic Attack, Vascular Disease, Age 65–74 years, and Sex Category [female]) is a validated, evidence-based tool used to estimate the risk of stroke in patients with non-valvular atrial fibrillation (AF).

It serves as an essential bedside assessment in the emergency department, particularly in patients presenting with new-onset AF, uncontrolled AF, or AF with an uncertain history of anticoagulation. The CHA_2DS_2-VASc score guides clinicians in determining the urgency and appropriateness of initiating oral anticoagulation therapy to reduce the risk of thromboembolic events. Atrial fibrillation (AF) is the most common persistent arrhythmia and is characterized by rapid and disordered excitation of the atria, leading to irregular activation of the ventricles. Studies conducted in India have shown wide variations in the prevalence of AF, ranging from 0.1% to 1.6%. [1] AF is associated with significant clinical complications, the most serious of which is ischemic stroke. Patients with AF have a five-fold increased risk of stroke compared to those without AF. [2] Strokes related to AF are typically more severe and are associated with higher rates of disability and mortality. [3] Cerebral embolism accounts for approximately 25–30% of acute ischemic strokes. [5]

Despite widespread outpatient use, the utility of the CHA_2DS_2-VASc score in emergency department settings has not been extensively evaluated. This study aims to assess its role in acute decision-making and outcome prediction.

Aim: To estimate the usefulness of CHA_2DS_2-VASc score in patients of atrial fibrillation in the emergency department.

Objectives

Primary Objectives

- To evaluate CHA_2DS_2-VASc score in all patients of atrial fibrillation
- To evaluate the need of anticoagulation depending on CHA_2DS_2-VASc score in the emergency department
- To determine final outcome after anticoagulation, depending on the CHA_2DS_2-VASc score

Secondary Objectives

- To study the clinical demographics of all patients of atrial fibrillation
- To determine the incidence of stroke associated with AF
- To find out the association between the CHA_2DS_2-VASc score and outcome

Methods

Patients presenting to the emergency department with atrial fibrillation fulfilling the inclusion criteria were enrolled after informed consent.

Demographic data, comorbidities, and risk factors were recorded. CHA_2DS_2-VASc score was calculated at presentation. Patients were managed according to standard treatment protocols.

Results

Table 1: Age Group-Wise Distribution

Age Groups In Years	Frequency	Percentages
18-20	1	0.67%
21-40	7	4.67%
41-60	35	23.33%
61-80	83	55.33%
>80	23	15.33%
Total	150	100%
Mean Age	66.23 Year	

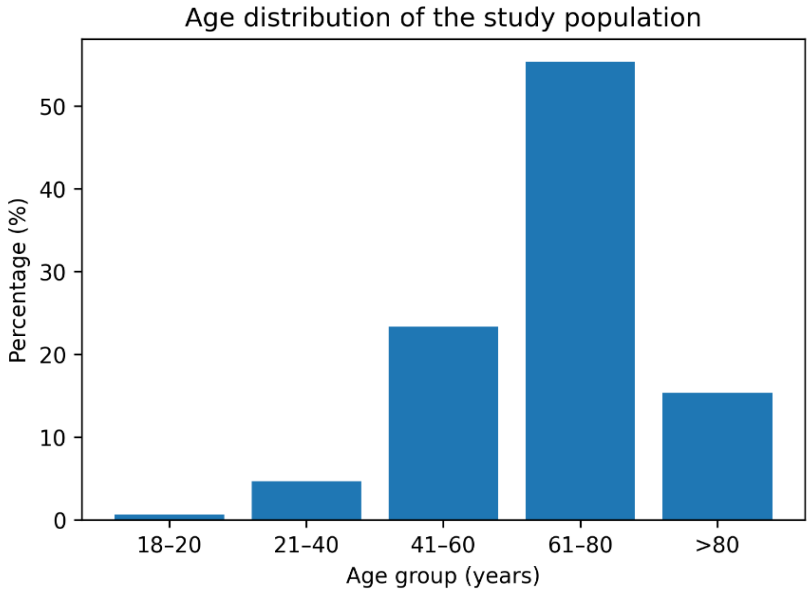

Figure 1: Age Distribution of the study population

The majority of patients were elderly, with over half belonging to the 61–80 years age group. The mean age of the study population was 66.23 years, indicating a predominance of older individuals presenting with atrial fibrillation in the emergency department.[Table 1]

