Prevalence of atrial fibrillation in an urban population in India: the Nagpur pilot study

Daljeet Kaur Saggu,[1] Gomathi Sundar,[1] Sandeep G Nair,[1] Varun C Bhargava,[2] Krishnamohan Lalukota,[1] Sridevi Chennapragada,[1] Calambur Narasimhan,[1] Sumeet S Chugh[3]

[1]Department of Cardiology, CARE Hospital, Hyderabad, Telangana, India
[2]Department of Cardiology, Ganga CARE Hospital, Nagpur, Maharashtra, India
[3]Heart Institute, Cedars-Sinai, Los Angeles, California, USA

Correspondence to
Professor Sumeet S Chugh, Cedars-Sinai Medical Center, Heart Institute, 127 S San Vicente Blvd, Los Angeles, CA 90048, USA; sumeet.chugh@cshs.org

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ABSTRACT

Objectives Atrial fibrillation (AF) is the most common sustained arrhythmia encountered in clinical practice with major public health impact mainly due to the increased risk of stroke. The recent Global Burden of Disease Study reported a lack of prevalence data from India. Our goal was to conduct a pilot study to evaluate the feasibility of assessing AF prevalence and stroke prophylaxis in an urban Indian community.

Methods A screening camp was conducted in Nagpur, India, that evaluated adults aged ≥18 years. We collected demographics, recorded blood pressure, height, weight and the 12-lead electrocardiogram (ECG). The presence of diabetes and hypertension was recorded by self-reported history. Patients diagnosed with AF were evaluated further to assess aetiology and management.

Results Of the total 4077 randomly selected, community-dwelling adults studied, 0.196% (eight patients) were found to have AF. Mean age of the population was 43.9±14.8, and 44.5% were female. The mean age of the patients with AF was 60.5 ±15.8 years (five females). Rheumatic heart disease was found in five patients with AF. Three patients had history of stroke (37.5%) and one had peripheral arterial thrombosis. Three patients were on warfarin, but without routine international normalised ratio (INR) monitoring. One patient was on aspirin. Five patients were on β-blockers and one on both β-blocker and digoxin.

Conclusions The prevalence of AF was low compared with other regions of the world and stroke prophylaxis was underused. A larger study is needed to confirm these findings. This study demonstrates that larger evaluations would be feasible using the community-based techniques employed here.

INTRODUCTION

Atrial fibrillation (AF) is a major public health problem worldwide.[1–3] The global prevalence is estimated to be 0.47%, but there is significant regional variation.[3] Also, overall prevalence of AF increases with age,[3 4] reaching a prevalence rate as high as 10% in octogenarians.[4 5] However, most of the available data on prevalence of AF is from studies performed in North America and Western Europe. There is a significant lack of epidemiological information regarding AF in the low/middle-income nations, including India.

Stroke is one of the frequent and devastating complications of AF.[6] It often leads to permanent disability including cognitive dysfunction causing huge financial and emotional burden to the families of the affected. About one-third of the patients with AF are asymptomatic.[7] AF may go undetected in these patients until symptoms develop, and stroke could be the first manifestation of AF. Prevalence studies are important in estimating the population burden of the disease and are instrumental in developing effective public health policies, for example, in the case of AF, embolic stroke is preventable with simple anticoagulation measures.

In India, there are no large-scale population-based prevalence studies of AF except for a single study performed in a Himalayan village population two decades ago.[8] Our goal was to study the prevalence of AF in an urban Indian population in the current setting of rising global burden of AF. We also hypothesised that the relatively higher prevalence of rheumatic heart disease (RHD) in India[9 10] would further impact the prevalence of AF in this region.

METHODS

Inhabitants of Nagpur who were ≥18 years were invited to participate in the study.

Nagpur, a city in the state of Maharashtra in central India, has a population of 2 905 421, with a female-to-male ratio of 961:1000 (2011 population census).[11] The population density is 470 inhabitants per square kilometre. Within India, Nagpur is rated relatively high in health indices and literacy rates.[11 12] The study was conducted by holding a surveillance camp at the Guru Nanak Bhawan, Ashok Chowk, in Nagpur during the festivals of Baisakhi and Ambedkar Jayanti (fall on consecutive days), which attract a large conglomeration of people from diverse denominations and backgrounds. Notifications about the ECG-based study were put up on banners at strategic locations in the city a month prior to the festival days. The study was conducted over 2 days (ie, festival days), for a duration of 14 hours each day.

