Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Cardiology

Treatment Patterns and Clinical Outcomes among Patients with Non-Valvular Atrial Fibrillation

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DOI: https://doi.org/10.36347/sjams.2026.v14i08.006 | **Received:** 25.06.2026 | **Accepted:** 13.08.2026 | **Published:** 23.08.2026

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Abstract **Original Research Article**

Background: Atrial fibrillation is the most common cardiac arrhythmia and increases the risk of stroke, heart failure, and mortality. NVAF accounts for most AF cases, with treatment focused on anticoagulation and rate or rhythm control. DOAC use has increased globally, but evidence from Bangladesh remains limited. This study aimed to assess treatment patterns and clinical outcomes among patients with NVAF in Bangladesh. ***Methods:*** A hospital-based observational study included 287 adults with NVAF at Naogaon Medical College, Naogaon, Bangladesh, from January 2025 to June 2026. Clinical characteristics, treatment patterns, and CHA_2DS_2-VASc scores were assessed. Patients were followed for 12 months for thromboembolic events, major bleeding, heart failure hospitalization, and mortality. Data were analyzed using appropriate statistical tests, with $p<0.05$ considered significant. ***Results:*** Among 287 patients with NVAF, the mean age was 63.9 ± 11.1 years and 58.5% were male. Hypertension was the most common comorbidity. Oral anticoagulation was used in 82.2% of patients, including DOACs in 51.2% and warfarin in 31.0%; rate control was the predominant management strategy (72.5%). During 12 months of follow-up, 11.8% experienced a major clinical event, including stroke/TIA (4.9%), major bleeding (3.8%), and heart failure hospitalization (3.5%). Stroke/TIA was lower among anticoagulated patients than non-anticoagulated patients (3.0% vs 13.7%, p=0.004). Previous stroke/TIA, CHA_2DS_2-VASc ≥2, and absence of anticoagulation were independent predictors of stroke/TIA, while age ≥75 years and concomitant antiplatelet therapy independently predicted major bleeding. ***Conclusion:*** DOACs were the most commonly used anticoagulants, and rate control was the predominant strategy. Anticoagulation was associated with fewer stroke/TIA events, highlighting the importance of appropriate anticoagulation in NVAF management.

Keywords: Non-Valvular Atrial Fibrillation, Clinical Outcomes, Treatment Patterns, CHA_2DS_2-VASc score.

INTRODUCTION

Atrial fibrillation (AF) is the most common cardiac arrhythmia, accounting for approximately one-third of hospitalizations for cardiac rhythm disorders. It is associated with substantial morbidity and mortality, including increased risks of stroke, heart failure, cognitive impairment, reduced quality of life, and overall mortality [1,2]. AF is broadly classified into valvular and non-valvular atrial fibrillation (NVAF) [3]. NVAF occurs in the absence of moderate-to-severe mitral stenosis or mechanical prosthetic heart valves. Permanent NVAF refers to AF that is accepted as the established rhythm, with management primarily focused on rate control and stroke prevention [3].

The global prevalence of NVAF has increased markedly and now accounts for approximately 95% of AF cases, alongside a decline in rheumatic heart disease [4]. AF may be asymptomatic or present with palpitations, dyspnea, fatigue, reduced exercise tolerance, dizziness, chest discomfort, presyncope, or syncope. Some patients may first present with complications such as heart failure or thromboembolic events [5]. Early detection, particularly of silent AF, remains challenging because serious complications such as stroke and heart failure may occur before diagnosis. Management includes rate and rhythm control, stroke prevention, acute treatment, and management of underlying cardiovascular conditions [6,7].

Warfarin was historically the standard anticoagulant for stroke prevention in NVAF; however, bleeding risk, dietary restrictions, and the need for regular monitoring limited its use. DOACs, including dabigatran, rivaroxaban, apixaban, and edoxaban, subsequently provided effective alternatives, with generally similar or better stroke prevention and lower bleeding risk than warfarin. Consequently, clinical practice has increasingly shifted toward DOACs, although underuse of oral anticoagulation remains a concern [8–10]. Factors contributing to underuse include underestimation of stroke risk, overestimation of bleeding risk, patient concerns about treatment, medication burden, and poor adherence. Improved patient and physician education and shared decision-making may help promote appropriate anticoagulation [11,12].