Table 2: Gender Wise Distribution

Gender	Frequency	Percentage
Male	99	66%
Female	51	34%
Total	150	100%

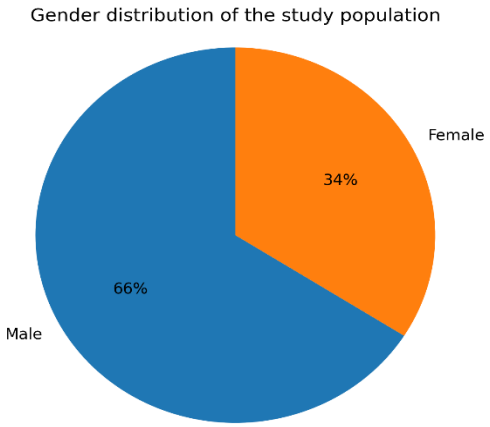

Figure 2: Age Distribution of the study population

Male patients constituted the majority of the study population (66%), demonstrating a clear male predominance among patients presenting with atrial fibrillation.[TABLE 2]

Table 3: Risk Factors-Wise Distribution-

Risk Factors	Frequency	Percentage
Smoking	63	42%
Alcohol	39	26%
Hypertension	97	64%
Diabetes	81	54%
History Of Cerebral Infarction	36	24%
Ihd	34	22.66%
Chronic Renal Disease	6	4%

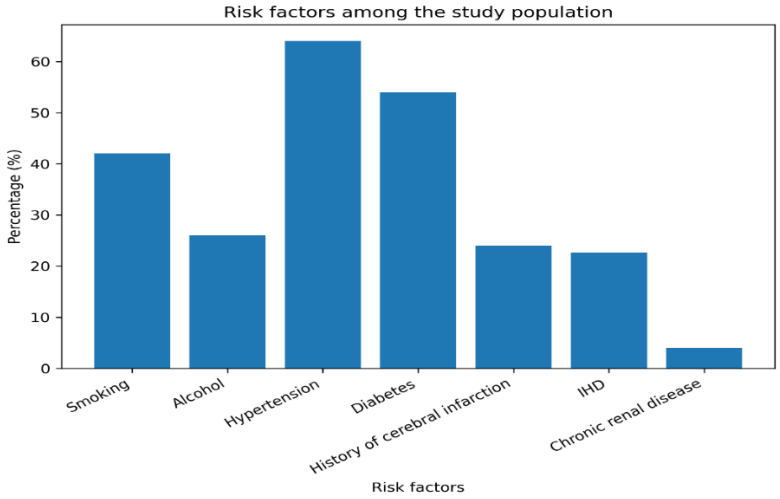

Figure 3: Risk Factors among the study population

Hypertension was the most common risk factor, followed by diabetes mellitus and smoking. A substantial proportion of patients had a prior history of cerebral infarction, indicating a high-risk study population.[TABLE 3]

Table 4: Drugs Wise Distribution of Patient with Atrial Fibrillation

Oral Medication	Frequency	Percentage
Oral Antiplatelet	45	30%
Oral Anticoagulation	16	10.66%
Both	46	30.67%
Oral Beta Blockers	14	9.33%
Cardiac Glycosides	16	10.67%
None	16	10.67%

