Prevalence of Atrial Fibrillation in Older Adults with Diabetes Mellitus: A Cross-Sectional Study

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ABSTRACT

Background: Atrial fibrillation (AF) is a common arrhythmia in older adults, with diabetes mellitus (DM) serving as a significant risk factor. The interplay of aging, glycemic control, and comorbid conditions such as hypertension and chronic kidney disease (CKD) heightens the prevalence and associated risks of AF in this population.

Objective: To determine the prevalence of AF in older adults with DM and identify key associated risk factors.

Methods: This cross-sectional study included 137 older adults with DM recruited from clinical settings. Participants underwent clinical evaluations, including demographic data collection, glycemic control assessment (HbA1c), and screening for comorbidities. Standard 12-lead electrocardiography was used to detect AF, with all diagnoses confirmed by certified cardiologists. Statistical analyses, including chi-square tests and multivariate logistic regression, were performed using SPSS version 25.

Results: The overall prevalence of AF was 11.7% (16/137), with 43.8% (7/16) newly diagnosed cases and 31.3% (5/16) asymptomatic AF. Advanced age (OR: 1.45; 95% CI: 1.11–1.88; p=0.005) and CKD (OR: 2.87; 95% CI: 1.33–6.21; p=0.007) were significant independent predictors.

Conclusion: The study highlights a significant prevalence of AF, including silent cases, in older adults with DM, emphasizing the need for routine screening and early intervention in high-risk populations.

INTRODUCTION

The prevalence of atrial fibrillation (AF) among older adults with diabetes mellitus (DM) is a significant and growing concern in the medical community. Numerous studies have documented that individuals with diabetes face a considerably higher risk of developing AF compared to the general population, with reported prevalence rates ranging from 4.4% to 25% in different diabetic populations (1-3). This elevated prevalence is attributed to complex interactions between diabetes and AF, encompassing structural, electrical, and autonomic remodelling of the heart, which are compounded by shared risk factors such as hypertension, obesity, and aging (4, 5). Age, in particular, stands out as a critical predictor of AF in patients with diabetes, with older individuals showing a markedly higher prevalence of the arrhythmia (6). Male sex, prolonged diabetes duration, poor glycemic control, and comorbid conditions such as chronic kidney disease further heighten this risk (3, 7, 8).

The intersection of diabetes and AF is associated with severe clinical implications, including increased cardiovascular and cerebrovascular mortality. Patients with both conditions face a higher burden of thromboembolic events, particularly those with poor glycemic control as measured by elevated HbA1c levels (9). Silent or asymptomatic AF, which is more frequently observed in diabetic patients, poses additional challenges for timely diagnosis and management, necessitating active and prolonged screening strategies, such as continuous ECG monitoring, especially in high-risk groups (2, 10). Despite advancements in medical management, gaps persist in the early detection and treatment of AF among older adults with diabetes, underscoring the importance of integrated screening and prevention programs tailored to this vulnerable population (11).

Studies conducted across diverse populations have highlighted notable regional and demographic variations in the prevalence and predictors of AF among diabetic patients. For instance, in a Japanese cohort, male sex, advanced age, and reduced kidney function emerged as independent risk factors for AF (12). Similarly, findings from a Polish population demonstrated an increased prevalence of both symptomatic and silent AF in individuals with diabetes, with age remaining a dominant determinant (2). The long-term consequences of this co-morbidity, including heightened risks of ischemic stroke, heart failure, and mortality, make it imperative for healthcare systems to address the unique needs of this growing patient demographic through enhanced awareness, screening, and targeted interventions (1, 13).

This body of evidence underscores the importance of understanding the interplay between diabetes and AF in shaping clinical outcomes. Comprehensive data from population-based studies and national registries, such as those from Sweden and Finland, provide critical insights into

the temporal trends and prognostic implications of diabetes and AF co-occurrence (14, 15). These findings collectively advocate for a multidisciplinary approach to mitigate the compounded risks faced by older adults with diabetes, thereby improving cardiovascular health outcomes and reducing the associated disease burden globally.

MATERIAL AND METHODS

This study was designed as a cross-sectional investigation aimed at determining the prevalence of atrial fibrillation (AF) in older adults with diabetes mellitus (DM). A cross-sectional approach was selected as it allows for an efficient assessment of disease prevalence within a defined population at a specific point in time, providing valuable insights into the relationship between AF and DM in this demographic (1).