Recent global real-world studies have demonstrated a growing shift toward DOAC-based anticoagulation in NVAF, with generally favorable clinical outcomes. In the Netherlands, increasing DOAC use was accompanied by reductions in ischemic stroke and major bleeding. Similarly, an Egyptian registry reported DOACs as the most commonly used anticoagulants, with relatively low rates of thromboembolic events and mortality [4,13].

In Bangladesh, available evidence is limited and has largely focused on hospitalized patients with AF. A study from two tertiary centers reported rheumatic valvular heart disease as the most common underlying condition, followed by ischemic heart disease and hypertension. Stroke and left atrial thrombus were also reported, while warfarin remained the most frequently used anticoagulant [14]. However, contemporary data on treatment patterns and clinical outcomes specifically among patients with NVAF remain limited.

Therefore, this study aimed to assess treatment patterns and clinical outcomes among patients with NVAF in Bangladesh.

METHODOLOGY:

Study Design and Setting

A hospital-based observational study was conducted in the Department of Cardiology, Naogaon Medical College, Naogaon, Bangladesh, over a period of 18 months from January 2025 to June 2026**.** The study was designed to assess the treatment patterns and clinical outcomes among patients with non-valvular atrial fibrillation (NVAF).

Study Population

The study included adult patients diagnosed with NVAF who attended the cardiology outpatient department or were admitted to the cardiology unit during the study period. A total of 287 eligible patients were included in the final analysis.

Eligibility Criteria

Patients aged 18 years or older with documented NVAF were included. AF was confirmed from available electrocardiographic records, including a 12-lead ECG or rhythm monitoring documentation. Patients with valvular atrial fibrillation, mechanical prosthetic heart valves, moderate-to-severe rheumatic mitral stenosis, or incomplete clinical or treatment records were excluded.

Data Collection

Data were collected using a structured data collection form through patient interviews, clinical examination, review of medical records, and available investigation reports. Sociodemographic information included age, sex, and place of residence. Clinical information included type of AF, duration of AF, previous stroke or transient ischemic attack (TIA), hypertension, diabetes mellitus, heart failure, ischemic heart disease, chronic kidney disease, and dyslipidemia. The type of AF was categorized as paroxysmal, persistent, or permanent based on clinical documentation and standard clinical definitions. Relevant cardiovascular risk factors were recorded at baseline.

Assessment of Stroke Risk

Stroke risk was assessed using the CHA_2DS_2-VASc score, which incorporates congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, previous stroke/TIA or thromboembolism, vascular disease, age 65–74 years, and sex category. Participants were categorized into three groups according to their score: 0, 1, and ≥2.

Assessment of Treatment Patterns

Information regarding pharmacological and procedural management was obtained from prescriptions and medical records. Antithrombotic treatment was categorized as DOAC therapy, warfarin therapy, antiplatelet therapy without anticoagulation, or no antithrombotic therapy**.** The specific DOACs, including apixaban, rivaroxaban, and dabigatran, were also recorded.

Management of AF was categorized into rate-control and rhythm-control strategies. Rate-control medications included beta-blockers, calcium-channel blockers, and digoxin. Rhythm-control treatment included amiodarone and other antiarrhythmic drugs. Previous electrical cardioversion and catheter ablation were also documented.

Follow-up and Clinical Outcomes

Patients were followed for 12 months from enrollment or reviewed through available clinical records to assess treatment-related and cardiovascular outcomes. The primary clinical outcomes assessed were stroke/TIA, systemic embolism, major bleeding, hospitalization for heart failure, and cardiovascular

mortality. Non-cardiovascular mortality was also recorded.

Major bleeding was defined according to clinically significant bleeding requiring hospitalization, blood transfusion, intervention, or resulting in a clinically important fall in hemoglobin. The occurrence of any major clinical event during follow-up was also recorded.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics. Continuous variables were expressed as mean ± SD and categorical variables as frequency and percentage. The chi-square or Fisher's exact test was used for categorical comparisons. Logistic regression was performed to identify predictors of stroke/TIA and major bleeding, with results presented as ORs and 95% CIs. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the appropriate institutional ethics committee of Naogaon Medical College. Written informed consent was obtained from participants before enrollment, and confidentiality of all collected information was maintained throughout the study.

RESULTS:

Table 1 shows total of 287 patients with non-valvular atrial fibrillation (NVAF) were included in the study. The mean age of the participants was 63.9 ± 11.1 years, with 168 (58.5%) being male and 119 (41.5%) females. Hypertension was the most common comorbidity, present in 193 (67.2%) patients, followed by diabetes mellitus (n=92, 32.1%), heart failure (n=75, 26.1%), and ischemic heart disease (n=68, 23.7%). Paroxysmal AF was present in 108 (37.6%) patients, while 179 (62.4%) had persistent or permanent AF.

