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**Prevalence of atrial fibrillation without diagnosis or treatment in Primary Health Care in Joinville, Brazil**

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## **ABSTRACT**

**Introduction:** Estimation of the prevalence of undiagnosed or untreated atrial fibrillation (AF) is crucial for the prevention of AF-related ischemic stroke. **Objective:** To assess the prevalence of undiagnosed or untreated AF in primary care. **Methods:** We conducted a prospective cross-sectional non-randomized study in Joinville, Brazil, among elderly individuals in primary care units (PCUs). **Results:** One thousand individuals were included, with a mean age of  $69\pm 7$  years, and 57% women. Prevalence of AF was 3%, with 50% of AF patients being previously undiagnosed and 33% of previously diagnosed AF patients not receiving oral anticoagulation despite clinical indication. Using age-standardized prevalences, we estimated 68 and 27,342 strokes per year due to untreated or undiagnosed AF in Joinville and Brazil, respectively. **Conclusion:** The observation that two out of three AF patients were either undiagnosed or untreated is very alarming. Screening strategies to uncover this population are urgently needed.

**Keywords:** atrial fibrillation; Primary Health Care; population control; health of the elderly; stroke.

## INTRODUCTION

Atrial fibrillation (AF) is the most common sustained arrhythmia in the world, contributing to an increased risk of ischemic stroke, hospitalization, and death<sup>1,2</sup>. Estimating the prevalence of undiagnosed AF is challenging due to several factors, such as the lack of a validated screening strategy in different clinical scenarios<sup>1-5</sup>. Failure to timely diagnose AF and initiate oral anticoagulation (OA) can lead to stroke-related death and disability<sup>2,3</sup>.

The aging of the population observed in several developing countries makes the impact of AF on society progressively greater<sup>1,5</sup>. Health promotion in primary health care is a key element for cardiovascular prevention in this context, but the lack of AF screening and diagnosis actions jeopardizes efforts for early diagnosis<sup>3,5,6</sup>. The Brazilian Unified Health System (*Sistema Único de Saúde – SUS*) through the family health strategy (*Estratégia de Saúde da Família - ESF*), provides its users with universal coverage centered on the community. The Basic Family Health Units (*Unidades Básicas de Saúde da Família - UBSF*) offer a first contact with the health system and, although the prevention and treatment of cardiovascular diseases are within the scope of the ESF, the unavailability of electrocardiography (ECG) at the UBSF means that the diagnosis and treatment of AF is more restricted to secondary and tertiary care<sup>6-8</sup>.

This study aimed to assess the prevalence of AF without diagnosis or treatment in Primary Health Care.

## METHODS

A prospective, cross-sectional, non-randomized study was carried out in Joinville, Santa Catarina. For the FASUS (Atrial Fibrillation Screening in the Brazilian Unified Health System) study, all participating UBSFs were provided ECG capability, with the test being analyzed remotely by cardiologists. All the people were at their local UBSF for a medical

appointment or other health service. After palpating the radial pulse, an oral questionnaire on cardiovascular risk factors was administered and, regardless of the rhythm observed, a 12-lead ECG was performed on all subjects. The study procedures were carried out sequentially on the same day, lasting approximately 30 minutes. Cases with AF and atrial flutter were grouped for analysis in the study.

All individuals had only one ECG performed during screening (study ECG). Patients with AF on the study ECG had their electronic medical records reviewed by the FHS doctors. We defined elderly individuals aged 60 or over; undiagnosed AF as a patient with AF on the study ECG who did not mention AF in their electronic medical record; and untreated AF as a patient with AF on the study ECG and CHA<sub>2</sub>DS<sub>2</sub>-VASc equal to or greater than 2 (men) or 3 (women), with no contraindication for OA in the electronic medical record. Student's t-tests were used for continuous variables. For proportions,  $\chi^2$  tests were used. A two-tailed p-value <0.05 was considered statistically significant. Statistical analyses were carried out using RStudio 2021.09.2. The study protocol was approved by the research ethics committee of the Fundação Educacional da Região de Joinville (UNIVILLE), CAAE: 24734619.2.0000.5366 and Opinion: 3.784.158.

