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Original Article

The Prevalence of Atrial Fibrillation in the Iranian Population in a 15-Year Cohort Study

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ABSTRACT

Background: Atrial fibrillation (AF) is the most common cardiac arrhythmia, with a significant rise in prevalence during recent decades. Considering its remarkable morbidity and mortality rates, AF has become a significant concern worldwide. To our knowledge, this is the first study to assess the prevalence of AF in Iran.

Methods: The current cross-sectional study is a part of the Isfahan Cohort Study (ICS), which has evaluated 6504 adults aged over 35 years and followed them up since 2001. An echocardiogram was taken from all the participants and interpreted by 2 skilled residents of cardiology. AF diagnosis was made based on the ICD-10-CM codes (I480-I484, I489), and its prevalence was determined.

Results: Thirteen out of 6504 study participants (prevalence=0.19%) at a mean age of 61.8± 9.5 years were diagnosed with AF. AF was slightly predominant among males (53.8% vs 46.2%). Diabetes mellitus, ischemic heart disease, and peripheral vascular disease were present in 1 (7.7%), 2 (15.4%), and 1 (7.7%) cases with AF, respectively.

Conclusions: The remarkably low rate of AF in this study compared with other investigations may be due to the lower age of the assessed population, less alcohol consumption in Iranian society, and failure to find cases with paroxysmal and transient AF. ***(Iranian Heart Journal 2022; 23(2): 53-60)***

KEYWORDS: Atrial fibrillation, Cohort study, Iran, Prevalence

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Atrial fibrillation (AF) is the most common cardiac arrhythmia, with a significant rise in prevalence during recent decades.[1] The remarkable morbidity (eg, ischemic stroke and heart failure) and mortality rates of AF have made this arrhythmia a major global concern.[2]

Varieties of cardiopulmonary complications are responsible for AF occurrence as they lead to increased afterload, elevated filling pressure, and eventually, enlarged left atria.[3] Conditions such as obstructive sleep apnea, hypertension, and obesity are among the mentioned cardiopulmonary complications that have dramatically increased during recent years.[4] On the other hand, AF is an age-related phenomenon. A doubled risk of AF incidence has been estimated to occur by each decade of life. Increased longevity, decreased vascular compliance, and increased risk of cardiovascular diseases by aging are age-related factors turning AF into a worldwide epidemic issue.[5,6]

It has been estimated that up to 2% of adults suffer from AF, while it seems that this arrhythmia affects a more extensive undiagnosed population, accounting for up to 3% of the general population.[7] The prevalence of AF differs from one country to another, taking into account ethnicity, race, dietary and lifestyle habits, genetics, and predisposing risk factors.[1] For instance, the prevalence of hypertension as a significant risk factor for AF in an industrialized country like Japan is dramatically higher than that in the United States but less than that in other industrialized European countries such as Germany and England.[8-11]

On the other hand, the mentioned estimation for the AF prevalence is age-dependent and increases by considering the aging phenomenon in the communities, besides the number of survivors from cardiovascular and cerebral accidents.[1]

In most developed countries and, to a lesser extent, developing countries, databases present the prevalence and incidence of AF through population-based studies.[1,2,4,12-14] Some healthcare systems have provided schedules for the screening of AF, including routine rhythm control and electrocardiography (ECG) as of a specific age.[6,15] We sought to address the dearth of information on AF prevalence in Iran for the first time.

METHODS

Data were obtained from the Isfahan cohort study (ICS). The ICS is an ongoing prospective population-based study conducted on 6504 adults over 35 years residing in 3 rural and urban areas in the center of Iran: Isfahan, Najaf Abad, and Arak. This ongoing study aims to define cardiovascular disease risk factors and take relevant preventive care in the Iranian community.[16] The study samples were selected via a multistage random sampling method from the Isfahan Healthy Heart Program (IHHP). The study population was recruited from January 2 through September 28, and the subjects were followed up for at least 10 years.[17,18] After providing written signed consent for participation in the study, all the participants took part in 30-minute interviews. Additionally, the participants' presentations, including demographic characteristics, socioeconomic status, behaviors, attitudes, and lifestyle-related behaviors (eg, smoking, physical activity, and nutritional habits), were entered into the study checklist. The subjects were divided into 10-year age subgroups: 35 to 44 years old, 45 to 54 years old, 55 to 64 years old, 65 to 74 years old, and 75 years old or above.