Table 1: Sociodemographic and clinical characteristics of study participants (n=287)

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
<65	149	51.9
≥65	138	48.1
Mean age ± SD	**63.9 ± 11.1**	
Sex		
Male	168	58.5
Female	119	41.5
Residence		
Urban	174	60.6
Rural	113	39.4
Type of AF		
Paroxysmal	108	37.6
Persistent	96	33.4
Permanent	83	28.9
Comorbidities		
Hypertension	193	67.2
Diabetes mellitus	92	32.1
Heart failure	75	26.1
Ischemic heart disease	68	23.7
Previous stroke/TIA	41	14.3
Chronic kidney disease	29	10.1
Dyslipidemia	118	41.1
CHA_2DS_2-VASc score		
0	16	5.6
1	54	18.8
≥2	217	75.6

Treatment patterns

Table 2 presents among the 287 patients, 236 (82.2%) received oral anticoagulant therapy, while 51 (17.8%) did not receive anticoagulation. DOACs were used by 147 (51.2%) patients and warfarin by 89 (31.0%). Apixaban was the most frequently prescribed DOAC (n=69, 24.0%), followed by rivaroxaban (n=58, 20.2%) and dabigatran (n=20, 7.0%). Antiplatelet therapy without anticoagulation was prescribed in 31 (10.8%) patients, whereas 20 (7.0%) received neither anticoagulant nor antiplatelet therapy.

Regarding rate/rhythm management, 208 (72.5%) patients received a rate-control strategy, whereas 79 (27.5%) received a rhythm-control strategy. Beta-blockers were the most commonly prescribed rate-control agents (n=176, 61.3%), followed by calcium-channel blockers (n=40, 13.9%) and digoxin (n=36,

12.5%). Among patients receiving rhythm-control therapy, amiodarone was the most frequently used antiarrhythmic drug (n=47, 16.4%). Electrical cardioversion had been performed in 36 (12.5%) patients and catheter ablation in 13 (4.5%).

Table 2: Treatment patterns among patients with NVAF (n=287)

Treatment	Frequency (n)	Percentage (%)
Oral anticoagulation	236	82.2
DOAC	147	51.2
-Apixaban	69	24.0
-Rivaroxaban	58	20.2
-Dabigatran	20	7.0
Warfarin	89	31.0
No oral anticoagulation	51	17.8
Antiplatelet only	31	10.8
Neither anticoagulant nor antiplatelet	20	7.0
Rate-control strategy	208	72.5
Beta-blocker	176	61.3
Calcium-channel blocker	40	13.9
Digoxin	36	12.5
Rhythm-control strategy	79	27.5
Amiodarone	47	16.4
Other antiarrhythmic drugs	32	11.1
Electrical cardioversion	36	12.5
Catheter ablation	13	4.5

Anticoagulation according to stroke risk

Table 3 shows the proportion of patients receiving anticoagulation increased with increasing CHA_2DS_2-VASc score. Among patients with a score of 0, 9 (56.3%) received anticoagulation, compared with 40 (73.7%) among those with a score of 1 and 187 (86.6%) among those with a score ≥2. DOACs were more frequently used than warfarin across the higher-risk groups.

Table 3: Anticoagulation according to CHA_2DS_2-VASc score

CHA_2DS_2-VASc score	Total n	Anticoagulated n (%)	DOAC n (%)	Warfarin n (%)	Not anticoagulated n (%)
0	16	9 (56.3)	6 (37.5)	3 (18.8)	7 (43.8)
1	54	40 (74.1)	25 (46.3)	15 (27.8)	14 (25.9)
≥2	217	187 (86.2)	116 (53.5)	71 (32.7)	30 (13.8)
Total	**287**	**236 (82.2)**	**147 (51.2)**	**89 (31.0)**	**51 (17.8)**

Clinical outcomes during follow-up

Table 4 shows during a median follow-up period of 12 months (IQR: 10–14 months), 34 (11.8%) patients experienced at least one major clinical event. Stroke/TIA occurred in 14 (4.9%) patients, while major bleeding occurred in 11 (3.8%). Hospitalization for heart failure was recorded in 10 (3.5%) patients and systemic embolism in 3 (1.0%). A total of 5 (1.7%) patients died from cardiovascular causes and 6 (2.1%) died from non-cardiovascular causes.