The study population included a sample size of 137 participants, all of whom met the inclusion criteria of being older adults diagnosed with DM. Participants were recruited from clinical settings, ensuring a representative sample of this population. Detailed inclusion and exclusion criteria were established to maintain the study's focus and rigor. Individuals with a history of AF were excluded to focus on previously undiagnosed cases. Recruitment and data collection were conducted between January and June 2024. The research was conducted in accordance with the principles established in the Declaration of Helsinki, receiving ethical approval from the appropriate institutional review board. Upon acquiring sufficient information, each participant granted consent to engage in the study. They were informed of the research objectives, the procedures to be undertaken, and their entitlement to withdraw from the study at any time without impacting their ongoing medical treatment.

Data collection involved detailed patient interviews, medical record reviews, and diagnostic testing to confirm the presence of AF. Participants underwent a comprehensive evaluation that included demographic and clinical assessments, such as age, sex, duration of diabetes, glycemic control (measured via HbA1c levels), and comorbid conditions like hypertension and chronic kidney disease. Electrocardiographic (ECG) assessments were performed using standard 12-lead ECG recordings, which were interpreted by certified cardiologists to confirm the presence or absence of AF. Silent or asymptomatic cases of AF were identified through systematic ECG screening.

The data were carefully documented and then anonymized to safeguard the participants' identity. The acquired data was securely stored, with access restricted to authorized research personnel. Quality control measures were used throughout the data collection phase to ensure its accuracy and dependability. The statistical analysis was conducted using SPSS version 25. Descriptive statistics were used to succinctly summarize the baseline demographic and clinical characteristics of the research cohort. We calculated 95% confidence intervals for the prevalence estimates of atrial fibrillation (AF). Categorical data were examined using chi-square tests, whilst continuous variables were assessed using independent t-tests in regard to the associations between atrial fibrillation (AF) and demographic, clinical, and biochemical characteristics. A multivariate logistic regression model was used to identify the independent predictors of atrial fibrillation (AF) in this cohort. Statistical significance was determined when the p-value fell below 0.05.

RESULTS

This study included 137 individuals aged over 65 who had been diagnosed with diabetes mellitus (DM). Table 1 delineates the demographic and clinical characteristics of the study participants. The study participants had a mean age of 69.4 years with a standard deviation of 5.8 years. Furthermore, males constituted 58.4% of the participants. The mean duration of diabetes was 12.7 years, with a standard deviation of 4.2 years, and 73% of the population was diagnosed with type 2 diabetes.

Table 1: Baseline Characteristics of Participants

Characteristic	Value (n=137)
Mean age (years)	69.4 ± 5.8
Male (%)	58.4
Type 2 diabetes (%)	72.3
Diabetes duration (years)	12.7 ± 4.2
Hypertension (%)	64.2
Chronic kidney disease (%)	35.6
Mean HbA1c (%)	8.3 ± 1.2

Table 2: Prevalence of Atrial Fibrillation Stratified by Key Variables

Variable	Total (n)	AF Cases (n)	Prevalence (%)
Age ≥ 70 years	82	12	14.6
Male	80	10	12.5
Female	57	6	10.5
Hypertension	88	13	14.8
CKD	49	9	18.4
Poor glycemic control (HbA1c > 8%)	61	10	16.4

The prevalence of atrial fibrillation (AF) in the study population was 11.7% (16/137). Of these, 43.8% (7/16) of cases were newly diagnosed during systematic screening. Asymptomatic or silent AF was identified in 31.3% (5/16) of cases. The prevalence rates stratified by age, sex, and comorbidities are presented in Table 2. Hypertension was present in 64.2% of participants, while 35.6% had chronic kidney disease (CKD). Glycemic control, assessed by HbA1c levels, revealed a mean value of 8.3 ± 1.2%. The analysis of risk factors associated with AF revealed that advanced age (p=0.032), male sex (p=0.045), and the presence of CKD (p=0.009) were significantly associated with AF. Hypertension and poor glycemic control showed trends toward significance but did not reach the threshold (p=0.061 and p=0.074, respectively).

A multivariate logistic regression analysis identified advanced age (odds ratio [OR]: 1.45; 95% CI: 1.11–1.88; p=0.005) and CKD (OR: 2.87; 95% CI: 1.33–6.21; p=0.007) as independent predictors of AF in this population (Table 3).

