

## Frequency of Atrial Fibrillation in Patients with Acute Ischemic Stroke

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### Abstract

**Objective:** To detect the frequency of atrial fibrillation (AF) in patients with acute ischemic stroke (AIS) and determine the factors associated with a higher risk of developing the disease.

**Material and Methods:** This descriptive, cross-sectional study was conducted in the Medicine Department, Federal Government Polyclinic Hospital, Islamabad after ethical approval from 1st February 2022 to 30th January 2023. After taking written informed consent, 72 patients presenting in emergency and outpatient departments with AIS were included by nonprobability convenient sampling. All patients underwent electrocardiograms (ECGs) to diagnose AF. The severity of AF was determined by the National Institute of Health Stroke Scale (NIHSS). The demographic details of patients, duration of disease and co-morbidities such as hypertension, ischemic heart disease, diabetes mellitus were recorded. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.

**Results:** The frequency of AF was 20 (27.8%) in patients with acute ischemic stroke. Seven (9.7%) patients had known AF and 13 (18.1%) patients had unknown AF. The mean duration of AF was  $11.4 \pm 21.8$  days. One (1.4%) patient had acute AF, 5 (6.9%) had paroxysmal AF and 1 (1.4%) had persistent AF. Increased age (>60 years) and higher NIHSS scores were linked with higher chances of developing AF.

**Conclusion:** A greater proportion of patients (27.8%) with acute ischemic stroke developed atrial fibrillation in our study. Patients with age >60 years and severe ischemic stroke as indicated by NIHSS score had higher chances of developing atrial fibrillation.

**Keywords:** Atrial fibrillation, AF, acute ischemic stroke, AIS

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### Introduction

Stroke is a serious health concern, affecting 89.13 million individuals worldwide. Acute ischemic stroke (AIS) is the most common type of stroke, constituting 80-85% of all stroke cases. Out of 89.13 million cases, 68.16 million individuals are affected by AIS. Acute ischemic stroke (AIS) is a leading contributor to global morbidity and mortality. Stroke is responsible for 7.08 million deaths. Almost 3.48 million deaths are

caused by AIS.<sup>1,2</sup> It is also associated with a huge socio-economic burden including the cost of loss of employment, healthcare, and rehabilitation.<sup>3</sup> The incidence of stroke and its associated mortality has decreased in high-income countries. But its prevalence has risen in low- and middle-income countries (LMIC). At present, greater than 75% of the deaths and 80% of the disability-adjusted life-years (DALYs) attributed to stroke occur in LMIC.<sup>4</sup> Stroke is a major cause of chronic physical disabilities as well as impaired cognition of the patients. In addition, it also has a significant impact on their social life and leading to a poor quality of life.<sup>5</sup> It is also responsible for seizure disorder, depression, and dementia.<sup>6</sup> The management of stroke needs a multidisciplinary approach and includes symptomatic management, stroke thrombolysis, secondary prevention, and rehabilitation.<sup>7</sup>

Atrial fibrillation is a frequently occurring arrhythmia with complex pathophysiology and profound health

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effects.<sup>8</sup> It affects nearly 5 million people across the world but its prevalence is rising with each passing year. A significant proportion of mortality and morbidity is attributed to this disease.<sup>9</sup> Combating the global burden of this disease has become a great challenge.<sup>10</sup> Evidence suggests acute ischemic stroke has a key role in the pathogenesis of AF. In the acute phase after stroke, various ECG changes occur leading to AF. Three to five days after stroke, 7% of the patients with AIS develop AF. The frequency increases with prolonged cardiac monitoring. Recently, the disease was termed AF diagnosed after stroke (AFDAS).<sup>11</sup> Various factors are associated with an increased risk of developing AFDAS. Older age is associated with greater chances of AFDAS. The disease is less common in some races such as Hispanic and Blacks. This may be attributed to the small size of the left atrium. According to the Ontario Stroke Registry, women are at higher risk of AFDAS.<sup>12</sup>

This study was conducted to assess the magnitude of AF burden in individuals admitted to a medical facility following an ischemic stroke. The investigation aimed to quantify and understand the prevalence and intensity of AF in our population, providing valuable insights into the association between AF and ischemic stroke. The findings from this study could be instrumental in guiding healthcare professionals toward the most suitable preventive and treatment approaches for AF in patients with AIS, thereby enhancing overall patient outcomes. The study also attempted to determine the factors associated with a higher risk of developing AF in our population. So, that we can identify patients at higher risk and manage them accordingly.

