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High Prevalence of Atrial Fibrillation in Elderly Patients Hospitalized with Heart Failure

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Abstract

Background: Atrial Fibrillation (AF) is a common condition in the elderly and often occurs together with Heart Failure (HF). The differences between elderly patients with HF according to the presence or absence of AF were analysed.

Material and methods: Patient data were collected from consecutively admitted patients 75 years of age and older with acute decompensated HF from the Spanish National Heart Failure Registry (RICA) with data retrieved from internal medicine settings.

Results: Of a total of 1,473 patients (mean age 82.16 years), AF was present at enrolment in 851 (57.8%). Patients with AF had a higher Charlson index (3.76 vs. 3.46; p=0.03), lower Barthel index (80.15 vs. 82.8; p=0.03), more preserved EF (74.6% vs. 66.4; p=0.001), and more advanced NYHA functional classes III-IV (46.8% vs. 34.9%; p<0.001). Nearly 75% of AF patients were on anticoagulant therapy (25.2% in patients with no AF). One-year mortality was higher in AF patients, but statistical significance was not reached. In the multivariate analysis, Charlson index, systolic blood pressure, haemoglobin levels and functional class were associated with one-year mortality.

Conclusions: In our hospitalized cohort of elderly patients with HF, AF prevalence was very high. These patients were more symptomatic, but AF was not associated with one-year mortality.

Introduction

Atrial fibrillation (AF) and Heart Failure (HF) often occur together, and each is a predisposing factor for the other [1]. In patients with HF in sinus rhythm, the incidence of AF is 5.4% per year. Likewise, the incidence of HF in patients with AF is 3.3% per year. [2]. In another report from the Framingham study, the odds ratio for developing AF over a two-year period among patients with HF was 4.5% for men and 4.9% for women [3].The prevalence of AF in patients with HF varies between 10% and 30% depending in part on the stage of HF [4-6].

AF is a frequent condition of aging, increasing in line with the age of the population [7], with a prevalence of about 5% in people aged 65 years and older and at least 10% in those over the age of 80 [8,9]. Recently, in Spain, a 17.7% (14.1%-21.3%) prevalence of AF was reported in patients older than 80 [10]. Moreover, in patients with HF the presence of AF has been described in the 22.4% of the subjects. [11].

AF can impair myocardial function by different mechanisms. Loss of atrial systole limits ventricular filling and may reduce stroke volume by up to 20% [12]. Moreover, the persistence of AF with high ventricular rates can also lead to rate-related cardiomyopathy [13]. As a result, permanent AF was associated with significant worsening of New York Heart Association functional class (mean, 2.4 to 2.9) [14].

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On the other hand, there are conflicting data as to whether AF is an independent predictor of mortality in patients with HF and Reduced Ejection Fraction (HFREF) [15]. Moreover, although AF may be even more prevalent in HF with Preserved Ejection Fraction (HFPEF), the prognostic influence of AF in these patients is not well known [16,17].

On the basis of the above evidence, we decided to analyse the differences in clinical presentation and therapeutic management between elderly patients with HF and either reduced or preserved ejection fraction, from a Spanish HF registry, according to the presence of AF. The prognostic influence of AF after one year of follow-up was also evaluated in this cohort of elderly patients with HF.

Material and Methods

Patient data were collected from the Spanish National Heart Failure Registry (RICA), supported by the Heart Failure Working Group of the Spanish Society of Internal Medicine. RICA is a multicentre, prospective, cohort study of HF patients admitted to Internal Medicine departments of 52 hospitals, mostly public but some private, across Spain, the characteristics of which have been described elsewhere [18,19]. The study protocol was approved by the Ethics Committee of the Hospital Universitario "Reina Sofía", Córdoba, Spain. All consecutively admitted patients with acute decompensated HF attended by internal medicine physicians were enrolled in the registry, and patients older than 75 years were included in this study. In addition to giving their written informed consent, patients had to meet the following criteria: admission due to HF according to the European Society of Cardiology (ESC) guidelines [20], presenting with a first episode of HF or decompensation of chronic HF. Exclusion criteria were HF due to pulmonary hypertension and unwillingness to participate in the study.