## RESULTS

One thousand consecutive individuals aged 60 or over were included, corresponding to 1.2% of Joinville's elderly population. The main characteristics of this population are shown in Table 1. The average age was  $69 \pm 7$  years, with 571 women (57%). The prevalence of AF was 3% (n=30), with 28 cases of AF and 2 cases of atrial flutter. Among the patients diagnosed with AF, eight (27%) were aged between 60 and 69, sixteen (53%) were aged between 70 and 79, and six (20%) were aged 80 or over. Fifteen patients (50%) had undiagnosed AF and five patients (33%) with previously diagnosed AF did not receive OA despite having a clinical

indication. The prevalence of AF without diagnosis or treatment was 2%, with 67% of AF patients falling into this category (n=20). A sensitivity of 43% and specificity of 90% were observed for radial pulse palpation to diagnose AF, with an accuracy of 89% considering the prevalence of AF observed.

Hypertension was reported by 61% of patients (67% with AF, 61% without AF,  $p=0.53$ ), heart failure in 9% (20% with AF, 8% without AF,  $p=0.021$ ), diabetes mellitus in 24% (27% with AF, 24% without AF,  $p=0.74$ ), previous stroke in 9% (20% with AF, 9% without AF,  $p=0.037$ ). The mean CHA<sub>2</sub>DS<sub>2</sub>-VASc score was  $4 \pm 1$  among patients with AF and  $3 \pm 1$  in those without AF ( $p=0.011$ ). Only one patient (7%) with AF without a previous diagnosis had no clinical indication for OA considering the CHA<sub>2</sub>DS<sub>2</sub>-VASc score. Six patients reported a previous stroke and had AF on the study ECG, and of these, only two (33%) were receiving OA.

For the population of Joinville and Brazil, the age-standardized prevalence of AF was 3.0% and 3.3%, respectively, and the age-standardized prevalence of AF without diagnosis or treatment was 2.1% and 2.3%, respectively (Table 2). Using the age-standardized prevalences for Joinville and Brazil, the annual incidences of strokes due to AF without diagnosis or treatment were estimated at 68 and 27,342 cases, respectively.

## DISCUSSION

This is the first Brazilian prospective study on the prevalence of AF without diagnosis or treatment in primary health care. It is a relevant characterization for public health policies and reflects the need for AF screening in our country. The observation that two out of every three AF patients were undiagnosed or received treatment, even with a clinical indication, is alarming. This observation seems to be in line with the local scenario of AF-related strokes, considering that 47% of patients in the Joinville Stroke Registry (JOINVASC) only receive a

diagnosis of AF after an AF-related stroke<sup>8</sup>. The diagnosis of AF seems to be more frequent in UBSF in developed countries since only 25% of AF patients screened in the Strokestop study and 18% in the intervention arms of the SAFE study had no previous diagnosis<sup>2,3</sup>. In developed countries, the diagnosis of AF after a stroke is also less frequent, generally not exceeding 30% of AF-related strokes<sup>9,10</sup>. The observation that 29 of the 30 AF patients in the study indicated oral anticoagulation also reinforces the potential favorable impact of AF screening in primary care in Brazil.

Previous studies on the prevalence of AF in Brazil were mostly retrospective and did not focus on the UBSF<sup>6,7</sup>. Although the observed prevalences are comparable, the fraction of cases without diagnosis or treatment had not yet been assessed in our setting. The limitations of this study include its cross-sectional design, which provides a conservative estimate of AF prevalence and has limited capacity to detect paroxysmal AF, and the lack of comparable studies in developing countries.

The impact of AF screening on the workload of the UBSF, the impact of identifying other ECG abnormalities, and the potential increase in medical consultations and referrals to cardiology will be evaluated prospectively. The observation of high specificity and low sensitivity compared to the literature<sup>3</sup> may be associated with the low familiarity of the multi-professional team with pulse palpation and the short training time. At the moment, isolated screening with radial pulse palpation cannot be indicated in our reality, and it is hoped that with continued education, greater sensitivity will be observed, sustaining good accuracy of this intervention, which will be evaluated in the continuation of the study.