## Material and Methods

This descriptive, cross-sectional study was conducted in the Medicine Department, Federal Government Polyclinic Hospital, Islamabad after ethical approval (Ethical approval number: No. FGPC 1/12/2021). The duration of study was one year from 1st February 2022 to 30th January 2023. A sample size of 72 was calculated using the WHO sample size calculator taking the prevalence of AF as 25.2%, 13 95% confidence interval and 10% margin of error. Patients of any gender and age ranging from 18 to 65 years presenting in emergency and outpatient departments with acute ischemic stroke (whether first episode or recurrent) were included by nonprobability convenient sampling. Patients experiencing hemorrhagic stroke, transient ischemic attack (TIA), cerebral tumor, brain abscess, tuberculoma, or other

space-occupying lesion were excluded. After obtaining approval from the hospital's ethical committee, patients or their attendants gave written informed consent. Patients with AIS had an abrupt impairment of neurological function lasting >24 hours, characterized by focal neurological deficits like hemiparesis or cranial nerve palsies, which was radiologically confirmed through hypodense lesions on computerized tomography (CT) brain scans. All patients underwent electrocardiograms (ECGs) to determine the presence or absence of atrial fibrillation. A cardiac rhythm disturbance distinguished by an irregularly irregular radial pulse during the examination and the absence of P waves, along with irregular R-R intervals evident on twelve-lead ECG was labeled as atrial fibrillation. Patients with a history of AF, supported by past medical records and ECGs (if available), underwent a thorough review, including a comprehensive history assessment, to ascertain whether their atrial fibrillation was previously diagnosed (known AF) or undiagnosed (unknown AF). Patients not previously diagnosed or detected as having AF had unknown AF. Patients with a documented history of atrial fibrillation established through their medical records, historical information, and prior ECG results were categorized as Known AF. For those with known AF, the duration of their atrial fibrillation was documented. Based on the duration, atrial fibrillation was further classified as acute, paroxysmal, or persistent. Patients having a history of AF of 1 week duration had acute AF, >1 week but <6 months duration had paroxysmal AF and > 6 months but < 1 year had persistent AF. The severity of AF was determined by the National Institute of Health Stroke Scale (NIHSS). The interpretation of NIHSS is as follows: 1-4: Minor stroke, 5-15: Moderate stroke, 16-20: Moderately severe, 21-42: Severe stroke.<sup>14</sup> The demographic details of patients with acute ischemic stroke (such as name, age, gender), medical history (including presenting symptoms and symptom duration), co-morbidities such as hypertension (HTN), ischemic heart disease (IHD), diabetes mellitus (DM) and a comprehensive physical examination were meticulously recorded. The data was analyzed with the Statistical Package for the Social Sciences (SPSS) version 25.0. Quantitative variables, including age and duration of symptoms were expressed as mean and standard deviations. Categorical variables, such as gender, presentation symptoms, presence of atrial fibrillation, and comorbidities, were presented as frequencies and percentages. A Chi-square test was employed to identify the association between AF and other variables. A

significance level of  $p \leq 0.05$  was considered statistically significant.

## Results

Patients had an average age of  $54.7 \pm 6.3$  years. Among these, 41 (56.9%) were male, and 31 (43.1%) were female. Thirty-four (47.2%) of the patients were 71-80 years old followed by 23 (31.9%) patients 61-70 years of age. The average duration of symptoms was  $8.33 \pm 4.20$  hours. The main symptoms were numbness observed in 17 (23.6%), confusion in 15 (20.8%), dizziness in 11 (15.3%), trouble in speaking in 10 (13.9%), trouble in walking in 10 (13.9%), and severe headache in 9

(12.5%) of the patients. The results of comorbidities showed that 15 (20.8%) patients had hypertension, 18 (25%) patients had ischemic heart disease and 17 (23.6%) patients had diabetes mellitus. The frequency of AF was 20 (27.8%) in patients with acute ischemic stroke. Based on history, 7 (9.7%) patients had known AF and 13 (18.1%) patients had unknown AF. The mean duration of AF was  $11.4 \pm 21.8$  days. According to duration 1 (1.4%) patients had acute AF, 5 (6.9%) had paroxysmal AF and 1 (1.4%) had persistent AF. The majority of the patients had NIHSS of 5-15 (48.6%) followed by 16-20 (37.5%). These results are shown in Table 1. The association of AF was seen with various variables that showed a significant relation of AF with age and severity of ischemic stroke, as indicated by NIHSS. Increased age ( $>60$