The registry included sociodemographic information, previous medical histories, comorbidity (Charlson index), baseline functional status for basic activities of daily living (Barthel index), clinical data (blood pressure, heart rate, weight and height), laboratory evaluations, complications during hospitalisation, and prescriptions at discharge.

HF was characterized in more detail by the use of the New York Heart Association (NYHA) functional class scale, Left Ventricular Ejection Fraction (LVEF) evaluation by means of 2-D echocardiography, cardiothoracic ratio with chest X-ray and heart rhythm and rate by EKG. Baseline biochemical variables obtained at the time of hospital admission included kidney function, lipid and glucose profile, uric acid, troponin and natriuretic peptides. Anaemia was defined using the World Health Organization criteria: haemoglobin <12g/dL in women and <13g/dL in men. Systolic dysfunction was defined as ejection fraction <45%. AF was defined as arrhythmia on EKG at the time of hospitalization. We evaluated the mortality of RICA patients aged 75 years or older after one year of follow-up according to the presence of AF. Survival time was the number of days between the day of inclusion in the registry and either 12-month follow-up completion or the date of death.

Statistical analysis

A descriptive analysis of the sample was conducted. Results are shown as means and standard deviation for quantitative variables and percentages for categorical variables. Continuous variables were tested for normal distribution using the Kolmogorov–Smirnov test. Chi-squared tests and Analysis of Variance (ANOVA) were implemented to compare categorical and quantitative variables respectively. Univariate and multivariate analyses were used to evaluate Hazard Ratio (HR) between AF and death at one year using Cox proportional hazards models. Covariates considered to be of potential prognostic impact selected a priori and covariates associated with mortality on univariate analysis were used for adjustment in the multivariate analyses ($p<0.10$). Tests were 2-tailed and p-values < 0.05 were regarded as statistically significant. All statistical analyses were performed using the IBM SPSS statistical package version 21.

Results

At the time of performing this analysis there were 2,051 patients in the RICA registry. The mean age was 78 (SD: 8.6) and the percentage of women was slightly higher (53.1%). A total of 1,377 (67.1%) had HFPEF and 1,113 (54%) had AF at the time of inclusion in the registry. There were 1,473 patients aged 75 years or over (71.8% of the whole group) of whom 851 had AF (57.8%). AF was clearly more prevalent in patients 75 years of age or older (45.3% vs. 57.8%, $p<0.001$).

Baseline characteristics

Table 1 shows the characteristics of elderly patients with HF according to the presence or absence of baseline AF. There was no difference in gender or age between both subgroups. Compared with

Table 1: Characteristics of elderly (≥75 years) heart failure patients in the RICA registry with atrial fibrillation vs. non-atrial fibrillation

Variable	n	AF (851)	non-AF (622)	p
Age [mean (SD)]	851/622	82.47 (4.5)	82.16 (4.8)	0.1
Sex (male %)	851/622	40.5	44.4	0.1
Charlson index [mean (SD)]	851/622	3.76 (2.56)	3.46 (2.56)	0.03
Barthel index [mean (SD)]	827/604	80.15 (21.6)	82.8 (21.44)	0.02
Body mass index[mean (SD)]	851/622	27.9 (5.0)	28.5 (5.3)	0.06
Heart rate [mean (SD)]	851/622	88.6 (24.3)	87.4 (22.5)	0.3
Systolic blood pressure, mmHg [mean (SD)]	851/622	138.31(27.3)	143.5(29.6)	0.001
Diastolic blood pressure, mmHg [mean (SD)]	851/622	75.6(16.7)	76.7(16.7)	0.21
History				
Arterial hypertension (%)	851/622	86.8	87.0	0.9
Diabetes mellitus (%)	851/622	40.8	42.4	0.5
Smoking (%)	851/622	4.2	6.4	0.07
Prior myocardial infarction	851/622	20.0	25.9	0.008
Hyperlipidaemia (%)	851/622	42.7	46.9	0.11
COPD (%)	851/622	26.8	25.4	0.5
Chronic renal failure(%)	851/622	33.3	32.5	0.7
NYHA (%)	848/621			
I	34/66	4.0	10.6	<0.001
II	417/338	49.2	54.4	
III	353/202	41.6	32.5	
IV	44/15	5.2	2.4	