Stroke/TIA was significantly less frequent among patients receiving oral anticoagulation compared with those who were not receiving anticoagulation (3.0% vs. 13.7%, p=0.004). In contrast, major bleeding occurred in 9 (3.8%) anticoagulated patients and 2 (3.9%) non-anticoagulated patients (p=0.972). Cardiovascular mortality was also lower among anticoagulated patients (1.3% vs. 3.9%), although the difference was not statistically significant (p=0.242).

Table 4: Clinical outcomes during 12-month follow-up

Clinical outcome	Overall n (%)	Anticoagulated n=236 (%)	Not anticoagulated n=51 (%)	p-value
Stroke/TIA	14 (4.9)	7 (3.0)	7 (13.7)	**0.004**
Systemic embolism	3 (1.0)	2 (0.8)	1 (2.0)	0.451
Major bleeding	11 (3.8)	9 (3.8)	2 (3.9)	0.972
Heart failure hospitalization	10 (3.5)	7 (3.0)	3 (5.9)	0.380
Cardiovascular death	5 (1.7)	3 (1.3)	2 (3.9)	0.242
Non-cardiovascular death	6 (2.1)	4 (1.7)	2 (3.9)	0.330
Any major clinical event	34 (11.8)	26 (11.0)	8 (15.7)	0.356

Comparison between DOAC and warfarin users

Table 5 presents among the 236 patients receiving oral anticoagulation, 147 (62.3%) received DOACs and 89 (37.7%) received warfarin. Stroke/TIA occurred in 4 (2.7%) patients receiving DOACs compared with 5 (5.6%) receiving warfarin; however, the difference was not statistically significant (p=0.332). Major bleeding was observed in 4 (2.7%) DOAC users and 5 (5.6%) warfarin users (p=0.332). Heart failure-related hospitalization occurred in 9 (6.1%) DOAC users compared with 7 (7.9%) warfarin users (p=0.610). Cardiovascular death occurred in 2 (1.4%) patients receiving DOACs and 2 (2.2%) receiving warfarin (p=0.648).

Table 5: Comparison of clinical outcomes between DOAC and warfarin users

Outcome	DOAC (n=147) n (%)	Warfarin (n=89) n (%)	p-value
Stroke/TIA	4 (2.7)	5 (5.6)	0.332
Systemic embolism	1 (0.7)	1 (1.1)	0.754
Major bleeding	4 (2.7)	5 (5.6)	0.332
Heart failure hospitalization	9 (6.1)	7 (7.9)	0.610
Cardiovascular death	2 (1.4)	2 (2.2)	0.648
Non-cardiovascular death	3 (2.0)	2 (2.2)	0.925

Factors associated with stroke/TIA

Table 6 shows univariate analysis, age ≥65 years, previous stroke/TIA, heart failure, CHA_2DS_2-VASc score ≥2, and absence of oral anticoagulation were significantly associated with the occurrence of stroke/TIA during follow-up. These variables were subsequently entered into a multivariable logistic regression model.

After adjustment for potential confounders, previous stroke/TIA (adjusted OR [aOR]=3.58, 95% CI: 1.31–9.79; p=0.013), CHA_2DS_2-VASc score ≥2 (aOR=2.94, 95% CI: 1.08–7.98; p=0.035), and absence of oral anticoagulation (aOR=3.91, 95% CI: 1.39–10.98; p=0.010) remained independently associated with stroke/TIA.

Table 6: Factors associated with stroke/TIA during follow-up

Variable	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age ≥65 years	2.46 (0.88–6.89)	0.085	1.92 (0.64–5.75)	0.244
Male sex	1.31 (0.51–3.39)	0.571	1.18 (0.42–3.30)	0.756
Previous stroke/TIA	4.12 (1.63–10.42)	**0.003**	3.58 (1.31–9.79)	**0.013**
Heart failure	2.71 (1.02–7.20)	**0.045**	2.21 (0.77–6.34)	0.141
CHA_2DS_2-VASc ≥2	3.46 (1.28–9.35)	**0.014**	2.94 (1.08–7.98)	**0.035**
No oral anticoagulation	4.62 (1.86–11.48)	**0.001**	3.91 (1.39–10.98)	**0.010**
Persistent/permanent AF	1.76 (0.67–4.63)	0.250	1.51 (0.53–4.30)	0.440

Predictors of major bleeding

Table 7 shows multivariable analysis, age ≥75 years and concomitant antiplatelet therapy were independently associated with major bleeding. Patients aged ≥75 years had approximately three times higher odds of major bleeding (aOR=3.21, 95% CI: 1.09–9.46; p=0.034), while concomitant antiplatelet therapy was also associated with increased bleeding risk (aOR=2.88, 95% CI: 1.01–8.19; p=0.048).