**Table 1:** Descriptive Statistics of Study Variables

| Study Variable          | Descriptive Statistics |
|-------------------------|------------------------|
| <b>Age</b>              | $54.7 \pm 6.3$ years   |
| <b>Age Groups</b>       |                        |
| 51-60 years             | 15 (20.8%)             |
| 61-70 years             | 23 (31.9%)             |
| 71-80 years             | 34 (47.2%)             |
| <b>Gender</b>           |                        |
| Male                    | 41 (56.9%)             |
| Female                  | 31 (43.1%)             |
| <b>Co-morbidities</b>   |                        |
| No Co-morbidity         | 22(30.6%)              |
| Ischemic heart disease  | 18(25%)                |
| Diabetes mellitus       | 17(23.6%)              |
| Hypertension            | 15(20.8%)              |
| <b>Symptoms</b>         |                        |
| Numbness                | 17(23.6%)              |
| Confusion               | 15(20.8%)              |
| Dizziness               | 11(15.3%)              |
| Trouble speaking        | 10(13.9%)              |
| Sudden trouble walking  | 10(13.9%)              |
| Severe headache         | 9(12.5%)               |
| Duration of AF Symptoms | $8.3 \pm 4.2$ hours    |
| Duration of AF          | $11.4 \pm 21.8$ days   |
| Frequency of AF         | 20 (27.8%)             |
| <b>Type of AF</b>       |                        |
| 1. Unknown AF           | 13(9.7%)               |
| 2. Known AF             | 7(18.1%)               |
| a. Acute AF             | 1(1.4%)                |
| b. Paroxysmal AF        | 5(6.9%)                |
| c. Persistent AF        | 1(1.4%)                |
| <b>NIHSS</b>            |                        |
| 1-4                     | 6(8.3%)                |
| 5-15                    | 35(48.6%)              |
| 16-20                   | 27(37.5%)              |
| 21-42                   | 4(5.6%)                |

**Table 2:** Association of AF in Patients of Acute Ischemic Stroke with Various Variables

| Variable              | Atrial Fibrillation |           | Total     | Chi-square Statistic | p-value |
|-----------------------|---------------------|-----------|-----------|----------------------|---------|
|                       | Present             | Absent    |           |                      |         |
| <b>Age Groups</b>     |                     |           |           |                      |         |
| 51-60 years           | 3                   | 15        | 18        | 7.61                 | 0.022*  |
| 61-70 years           | 8                   | 18        | 26        |                      |         |
| 71-80 years           | 9                   | 19        | 28        |                      |         |
| <b>Total</b>          | <b>20</b>           | <b>52</b> | <b>72</b> |                      |         |
| <b>Gender</b>         |                     |           |           |                      |         |
| Male                  | 10                  | 31        | 41        | 0.544                | 0.46    |
| Female                | 10                  | 21        | 31        |                      |         |
| <b>Total</b>          | <b>20</b>           | <b>52</b> | <b>72</b> |                      |         |
| <b>Co-morbidities</b> |                     |           |           |                      |         |
| IHD                   | 8                   | 10        | 18        | 0.305                | 0.85    |
| DM                    | 6                   | 11        | 17        |                      |         |
| HTM                   | 6                   | 9         | 15        |                      |         |
| <b>Total</b>          | <b>20</b>           | <b>30</b> | <b>50</b> |                      |         |
| <b>Symptoms of AF</b> |                     |           |           |                      |         |
| Numbness              | 3                   | 14        | 17        | 2.747                | 0.60    |
| Confusion             | 3                   | 12        | 15        |                      |         |
| Dizziness             | 4                   | 7         | 11        |                      |         |
| Trouble in speaking   | 4                   | 6         | 10        |                      |         |
| Trouble in walking    | 2                   | 8         | 10        |                      |         |
| Severe headache       | 4                   | 5         | 9         |                      |         |
| <b>Total</b>          | <b>20</b>           | <b>52</b> | <b>72</b> |                      |         |
| <b>NIHSS</b>          |                     |           |           |                      |         |
| 1-4                   | 1                   | 5         | 6         | 13.21                | 0.004*  |
| 5-15                  | 4                   | 31        | 35        |                      |         |
| 16-20                 | 12                  | 15        | 27        |                      |         |
| 21-42                 | 3                   | 1         | 4         |                      |         |
| <b>Total</b>          | <b>20</b>           | <b>52</b> | <b>72</b> |                      |         |