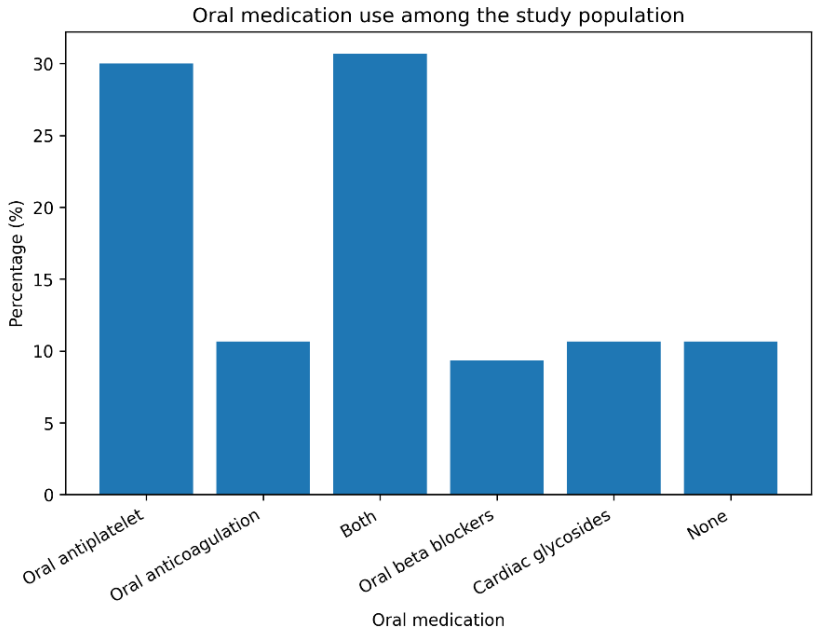

Figure 4: Oral medication use among the study population

Combined antithrombotic therapy was the most frequently used treatment, followed by oral antiplatelet therapy alone. A relatively small proportion of patients received oral anticoagulation alone.[TABLE 4]

Table 5: Correlation between CHA_2DS_2-VASC Score with Oral Type of Medications

Score	Antiplatelet Drugs	Anticoagulants Drug
0	0	0
1	6	2
2	12	8
3	14	14
4	10	20
5	13	15
6	11	11
7	8	8

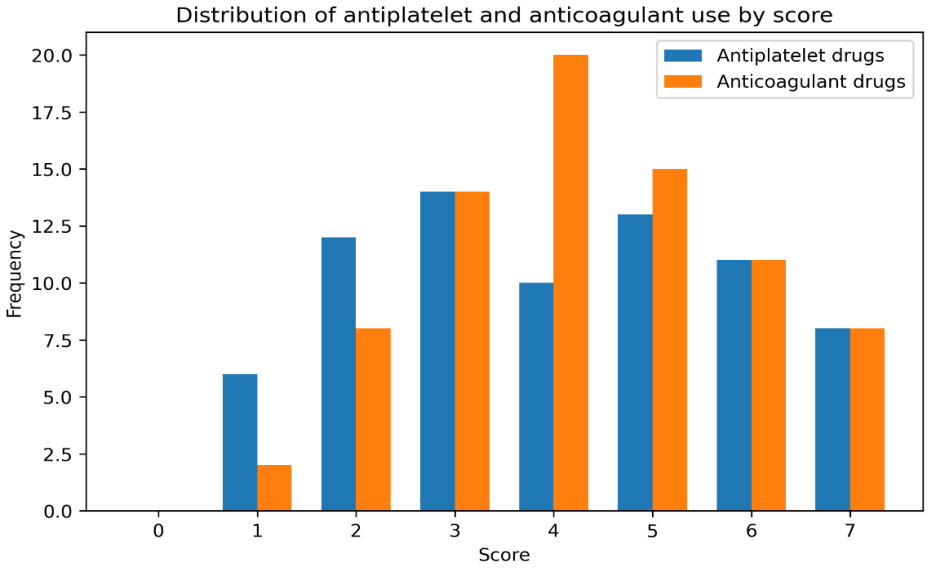

Figure 5: Distribution of antiplatelet and anticoagulant use by score

Table 6: Relation of CHA_2DS_2-VASC Score with Cerebral Infraction

CHA_2DS_2-VASC Score	Cerebra Infarction Absent	Cerebral Infarction Present
0	0	0
1	21	0
2	29	1
3	47	0
4	19	4
5	15	5
6	11	3
7	8	3
Total	150	16