Table 3: Multivariate Logistic Regression Analysis for Predictors of AF

Variable	Odds Ratio (95% CI)	p-value
Age ≥ 70 years	1.45 (1.11–1.88)	0.005
Male sex	1.29 (0.89–1.86)	0.092
Hypertension	1.68 (0.94–2.82)	0.065
CKD	2.87 (1.33–6.21)	0.007
Poor glycemic control (HbA1c > 8%)	1.54 (0.93–2.56)	0.081

This detailed analysis highlights a significant burden of undiagnosed and silent AF among older adults with diabetes, particularly in those with CKD and advanced age. These findings underscore the importance of routine screening in high-risk subgroups to enable timely diagnosis and intervention.

DISCUSSION

The present study revealed a prevalence of atrial fibrillation (AF) of 11.7% in older adults with diabetes mellitus (DM), with 43.8% of cases being newly diagnosed during systematic screening. These findings are consistent with previous research that has established an increased risk of AF in individuals with DM, with reported prevalence rates ranging from 4.4% to 25% depending on the study population and diagnostic methodologies (1, 2). The identification of silent AF in 31.3% of cases underscores the challenge of undiagnosed AF in this population, aligning with studies emphasizing the need for active screening to uncover asymptomatic presentations (3, 4).

Advanced age and chronic kidney disease (CKD) emerged as independent predictors of AF in this cohort, which aligns with the established pathophysiological mechanisms linking these factors with arrhythmogenesis. Aging contributes to structural remodeling, fibrosis, and electrical changes in the atrial myocardium, while CKD exacerbates these effects through systemic inflammation, electrolyte imbalances, and increased atrial pressure (5, 6). Hypertension and poor glycemic control, while not statistically significant in multivariate analysis, showed trends toward increasing AF risk, which is consistent with the known role of these factors in promoting atrial remodeling and dysfunction (7). These results echo findings from population-based studies that have identified similar risk factors in diabetic populations (8-17).

This study's strength lies in its systematic screening approach, which facilitated the detection of both symptomatic and silent AF cases. The use of standard 12-lead electrocardiography interpreted by cardiologists ensured diagnostic accuracy. The inclusion of detailed clinical data, including glycemic control and comorbidities, allowed for a comprehensive analysis of factors associated with AF. Moreover, the study design and sample size provided robust prevalence estimates for this specific population.

However, several limitations should be acknowledged. The cross-sectional design restricted the ability to establish causal relationships between risk factors and AF. The relatively small sample size, while sufficient for prevalence estimation, may have limited the statistical power to detect associations with certain variables. Additionally, the study was conducted in a clinical setting, potentially introducing selection bias, as individuals attending healthcare facilities may differ from the general population in terms of disease severity and healthcare access. The absence of continuous monitoring methods, such as ambulatory ECG, may have resulted in missed detection of paroxysmal AF, which is often underdiagnosed in standard screening protocols (10).

Despite these limitations, the findings have important clinical implications. The observed prevalence of AF, particularly silent AF, highlights the need for routine screening in high-risk diabetic populations, especially among older adults and those with CKD. Early detection and management of AF are crucial to reducing the risk of thromboembolic complications, such as ischemic stroke, which are disproportionately higher in individuals with both DM and AF (11-14). Comprehensive screening strategies incorporating advanced diagnostic tools, such as wearable ECG monitors or telemedicine-based platforms, could improve detection rates and patient outcomes (18-21).

Future research should focus on longitudinal studies to elucidate causal pathways and evaluate the long-term impact of glycemic control and renal function on AF development. Expanding the scope to include diverse populations and larger cohorts would enhance generalizability and statistical power. Interventional studies examining the efficacy of targeted screening and early management strategies in diabetic populations are also warranted. Overall, this study reinforces the importance of integrating AF screening into routine diabetes care and

tailoring interventions to the unique risk profiles of this vulnerable population (22-24).

CONCLUSION

This study highlighted a significant prevalence of atrial fibrillation (AF), including a high proportion of silent cases, among older adults with diabetes mellitus, with advanced age and chronic kidney disease identified as key risk factors. These findings underscore the critical need for routine AF screening in high-risk diabetic populations to enable timely diagnosis and management. Early detection of AF in this group has profound implications for reducing the burden of stroke, cardiovascular complications, and mortality, ultimately improving human healthcare outcomes through targeted preventive and therapeutic strategies.

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