\*Statistically Significant

years) and higher NIHSS were associated with higher chances of developing AF. (Table 2)

## Discussion

Despite recent advancements in treating modalities of acute ischemic stroke, a significant number of survivors experience disease complications. The prognosis of a patient after a cerebrovascular accident depends on the extent of the disease, the time lapse from clinical presentation to medical attention, rehabilitation provided, and the patient's level of functioning before the episode of stroke.<sup>15,16</sup> Patients with AIS are at high risk of developing atrial fibrillation. A study reported that the incidence of AF after acute ischemic stroke was 3.4%, 2.2% after hemorrhagic stroke, and 2.9% after non-stroke hospitalization.<sup>17</sup> Early detection and treatment of AF may minimize its associated morbidity and death. The episodes of stroke associated with AF are more likely to be severe, incapacitating, and deadly.<sup>18</sup>

In our study, the average age of the patients was 54.7±6.3 years, with 56.9% of patients being male. In a study by Shaikh et al., the mean age of the patients was 53.78 ± 8.34 years and 90.2% were males.<sup>19</sup> In another study, 69.5% were males and patients had an average age of 61.4 years.<sup>13</sup> In a study conducted in Pakistan, 56.67% of the patients with AIS were males.<sup>20</sup> Kiani et al. reported that 69% of the patients were males and the average age of the patients was 58.2 ± 10.1 years.<sup>21</sup> Our study showed that the most commonly affected age group was 71-80 years (47.2%) followed by 61-70 years (31.9%). Similarly, according to the study by Khalid et al., most of the patients with AIS were in the age group of 71-80 years (46.83%) followed by 61-70 years (25%) and 51-60 years (14.29%).<sup>20</sup> Our study showed that the average duration of AF symptoms was 8.3±4.2 hours. This duration was 9.18±7.55 hours in another study.<sup>19</sup> In our study, the majority of the patients had NIHSS scores of 5-15 (48.6%) followed by 16-20 (37.5%), 0-4 (8.3%) and 21-42 (5.6%). In a study, 44.7% of the patients had NIHSS scores from 6-15, 34.6% had scores >15 and 20.7% had scores <5.<sup>13</sup> In our study, the frequency of atrial fibrillation was 27.8% in patients with AIS. The frequency of AF was 26.5% in patients with AIS in another study.<sup>19</sup> Similarly, Goel et al., Kiani et al. and Shah et al. reported AF in 25.2%, 23% and 20.2% of the patients with AIS, respectively.<sup>13,21,22</sup> The frequency of AF in AIS patients was much less (18.67%) in another study conducted at Qazi Hussain Medical Complex in Nowshera, Pakistan.<sup>19</sup> The prevalence of AF was much

less in other studies. A study conducted in India revealed 8% prevalence of AT in AIS patients.<sup>23</sup> Our study showed that AF in patients with ischemic stroke was linked with increased age and higher NIHSS. A study reported a significant association of AF in patients of AIS with increasing age.<sup>20</sup> Goel et al. and Bhana et al. reported that AF was more common in females, elderly, patients with high NIHSS and atrial dilation with statistically significant results.<sup>13,23</sup> In contrast, another study reported that age is not significantly associated with age.<sup>21</sup>

A more extensive study is imperative with a large sample size and recruiting patients from multiple centers so that the results can be generalized. A high risk of morbidity and mortality associated with ischemic stroke is attributed to atrial fibrillation. However, the study did not evaluate the outcomes in patients of AIS who developed AF. The study should be conducted in the future to evaluate the patient outcomes at follow-up.

## Conclusion

A greater proportion of patients (27.8%) with acute ischemic stroke developed atrial fibrillation in our study. Patients with age >60 years and severe ischemic stroke as indicated by NIHSS score had higher chances of developing atrial fibrillation.

**Conflict of Interest:** *None*

**Funding Source:** *None*

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### Authors Contribution

**RA:** Conceptualization of Project  
**RA, MA:** Data Collection  
**MA, HSK:** Literature Search  
**AF, MN:** Statistical Analysis  
**HSK, RA:** Drafting, Revision  
**RA, RA:** Writing of Manuscript