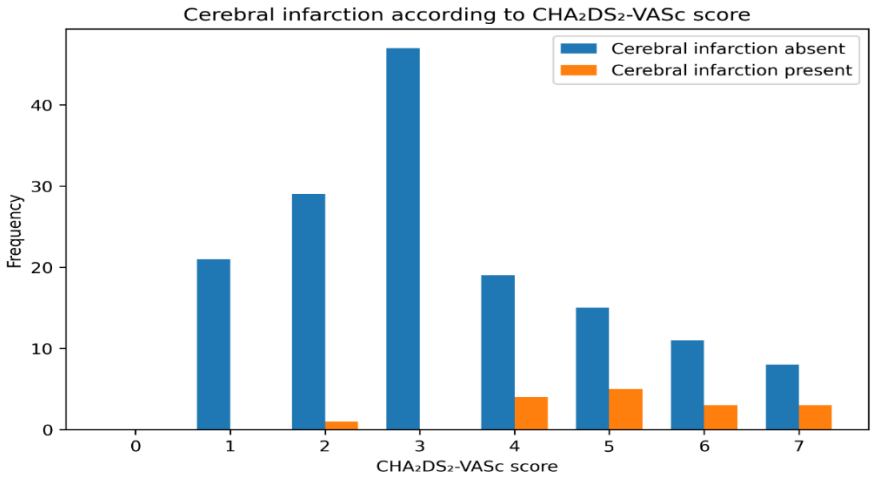

Figure 6: Cerebral infarction according to CHA_2DS_2-VASc score

$P < 0.05$ - This indicates that increasing CHA_2DS_2-VASc score is significantly associated with the occurrence of cerebral infarction.

Table 7: Correlation between Antithrombotic Therapies with Cerebral Infarction

Medication	Cerebral Infarction Present	Cerebral Infarction Absent
Oral Anticoagulant	0	16
Oral Antiplatelets	6	45
Both	0	46
None	10	15

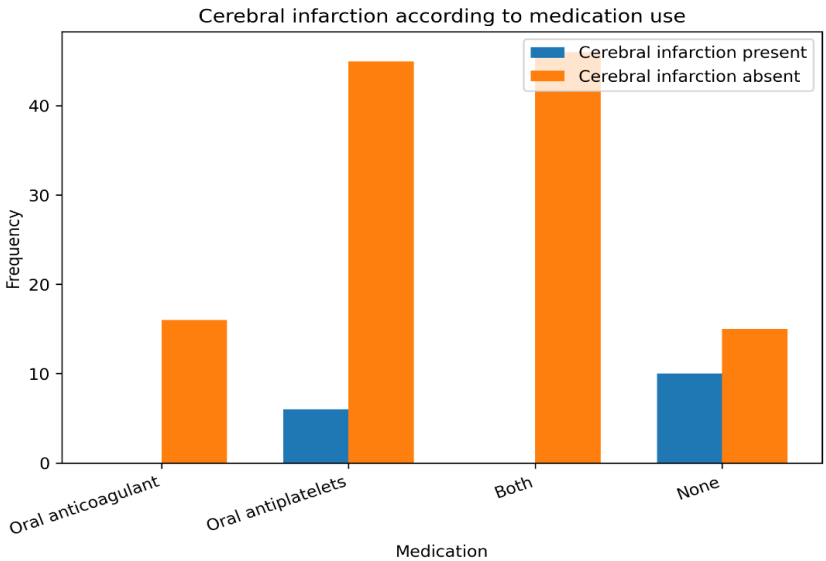

Figure 7: Cerebral infarction according to medication use

P-value = 0.000004 ($p < 0.001$). The association between the type of antithrombotic therapy and cerebral infarction is highly statistically significant. Cerebral infarction was significantly more common in patients not receiving any antithrombotic therapy

Table 8: Correlation between Antithrombotic Therapies with Intracranial Hemorrhage

Medication	Intracerebral Haemorrhage Presents	Intracerebral Haemorrhage Absent
Oral Anticoagulant	0	16
Oral Antiplatelet	1	45
Both	3	46
None	0	15