Screening method and data entry

After measurements of height, weight and blood pressure were taken, all participants were interviewed for basic health information by nursing students trained to obtain a prespecified clinical history. A 12-lead ECG was performed in all participants and interpreted by physicians for the presence or absence of AF. Participants who had AF were further interviewed by participating cardiologists, for AF-specific history and risk-factor assessment. Transthoracic echocardiograms were performed in all patients with AF to evaluate

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cardiac structure and function as well as to rule out the presence of intracardiac thrombus. Each patient's medical history was self-reported and medical records were verified whenever available. Figure 1 provides a schematic of how the study was conducted. Basic information and AF-specific questionnaire, ECG and echocardiogram findings were recorded on paper forms during the surveillance period and subsequently transferred to an electronic database.

Study personnel

For registration, demographic measurements, to obtain basic clinical history and to complete basic data collection forms, 20 nursing students were employed and underwent necessary training. Fifty nursing students were involved for recording ECGs. Five physicians were involved for ECG interpretation. Six cardiologists were involved for echocardiography and in-detail evaluation of patients in whom AF was diagnosed.

Sample size calculation

Assuming 4% AF in the adult group (>18 years, based on estimated prevalence of subclinical RHD and associated AF[9 13]) with 95% CI and 20% relative precision, the estimated sample size was 2305. Since the samples were drawn from the general population, we multiplied the estimated sample size by a design effect of 2 to minimise the variation in the samples; therefore the final sample size required was 4610 collected randomly.

Statistical analysis

The data were entered into Excel worksheet and exported to IBM SPSS V.19.0 for data analysis. The data were subjected to statistical analysis and descriptive statistics were generated viz. frequency distributions and cross-tabulation. Findings were expressed as mean and SD.

RESULTS

A total of 4077 patients were screened in the camp. Demographic characteristics and comorbid conditions of the population screened are shown in table 1.

Prevalence of AF

Eight patients were diagnosed with AF based on findings on 12-lead ECG. Mean age was 60.3±15.9 years. The overall prevalence of AF was 0.19%, and prevalence of AF by age category is shown in table 2. The age-adjusted prevalence of AF was 0.16%, which was lower because a larger proportion of the study population was in older age categories compared with the Maharashtra population.[14] The prevalence increased with age and was observed to be the highest in the age category of ≥80 years (3%).

Five of the eight patients were female. Cardiac conditions identified were chronic RHD in five patients and CAD in one patient. Five patients (62.5%) had self-reported history of hypertension (HTN). One patient, a 72-year-old woman, refused to undergo echocardiography. Therefore, cardiac structure and function by echocardiography could not be evaluated in this patient. In five patients with RHD, three had undergone interventions for mitral valve abnormalities in the past. One patient had CAD with history of percutaneous angioplasty (table 3). None had history suggestive of hyperthyroidism, chronic obstructive pulmonary disease, recent surgery and excess alcohol consumption. Six patients were on β-blocker therapy. One patient was on digoxin in addition to β-blocker therapy. Only three patients were on oral anticoagulation therapy (warfarin), and none of them were being monitored regularly for the INR.

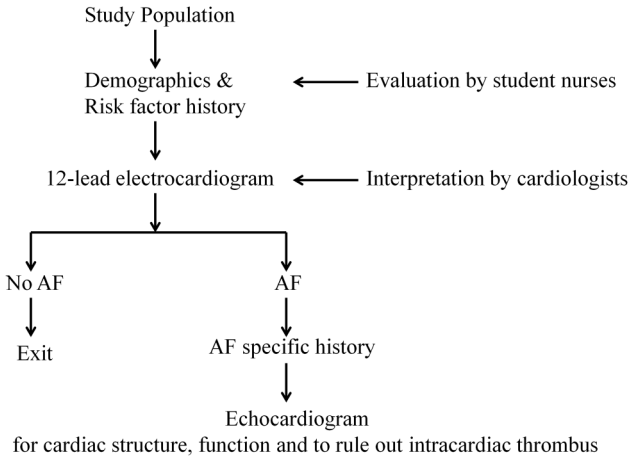

Figure 1 Study schematic indicating method of data collection and interpretation as well as identification of patients with atrial fibrillation (AF).