Efforts to reduce AF-related ischemic stroke depend on evidence-based AF screening, which in turn requires comparable clinical outcomes in the literature<sup>1-5</sup>. Among the main screening studies, the proportion of AF without diagnosis or treatment is largely unavailable, except in the Strokestop study (33%, versus 67% in the present study)<sup>2</sup>. The likelihood of AF being detected routinely varies according to the population's access to health care and the

equipment and quality of health services<sup>1,2,5,6</sup>. Therefore, we cannot consider the control arms in AF screening studies such as Loop or Strokestop as comparable to standard care in developing countries<sup>2,4</sup>, where the impact of AF screening should generate a significantly higher number of new AF diagnoses<sup>5-8</sup>.

Greater awareness is needed of undiagnosed and untreated AF patients, a vulnerable population around whom stroke prevention efforts should be centered. Elderly populations in Brazil, China, India, Pakistan, Bangladesh, Indonesia, and Nigeria are expected to double by 2050; these countries currently account for half of the world's population<sup>1,5</sup>.

Considering the serious individual and social consequences of AF-related stroke, strategies to reach AF patients without diagnosis or treatment are urgently needed.

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## REFERENCES

1. Rahman F, Kwan GF, Benjamin EJ. Global epidemiology of atrial fibrillation. *Nat Rev Cardiol.* 2014;11(11):639-54.  
<https://doi.org/10.1038/nrcardio.2014.118>
2. Svennberg E, Engdahl J, Al-Khalili F, Friberg L, Frykman V, Rosenqvist M. Mass Screening for Untreated Atrial Fibrillation: The STROKESTOP Study, *Circulation.* 2015;131(25):2176-84.  
<https://doi.org/10.1161/CIRCULATIONAHA.114.014343>
3. Fitzmaurice DA, Hobbs FDR, Jowett S, Mant J, Murray ET, Holder R, et al. Screening versus routine practice in detection of atrial fibrillation in patients aged 65 or over. *BMJ.* 2007;335(7616):383.  
<https://doi.org/10.1136/bmj.39280.660567.55>
4. Svendsen JH, Diederichsen SZ, Højberg S, et al. Implantable loop recorder detection of atrial fibrillation to prevent stroke (The LOOP Study): a randomized controlled trial. *Lancet.* 2021;398(10310):1507-16.  
[https://doi.org/10.1016/S0140-6736\(21\)01698-6](https://doi.org/10.1016/S0140-6736(21)01698-6)
5. Sandhu RK, Healey JS. Screening for undiagnosed atrial fibrillation. *Expert Rev Cardiovasc Ther.* 2018;16(8):591-8.  
<https://doi.org/10.1080/14779072.2018.1496018>
6. Marcolino MS, Palhares DMF, Benjamin EJ, Ribeiro AL. Atrial fibrillation: prevalence in a large database of primary care patients in Brazil. *Europace.* 2015;17(12):1787-90.  
<https://doi.org/10.1093/europace/euv185>
7. Santos IS, Lotufo PA, Brant L, Pinto Filho MM, Pereira AC, Barreto SM, et al. Atrial Fibrillation Diagnosis using ECG Records and Self-Report in the Community: Cross-Sectional Analysis from ELSA-Brasil. *Arq Bras Cardiol.* 2021;117(3):426-34.  
<https://doi.org/10.36660/abc.20190873>
8. Amaral CH, Amaral AR, Nagel V, Venancio V, Garcia AC, Magalhaes PSC, et al. Incidence and functional outcome of atrial fibrillation and non-atrial fibrillation-related cardioembolic stroke in Joinville, Brazil: a population-based study. *Arq Neuropsiquiatr.* 2017;75(5):288-94.  
<https://doi.org/10.1590/0004-282X20170039>
9. Jaakkola J, Mustonen P, Kiviniemi T, Hartikainen JEK, Palomäki A, Hartikainen P, et al. Stroke is the first manifestation of atrial fibrillation. *PLoS One.* 2016;11(12):e0168010.  
<https://doi.org/10.1371/journal.pone.0168010>



Lacerda et al. Prevalence of atrial fibrillation without diagnosis or treatment in Primary Health Care in Joinville, Brazil. ABCS Health Sci. [Epub ahead of print]. DOI: 10.7322/abcshs.2023031.2287

10. Friberg L, Rosenqvist M, Lindgren A, Terént A, Norrving B, Asplund K. High prevalence of atrial fibrillation among patients with ischemic stroke. Stroke. 2014;45(9):2599-605.