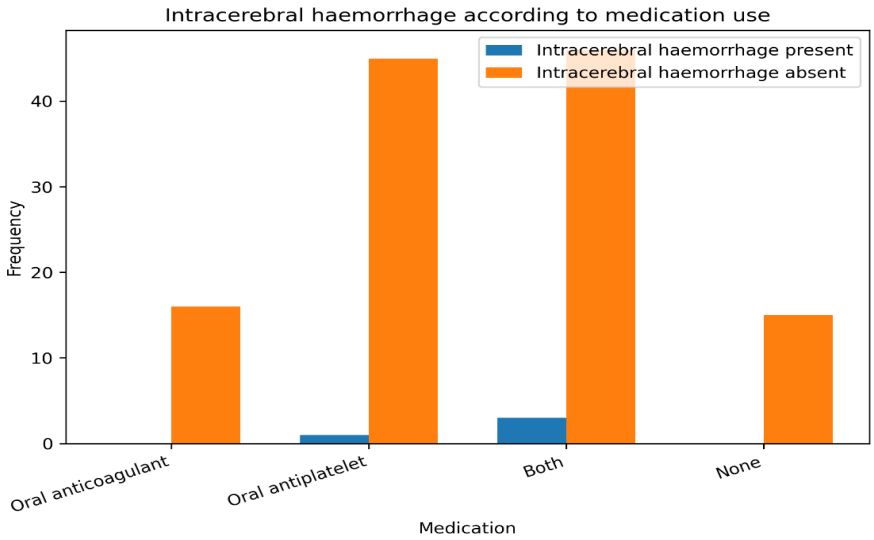

Figure 8: Intracerebral haemorrhage according to medication use

Table 9: Association of CHA_2DS_2-VASC Score with Mortality

CHA_2DS_2-VASC Score	Death	Survival
1	0	22
2	0	29
3	0	47
4	1	15
5	11	4
6	11	2
7	7	1

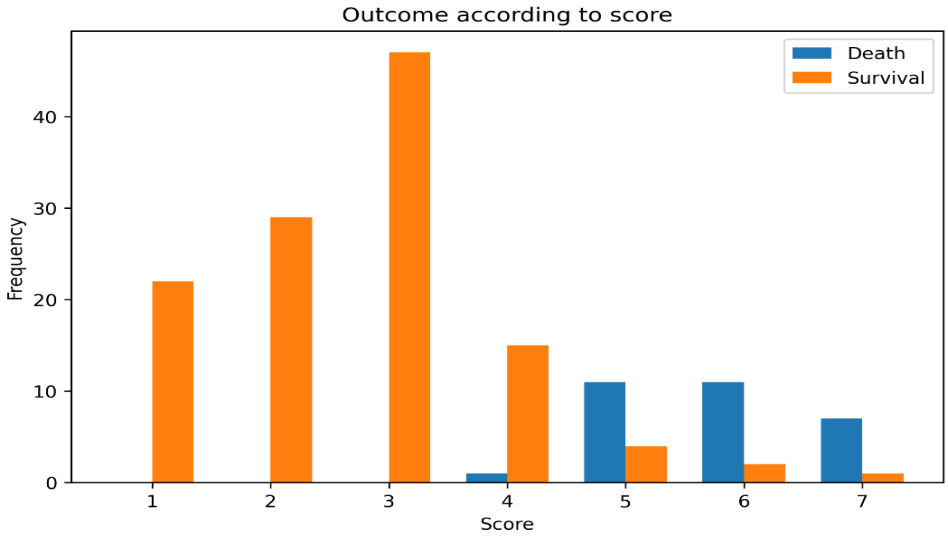

Figure 9: Outcome according to score

A highly significant association was observed between increasing CHA_2DS_2-VASc score and mortality. Mortality increased sharply at scores ≥5.[TABLE 9]

Discussion

The recommended comprehensive approach for managing atrial fibrillation (AF) is the ABC pathway. In this model, "A" stands for appropriate anticoagulation, "B" focuses on better symptom control, and "C" involves the management of cardiovascular risk factors and related health conditions. [9] One of the main goals in treating AF is to prevent cerebral infarction (stroke), and the most effective strategy for this is the long-term use of oral anticoagulants. [10]