The participants were then invited to the nearest healthcare center to undergo physical examinations and to be interviewed about their medical history. Blood pressure and anthropometric parameters were measured based on the standard protocols.[19]

A fasting blood sample was obtained for measuring the amount of total cholesterol, triglycerides, high-density lipoprotein cholesterol, and fasting blood sugar. A 12-lead ECG was obtained from all the participants, and patients with AF were registered. The diagnosis of AF was established based on the ICD-10-CM codes (I480-I484, I489), and 2 skilled residents of cardiology interpreted the ECGs.

The volunteers were followed up every 2 years for 16 years. Each of the following events was recorded in the checklist (fatal or nonfatal myocardial infarction, unstable angina, fatal or nonfatal stroke, and death). The events were reviewed and proved according to the Myocardial Infarction and Stroke Registry Database of the Isfahan Cardiovascular Research Center's Surveillance Department. The study protocol was approved by the Ethics Committee of the Isfahan Cardiovascular Research Institute.

The obtained data were entered into the Statistical Package for Social Sciences (SPSS; version 21.0, SPSS Inc, Chicago, IL, USA). The descriptive information was presented as mean values, standard deviations, absolute numbers, and percentages.

RESULTS

The study enrolled 6504 individuals. The mean age of the studied population at the time of study initiation was 51.0±11.7 years. The study population consisted of 3168 men (48.7%) at a mean age of 51.5±12.0 years and 3336 women (51.3%) at a mean age of 50.6±11.4 years.

The prevalence of AF among the studied population was 0.19% as AF diagnosis was made for 13 cases. The mean age of the patients with AF at baseline was 61.8±9.5 years. The prevalence of AF was slightly higher in men (53.8% vs 46.2%). Table 1 presents the baseline characteristics of the patients with AF. Based on this table, diabetes mellitus, ischemic heart disease, and peripheral vascular disease were present in 1 (7.7%), 2 (15.4%), and 1 (7.7%) of the cases with the AF rhythm, respectively.

Table 1. Baseline characteristic of the patients with AF

Baseline Characteristics	Patients With AF Overall, n (%)
No. of patients	13 (0.19%)
Age, y, mean (SD)	61.84 (9.5%)
Age group, y	
<55	2 (15.4%)
55–65	4 (30.7%)
65–74	6 (46.1%)
≥75	1 (7.7%)
Female/male	6 (46.2%)/ 7 (53.8%)
Previous stroke, TIA	1 (7.7%)
Hypertension	3 (23.1%)
Systolic blood pressure, mean (SD) (mm Hg)	120 ± 18
Diastolic blood pressure, mean (SD) (mm Hg)	76 ± 11.6
Diabetes mellitus	1 (7.7%)
Ischemic heart disease	2 (15.4
Vascular disease	1(7.7%)
Body mass index, mean (SD) (kg/m^2)	26.3 (3.9)
Fasting blood sugar, mean (SD) (mg/dL)	108 (83)
High-density lipoprotein, mean (SD)	47.15 (10.37)
Low-density lipoprotein, mean (SD)	135 (44)
Triglycerides, mean (SD)	159.6 (65)

AF, Atrial fibrillation; TIA, Transient ischemic attack

Follow-up investigations showed 2 deaths: 1 due to nonfatal stroke and 1 because of an unknown reason. Two patients experienced unstable angina, which did not lead to mortality.

DISCUSSION

The current study was derived from the ICS, which assessed 6504 adults aged over 35 years in terms of cardiovascular status and

followed them up for at least 10 years. This longitudinal follow-up study is still in progress (since 2001). ECG was taken from all the participants, and AF was detected in 13, representing a prevalence rate of 0.19% of AF cases in Iran's center (1.99 per 1000 cases of the general population).

The significant burden of AF-attributed complications, particularly stroke, on healthcare systems has focused worldwide attention on this cardiac arrhythmia. Therefore, numerous studies are in progress the world over to reduce the incidence/prevalence of AF, to diagnose AF earlier, to perform better therapeutic approaches to AF, to achieve successful control of the complications of AF, and to minimize its related costs as the most common arrhythmia.[20,21]

Assessing the prevalence of AF was initiated in 1982 by Framingham,[22] who estimated a rate of 1.88% of AF prevalence in the general population aged between 30 and 65 years. Subsequently, some studies undertaken during the 1980s and 90s reported a probable prevalence rate of 0.89% for AF in the United States' general population, which increased by aging.[23-26] These studies estimated that 2.3 million people in the United States had AF, with the range varying from 2.3% among adults older than 40 years to 5.9% among those aged over 65 years.[27]

The AnTicoagulation and Risk Factors in Atrial Fibrillation (ATRIA) study[28] was conducted in 2001 on 1.89 million adults aged over 20 years and revealed a prevalence rate of 0.95%. One of the conclusions was that the aging of the United States' population would increase the prevalence of AF, affecting up to 5 million people.