<https://doi.org/10.1161/STROKEAHA.114.006070>

**Table 1:** Main demographic and clinical characteristics of the study population, about the presence or absence of a diagnosis of AF.

	<b>Individuals with AF (n = 30)</b>	<b>Individuals without AF (n = 970)</b>	<b><i>p</i></b>
<b>Average Age (Standard Deviation)</b>	73 ± 7	69 ± 7	0.0011*
<b>Age: 60-69 years (%)</b>	8 (27%)	534 (55%)	0.0021
<b>Age: 70-79 (%)</b>	16 (53%)	357 (39%)	0.065
<b>Age: 80 and over (%)</b>	6 (20%)	79 (8%)	0.022*
<b>Female (%)</b>	11 (37%)	560 (58%)	0.024*
<b>Systemic Arterial Hypertension (%)</b>	20 (67%)	593 (61%)	0.53
<b>Heart Failure (%)</b>	6 (20%)	78 (8%)	0.021*
<b>Diabetes Mellitus (%)</b>	8 (27%)	232 (24%)	0.74
<b>Previous stroke (%)</b>	6 (20%)	87 (9%)	0.037*
<b>Previous AMI (%)</b>	3 (10%)	68 (7%)	0.46
<b>Use of antiplatelet agents (%)</b>	6 (20%)	139 (14%)	0.43
<b>CHA2Ds2-VASc score (Standard Deviation)</b>	4 ± 1	3 ± 1	0.011*
<b>Irregular pulse at screening (%)</b>	13 (43%)	94 (10%)	<0.001*
<b>ECG with other changes (except AF)</b>	17 (57%)	445 (46%)	0.24

AVCI: Ischemic Stroke; ECG: Electrocardiogram; AF: Atrial Fibrillation; AMI: Acute Myocardial Infarction.

**Table 2:** Age and gender distribution and age-standardized prevalence of atrial fibrillation (AF) and atrial fibrillation without diagnosis or treatment in the elderly in this study, in the Joinville population, and Brazil.

	<b>FASUS study</b>	<b>Joinville (DATASUS, 2021)<sup>a</sup></b>	<b>Brazil (DATASUS, 2021)<sup>a</sup></b>
<b>Elderly (% of total population)</b>	1,000 (100%)	82,061 (14%)	30,197,052 (14%)
<b>Female (% of all older people)</b>	571 (57%)	48,665 (56%)	17,519,099 (56%)
<b>Age 60-69 (% of all older people)</b>	542 (54%)	49,154 (60%)	16,732,965 (55%)
<b>Age 70-79 (% of all older people)</b>	373 (37%)	22,752 (28%)	9,023,041 (30%)
<b>Age 80 and over (% of all older people)</b>	85 (8,5%)	10,155 (12%)	4,441,046 (15%)
<b>Prevalence of older people with AF</b>	30 (3,0%)	2,489 (3,0%) <sup>b</sup>	984,496 (3,3%) <sup>b</sup>
<b>Prevalence of older people with AF without diagnosis or treatment</b>	20 (2,0%)	1,695 (2,1%) <sup>b</sup>	683,541 (2,3%) <sup>b</sup>
<b>Annual estimate of strokes due to AF without diagnosis or treatment</b>	1	68	27,342

AVC: Ischemic Stroke; AF: Atrial Fibrillation

<sup>a</sup> Population according to DATASUS (Department of Informatics of the Unified Health System), available at <https://datasus.saude.gov.br/>.

<sup>b</sup> Age-standardized prevalence.

<sup>c</sup> Estimated rates of thromboembolism without oral anticoagulation according to the original publication of the CHA<sub>2</sub>DS<sub>2</sub>-VASc score and the average CHA<sub>2</sub>DS<sub>2</sub>-VASc observed in the FASUS study.