However, this treatment comes with a risk of bleeding, so it's essential to carefully weigh the benefits and risks. This balance is often assessed using clinical scoring systems such as the CHA_2DS_2-VASc score (to estimate stroke risk) and the HAS-BLED score (to evaluate bleeding risk), which consider factors like hypertension, kidney or liver issues, history of stroke or bleeding, unstable INR levels, age, and use of certain drugs or alcohol. [11]

The present study evaluated the demographic profile, risk factors, antithrombotic treatment patterns, and their association with cerebral infarction, intracranial hemorrhage, and mortality in patients stratified by CHA_2DS_2-VASc score. The findings provide valuable insight into real-world clinical practice and outcomes, particularly in an Indian tertiary care setting.

Demographic Profile: The present study demonstrates that the disease predominantly affects the elderly population. A majority of patients (55.33%) were between 61 and 80 years of age, while 15.33% were older than 80 years.

In contrast, individuals younger than 40 years constituted only a small fraction (5.34%) of the study population. These findings indicate a strong age-related predisposition. The mean age of 66.23 years further supports the close relationship between increasing age and disease burden.

Advancing age is associated with progressive structural and functional changes in the vascular system, along with a rising prevalence of comorbid conditions such as hypertension and diabetes mellitus.

In addition, the likelihood of atrial fibrillation increases with age, thereby amplifying thromboembolic risk and contributing to worse clinical outcomes.

Risk Factor Profile: Among the risk factors analyzed, hypertension was the most frequently encountered, affecting nearly two-thirds of patients (64%). Diabetes mellitus was present in 54% of cases, while 42% had a history of smoking. These observations are in concordance with national and international data, including reports from the Indian Stroke Registry, which consistently identify hypertension and diabetes as dominant contributors to cerebrovascular pathology. The coexistence of multiple risk factors in a significant proportion of patients explains the higher CHA_2DS_2-VASc scores observed in the present study.

Furthermore, nearly one-quarter of patients (24%) had a documented history of cerebral infarction, highlighting a population at elevated risk for recurrent ischemic events.

Antithrombotic Therapy Patterns: Despite established clinical guidelines, oral anticoagulant therapy alone was prescribed to only 16% of patients in the present study. Antiplatelet therapy was used in 30.67% of cases, while 32.67% received a combination of antithrombotic agents. These findings suggest a preference for antiplatelet or combined therapy over anticoagulation in routine practice.

Comparable trends have been reported in large observational registries such as GARFIELD-AF and ORBIT-AF, as well as in Indian studies. Factors such as apprehension regarding bleeding complications, economic limitations, inadequate monitoring infrastructure, and physician reluctance likely contribute to the underuse of anticoagulants.

Correlation between CHA_2DS_2-VASC Score with Oral Type of Medications (Table 5): The analysis did not reveal a statistically significant relationship between CHA_2DS_2-VASc score and the prescription of oral anticoagulants ($p = 0.404$). This finding reflects a disparity between calculated stroke risk and actual therapeutic decisions.

Similar results have been documented in real-world observational studies, indicating that even patients with higher risk scores may not consistently receive anticoagulant therapy. This persistent gap emphasizes the need for better implementation of guideline-based management strategies.

Relation of CHA_2DS_2-VASC Score with Cerebral Infraction (Table 6): The present study demonstrates a statistically significant association between increasing CHA_2DS_2-VASc score and the occurrence of cerebral infarction ($p < 0.05$).

Cerebral infarction was predominantly observed in patients with higher CHA_2DS_2-VASc scores (≥4), while no infarction events were noted in lower score categories. This finding reinforces the validity of the CHA_2DS_2-VASc scoring system as an effective tool for stratifying thromboembolic risk.

Higher scores reflect the cumulative burden of established risk factors such as advanced age, hypertension, diabetes mellitus, prior stroke, and vascular disease, all of which independently and synergistically increase the risk of ischemic stroke. The results of this study are in concordance with previously published literature, which consistently demonstrates a stepwise increase in stroke risk with rising CHA_2DS_2-VASc scores. These findings highlight the importance of early identification of high-risk patients to enable timely initiation of appropriate preventive strategies.