In one of the most recent studies, conducted by Turakhia et al,[29] prevalence rates of 10% and 0.92% were detected in the elderly and working-age populations of the United States in 2018. This enormous number equals 5.3 million cases,[29] near the estimated prevalence for the 2050s.[28]

Furthermore, there are studies conducted in Asia. East Asian countries such as Japan, China, and Korea have reported considerably lower prevalence rates of AF than developed Western countries. Inoue et al,[33] in a study in 2009, reported an AF prevalence rate of only 0.56%.

Kuwabara et al[34] even presented a lower rate of 0.32% in 2011. Nonetheless, a more recent study, performed by Kodani et al,[35] reported a prevalence rate of 1.4% among healthy cases aged between 40 and 74 years. These varieties may have occurred due to the study performance methods and/or the selected study population.

Chen et al[36] evaluated 9309 adults over 20 years of age and found a prevalence rate of 0.9%. In South Korea, Kim et al[37] detected a prevalence rate of 0.73% in 2006, which rose 1.53% in 2015. Developing efficient screenings and increased rates of survivors due to better healthcare facilities may be responsible for the increased rate of AF in Eastern Asian countries.

The number of studies in the Middle East, mostly developing countries, is limited. The remarkable high rates of morbidity and mortality due to AF complications represent the significance of early diagnosis and proper approach considerations.[38] The lower prevalence of AF reported in Middle Eastern countries may be due to poor screening performed in these countries. The estimated prevalence of AF was 1.4% in Turkey[39] and 3.4% in Bahrain.[40] Hersi et al[41] performed their study on 7093 patients admitted for acute coronary syndromes among the general population in the Arabian countries of the Persian Gulf and reported a prevalence rate of 2.7% for AF.

The remarkable lower rate of AF cases found in our study may be attributed to the patients' age as our assessed study

population was older than 35 years, which is lower than the age of the recruited participants in most of the other studies. On the other hand, the ban on alcohol consumption in Iran's constitution and societal customs are other probable reasons for the lower prevalence of AF in this study. Failure to find cases with paroxysmal and transient AF is another probable etiology of this finding as Holter monitoring was performed for none of the participants.

The strong point of the current study is its population. Our literature review yielded no other study with this vast number of participants in the Iranian general population.

Our investigation's most significant limitation is its observational design as ECG was interpreted only once in 2001; however, further ECG studies are in progress. It seems that by the repetition of ECG, considerably higher numbers of AF cases would be detected because of aging. Further studies with a higher number of follow-up visits and diversity in the regions of interest for better generalizability of the outcomes are strongly recommended.

Table 2: Characteristics of atrial fibrillation prevalence in different communities (published after 2010)

Country	Study Duration	Study Population	Author	Prevalence	Incidence	Mean Age
Persian Gulf Countries	2011	7930	Hersi et al[41]	2.7%	-	64.6 y
Bahrain	2010-2011	7450	Garadah et al[40]	3.4%	-	59.45 y
South Korea	2006-2015	679416	Kim et al[37]	1.53%	1.77 per 1000	Median age: 68
China	2011	9309	Xiaoli et al[36]	0.90%	-	
Japan	From 2008 to 2015	12303	Kodani et al[35]	1.4%	2.5 per 1000	64.9 y
Japan	2004-2010	90143	Kuwabara et al[34]	0.32%	-	63.2 y
Sweden	2004-2010	75945	Norberg et al[31]	3%	-	-
South Korea	2008-2015	41505679	Lee et al[42]	0.67%	17.14 per 10000	-
The United Kingdom	1998-2010	57818	Lane et al[43]	1.4%	1.26 per 1000	74.2
Cuba, Mexico, Dominican Republic, and Puerto Rico	2008-2011	16415	Linares et al[12]	1%	-	-
Ecuador	2017	298	Del Brutto et al[44]	2.3%	-	70.5
Portugal (FAMA Study)	2010	10477	Bonhorst et al[45]	2.5 %	-	Median: 58
Sweden	2008-2010	65532	Andersson et al[46]	2.5%	-	74.3

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