DISCUSSION

In this screening study of 4077 randomly selected, community-dwelling adults, 0.2% (eight patients) were found to have AF. The mean age of the overall population was 43.9 ±14.8, and 44.5% were female. The majority of patients (n=5) had RHD, and four patients had suffered thromboembolic events. Three of the eight patients were on warfarin, but without routine INR monitoring. To the best of our knowledge, this is the first surveillance study of AF to be performed in an unselected urban population in India. The findings suggest a lower prevalence of AF compared with other studies in different regions of the world,[15–19] as well as underuse of oral anticoagulation. It is important to discuss the potential reasons for this lower burden of AF that we have observed. First, the method of surveillance is an important factor, specifically due to the fact that screening at a single time point would not be able to diagnose paroxysmal AF. While our single time point screening

Table 1 Demographic and baseline characteristics of patients screened.

Variables	Total population surveyed=4077
Age in years (mean±SD)	43.9±14.8
Age range in years	18–95
Females	1815 (44.5%)
Males—age in years (mean±SD)	43.2±15.44
Females—age in years (mean±SD)	44.9±14.16
Systolic blood pressure, mm Hg (mean±SD)	124.3±16.7
Diastolic blood pressure, mm Hg (mean±SD)	79.1±11.2
Height, cm (mean±SD)	159.4±8.8
Weight, kg (mean±SD)	62.2±11.26
Body mass index classification (N=3972)	
Underweight	478 (12%)
Normal range	1904 (47.9%)
Overweight	1099 (27.6%)
Obese	491 (12.3%)
Comorbid conditions (N=3159)	
Systemic hypertension	792 (25%)
Diabetes mellitus	481(15.2%)

N, total number.

Table 2 Age-wise prevalence of atrial fibrillation (AF) and aetiology

Age range (years)	Total number (%) N=4077	Number of AF	Prevalence (%)
18–29	768 (18.8%)	1	0.13
30–39	950 (23.3%)	0	0
40–49	870 (21.3%)	0	0
50–59	713 (17.4%)	2	0.28
≥60	776 (19%)	5	0.64

N, total number.

using the 12-lead ECG would be comparable with other studies using the same screening method, it would be difficult to compare with studies that used a stepwise screening performed with ambulatory or, more recently, handheld recording. Engdahl *et al*[20] screened Swedes aged 75 years old and reported that the incidence of AF increased from 1.2% with single time point screening to 7.4% with stepwise selection and extended handheld recording. Also, the population screened in the present study may have been younger than others (mean age 43.9 ±14.8 years).[21] Finally, while the goal is to perform actual surveillance for AF prevalence, the vast majority of currently published studies have used administrative databases, and therefore, may not be directly comparable with the present study.

Globally, the overall prevalence as estimated from 2010 data of the Global Burden of Disease Study (GBD, also performed from administrative databases) is 0.59% for males and 0.37% for females.[3] This systematic review also reports significant variation in the prevalence rates between different GBD regions: the highest is found in North America and the lowest in Asian Pacific, high-income countries with the difference reflected in both sexes as well.

In India, population-based studies are scarce. A study performed on a healthy population in Kalpa village, Kinnaur district in Himachal Pradesh, India, by Kaushal *et al*[8] in 1995 reported a prevalence of 0.1%. Kinnaur district currently has a population density of 13 inhabitants per square kilometre (2011 Census), significantly higher compared with the time period of the earlier study. Consequently, RHD, a disease resulting from overcrowding, would have been naturally low in Kalpa village at the time of the study and possibly explaining the lower prevalence of AF. With the ageing of the Indian population,[22] one would expect the prevalence of AF to rise over the years. On the contrary, in our study, the prevalence is similar to the one found almost two decades ago in Kalpa village. One possibility is that the subjects evaluated in the current study are relatively young, with poor representation of the elderly. There were only 19% in the age group ≥60 years and only 0.8% in the age group ≥80 years where the prevalence is found to be the highest in many studies.[23–25] However, in line with these studies, the prevalence of AF in the present study was also observed to increase with advancing age.