Correlation between Antithrombotic Therapies with Cerebral Infarction (Table 7): A highly statistically significant association was observed between the type of antithrombotic therapy and the occurrence of cerebral infarction ($p = 0.000004$; $p < 0.001$). Cerebral infarction was most frequently noted among patients not receiving any antithrombotic therapy, emphasizing the detrimental impact of lack of prophylactic treatment in high-risk individuals.

Notably, no cerebral infarction events were observed in patients receiving oral anticoagulants or combined anticoagulant–antiplatelet therapy, underscoring the superior efficacy of anticoagulation in stroke prevention. Although oral antiplatelet therapy offered partial protection, infarction events were still observed in this group, suggesting that antiplatelets alone may be insufficient in patients with elevated thromboembolic risk.

These findings are consistent with current international guidelines, which recommend oral anticoagulation over antiplatelet therapy for stroke prevention in patients with atrial fibrillation and high CHA_2DS_2-VASc scores.

The results emphasize the critical role of appropriate antithrombotic selection based on individualized risk assessment.

Correlation between Antithrombotic Therapies with Intracranial Hemorrhage (Table 8): Analysis of Table 8 revealed a low overall incidence of intracerebral haemorrhage across all antithrombotic therapy groups.

Intracranial haemorrhage was observed predominantly in patients receiving combined anticoagulant and antiplatelet therapy, while no haemorrhagic events were recorded in patients on oral anticoagulants alone or in those not receiving any antithrombotic therapy.

The occurrence of haemorrhage in the combination therapy group highlights the well-recognized trade-off between enhanced antithrombotic efficacy and increased bleeding risk. Nevertheless, the overall low frequency of intracerebral haemorrhage suggests that, when used judiciously, antithrombotic therapy remains relatively safe. Careful patient selection, dose optimization, and regular monitoring are essential to minimize bleeding complications, particularly in patients requiring combination therapy

Association of CHA_2DS_2-VASC Score with Mortality (Table 9): A strong and statistically significant association was identified between CHA_2DS_2-VASc score and mortality ($p < 0.001$). Mortality rates increased substantially with rising scores, particularly among patients with scores of five or higher. This finding highlights the broader prognostic value of the CHA_2DS_2-VASc score beyond its established role in estimating thromboembolic risk.

Similar conclusions have been reported by Lip et al. and Friberg et al., who demonstrated that higher CHA_2DS_2-VASc scores independently predict overall mortality.

Clinical Implications: The results of this study underscore the importance of accurate risk assessment and appropriate utilization of oral anticoagulants in patients at elevated risk. Strengthening physician awareness, improving patient education, and enhancing access to anticoagulation monitoring services may help address current treatment gaps and reduce preventable cerebrovascular morbidity and mortality.

Conclusion

In conclusion, our study highlights that patients with permanent atrial fibrillation (AF) often struggle with adhering to long-term oral medication regimens, which may require more proactive management and support from the healthcare system. We found that combining oral anticoagulants with antiplatelet drugs significantly reduces the incidence of cerebral infarction, but it also notably increases the risk of intracranial hemorrhage. There was no significant difference in the associated risks between using anticoagulants alone versus antiplatelet drugs alone. Given these findings, clinicians should exercise caution when selecting oral treatment regimens that include both anticoagulants and antiplatelet drugs, taking into consideration the patient's medication adherence. Additionally, factors such as the average ventricular rate and a history of cerebral infarction were found to be risk factors for all-cause mortality in AF patients, with a prior cerebral infarction increasing the risk of death by approximately sevenfold. The CHA2DS2-VASc score not only aids in determining appropriate oral treatments for AF patients but may also serve as a valuable predictor of all-cause mortality in those with permanent AF.

Abbreviations

- AF – Atrial Fibrillation
- ASI – Acute Ischemic Stroke
- CT – Computed Tomography
- MRI – Magnetic Resonance Imaging
- HD – Ischemic Heart Disease
- CVA – Cerebrovascular Accident

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