Table 7: Predictors of major bleeding during follow-up

Variable	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age ≥75 years	3.48 (1.24–9.76)	0.017	3.21 (1.09–9.46)	0.034
Male sex	1.42 (0.52–3.87)	0.493	1.28 (0.44–3.72)	0.651
Chronic kidney disease	2.76 (0.83–9.16)	0.095	2.31 (0.66–8.09)	0.190
Warfarin use	2.11 (0.74–6.01)	0.162	1.87 (0.62–5.64)	0.267
Concomitant antiplatelet therapy	3.14 (1.15–8.58)	0.026	2.88 (1.01–8.19)	0.048
Previous bleeding history	2.67 (0.78–9.14)	0.116	2.21 (0.61–8.01)	0.227

DISCUSSION:

In our study, patients with NVAF were predominantly older males, with hypertension being the most common comorbidity, followed by dyslipidemia, diabetes, and heart failure. This pattern is consistent with a large population-based study that reported increasing AF prevalence with age and a high burden of cardiovascular comorbidities, particularly hypertension, diabetes, heart failure, and prior stroke or thromboembolism. The high proportion of patients with CHA_2DS_2-VASc scores ≥2 in our study further indicates a substantial thromboembolic risk among patients with NVAF [15].

In our study, most patients received oral anticoagulation, with DOACs more frequently prescribed than warfarin, and apixaban being the most commonly used DOAC. Rate control was the predominant management strategy, with beta-blockers being the most frequently used agents. These findings are broadly consistent with real-world evidence showing substantial use of oral anticoagulation and increasing adoption of DOACs among patients with NVAF, although treatment patterns varied according to comorbidities and patient characteristics [16].

In our study, anticoagulation use increased with higher CHA_2DS_2-VASc scores, reaching 86.2% among patients with scores ≥2. DOACs were more commonly used than warfarin in these higher-risk groups. Similar findings have been reported in primary-care settings, where anticoagulation use increased among eligible patients, although vitamin K antagonists remained commonly prescribed. This supports the importance of risk-based anticoagulation while indicating a remaining treatment gap [17].

During 12 months of follow-up, 11.8% of patients experienced at least one major clinical event. Stroke/TIA occurred significantly less frequently among anticoagulated patients than non-anticoagulated patients (3.0% vs. 13.7%), while major bleeding rates were similar between groups. These findings are consistent with registry data demonstrating increasing risks of stroke/TIA, major bleeding, heart failure, and mortality with advancing age in patients with NVAF [18].

In our study, DOAC users had numerically lower rates of stroke/TIA and major bleeding than warfarin users, although these differences were not statistically significant. Similarly, real-world Medicare data have shown favorable clinical outcomes with DOACs compared with warfarin, including lower risks of stroke/systemic embolism and major bleeding among elderly patients with NVAF [19]. These findings support the growing role of DOACs as an alternative to warfarin in routine NVAF management.

Previous stroke/TIA, CHA_2DS_2-VASc score ≥2, and absence of oral anticoagulation were independently associated with subsequent stroke/TIA in our study. These findings are consistent with evidence from the SAMURAI-NVAF study, which highlighted the importance of previous cerebrovascular events and appropriate oral anticoagulant therapy in short-term outcomes among patients with NVAF and stroke/TIA [20].

Finally, age ≥75 years and concomitant antiplatelet therapy were independently associated with major bleeding in our study. This is consistent with evidence showing that older age and other clinical factors contribute to bleeding risk among anticoagulated patients with NVAF. Systematic assessment of bleeding risk may therefore help identify high-risk patients and support safer anticoagulation management [21].

Overall, appropriate risk-based anticoagulation was associated with fewer thromboembolic events, while older age and concomitant antiplatelet therapy identified patients requiring closer bleeding-risk monitoring.

CONCLUSION:

DOACs were the most commonly used anticoagulants, while rate control remained the predominant management strategy. Anticoagulation was associated with a lower occurrence of stroke/TIA, whereas previous stroke/TIA and higher stroke risk were associated with increased events. Older age and concomitant antiplatelet therapy were associated with major bleeding. These findings emphasize the importance of individualized, risk-based anticoagulation and careful follow-up to improve outcomes in patients with NVAF.

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