RHD was the most common cardiac condition (5/8 patients, 62.5%) identified among the patients diagnosed with AF in our study. A similar finding was reported by Bhardwaj[26] and the IHRS AF registry,[27] where RHD as a cause of AF in the Indian population was found to be 61% and 42%, respectively. This may explain the higher prevalence of AF in females (62.5%) in our study compared with males (0.12% vs 0.04%, respectively). The proportion of females was higher in the Bhardwaj study and IHRS AF registry: 55.47% and 51% females, respectively (although the difference was not statistically significant). These findings are contrary to reports from the Western world, where predominantly males were found to have AF.[11 12 15–18] The mean age of patients with AF in our study was 60.3 ±15.9 years, which was almost similar to REALIZE AF[28] and the IHRS AF registry, which reported average age as 60 and 54 years, respectively. Among non-valvular AF, HTN tends to be the most common comorbid condition. This was found in our study as well; the remaining three (37.5%) patients who had no RHD were hypertensive. Bhardwaj reported HTN and chronic obstructive pulmonary disease (COPD) as the other common cause of AF; however, we did not observe COPD in any of our patients with AF. Sixty per cent of our patients with valvular AF had suffered stroke, despite which there was underuse of oral anticoagulation, which is another important finding in our study. Of the eight patients, only three were on anticoagulation and these patients were not being monitored for their INR. The finding that, despite occurrence of stroke, two patients were not on anticoagulation therapy raises important concerns regarding awareness of AF and its complications in the community.

LIMITATIONS

Clearly, these findings from a limited pilot sample need to be confirmed in a larger study. Based on the cross-sectional design of this community-based study, paroxysmal or remote episodes of AF could not be captured with single ECG as the screening tool. In addition, the representation of patients aged ≥60 years was low in our study. The festival days chosen for the study was to ensure that study sampling is representative of the Nagpur population, as the festivals attract people from all walks of life cutting across religion, caste and social status. However, the sample may not truly represent the urban population of India. As already mentioned, Nagpur has comparatively better literacy and health indices compared with other cities in India. All these factors could have underestimated the true prevalence of AF

Table 3 Medical history and echocardiographic profile of patients with atrial fibrillation

Patient no.	Age (years)	Sex	Comorbidity	Cardiac condition	LA contrast	Previous surgery	Vascular events	Oral ACN
1	55	F	None	RHD	No	MVR	Peripheral thrombosis	Yes
2	68	F	HTN	None	No	–	No	No
3	28	F	None	RHD	Yes	–	Stroke	No
4	70	F	HTN	NA	NA	NA	NA	NA
5	80	M	DM, HTN, obesity	RHD	No	BMV	Stroke	No
6	60	M	None	RHD	No	CMV	No	No
7	52	F	HTN, overweight	RHD	No	BMV	Stroke	Yes
8	70	M	HTN	CAD	No	PTCA	No	Yes

ACN, anticoagulation; BMV, balloon mitral valvotomy; CAD, coronary artery disease; CMV, closed mitral valvotomy; DM, diabetes mellitus; F, female; HTN, hypertension; LA, left atrium; M, male; MVR, mitral valve replacement with metallic valve; NA, not applicable; PTCA, percutaneous transluminal coronary angioplasty; RHD, rheumatic heart disease (chronic).

and, thus, surveillance for AF in India needs to be performed in larger and more diverse populations.

CONCLUSION

The prevalence of AF in this urban population was low, and our findings raise concerns regarding the underuse of guideline-recommended AF treatment in the community, especially anticoagulation therapy. While these findings need to be confirmed in a larger study, they also indicate the feasibility of conducting a larger evaluation using the methods employed in the current study.

Key messages

What is already known about this subject?

Atrial fibrillation (AF) is a major public health problem worldwide with a global prevalence of 0.47% with most data from developed countries. AF is a major risk factor for stroke. Recognition of AF and adequate management is essential for prevention of stroke.

What does this study add?

There is a lack of data regarding prevalence of AF in India. Our study revealed a prevalence of 0.196%, lower compared with studies reported from other world regions. We attribute this observation to the urban population studied, where the prevalence of rheumatic heart disease (RHD) is likely to be low. Despite this, RHD was the most common disease identified among the patients diagnosed with AF. Though the prevalence of AF was low, our findings suggest there was an underuse of anticoagulation in patients with previous history of stroke.

How might this impact on clinical practice?

These findings indicate the feasibility of performing larger surveillance studies in various regions of India using this methodology. Such studies will guide clinical screening and management of AF. Our findings also suggest the importance of adherence to guideline-directed stroke prophylaxis for AF.

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Competing interests None declared.

Patient consent Obtained.

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