I-II	451/404	53.2	65.1	<0.001
III-IV	397/217	46.8	34.9	
Laboratory parameters mean (SD)				
Haemoglobin (mg/dl) [mean (SD)]	851/622	12.10 (1.96)	12.03 (1.93)	0.7
Creatinine (mg/dl)	851/622	1.41 (3.02)	1.38 (0.73)	0.8
MDRD (ml/min/1.73m^2)	851/622	55.74 (23.66)	55.43 (23.27)	0.2
C-reactive protein (mg/dl)	449/301	21.87 (40.50)	22.05 (46.1)	0.9
BNP (pg/ml)	140/95	951.5 (1064.9)	1775.7 (3667.7)	0.01
Pro-BNP (pg/ml)	358/241	6693.2 (12341.9)	6509.9 (7272.8)	0.8
Sodium (mEq/l)	851/622	139.0 (4.72)	139.1. (4.52)	0.9
Potassium (mEq/l)	816/602	4.29 (0.6)	4.31 (0.6)	0.6
Uric acid (mg/dl)	516/390	7.8 (2.49)	7.9 (2.69)	0.6
Electrocardiographic abnormalities (%)				
Left ventricular hypertrophy	851/622	27.7	28.8	0.7
Left bundle branch block	851/622	18.9	21.2	0.3
Right bundle branch block	851/622	13.2	14.0	0.6
Echocardiographic characteristics, mean (SD)				
Ejection fraction (%)	851/622	53.73 (14.43)	50.45 (15.36)	< 0.001
Preserved ejection fraction %	851/622	74.6	66.4	0.001
Left atrial dimension, mm	580/385	49.12 (8.9)	43.81 (7.9)	< 0.001
LVESV (mm)	405/276	38.00 (25.6)	39.20 (14.4)	0.5
LVEDV (mm)	223/159	49.03 (12.6)	52.89 (19.6)	0.02
Posterior wall thickness (mm)	195/141	12.57 (7.9)	12.22 (8.7)	0.7
Mitral regurgitation (moderate-severe) (%)	851/622	24.4	19.8	0.04
PAP (mmHg)	495/298	47.64 (15.84)	43.98 (15.38)	0.001
Treatment				
Betablockers	851/622	59.2	63.2	0.1
Diuretics	851/622	90.6	89.9	0.7
ACEI- RAA	851/622	75.0	80.5	0.01
Spironolactone	851/622	34.3	28.8	0.03
Digoxin	851/622	39.0	10.5	<0.001
Calcium channel blocker	851/622	21.5	22.3	0.7
Statin	851/622	37.7	47.1	< 0.001
Antiplatelets	851/622	24.6	56.4	< 0.001
Vitamin K antagonists	851/622	72.7	25.2	< 0.001
Mortality	851/622	22.8	19.1	0.094

COPD: Chronic Obstructive Pulmonary Disease, LVEDV: Left Ventricular End-Diastolic Volume, LVESV: Left Ventricular End-Systolic Volume, PAP: Pulmonary Arterial Pressure: ACEI-RAA: Angiotensin-Converting Enzyme Inhibitor, Renin-Angiotensin Antagonist, MDRD: Modification of Diet in Renal Disease

non-AF patients, those with AF had a higher Charlson index (3.76 vs. 3.46; p=0.03), a lower Barthel index (80.15 vs. 82.8; p=0.03) and less prior myocardial infarction (20% vs. 25.9%; p=0.008), more frequent preserved ejection fraction (EF) (74.6% vs. 66.4; p=0.001), and more advanced NYHA functional classes (III-IV) (46.8% vs. 34.9%; p<0.001). There were no differences in history of arterial hypertension, renal function and haemoglobin levels.

With respect to treatment, almost half of patients with AF were receiving digoxin (39% vs. 10.5%; p<0.001) and nearly 75% were on anticoagulant therapy with vitamin K antagonist (25.2% in patients with non-AF). On the other hand, more non-AF patients were receiving statins (47.1% vs. 37.7%; p ≤ 0.001), angiotensin-converting enzyme inhibitor, renin-angiotensin antagonist (ACEI-RAA) (80.5% vs. 75.0%; p=0.01) and antiplatelet treatment (56.4% vs. 24.6%; p<0.001).

Aetiology of patients with HF and AF and differences according to left ventricular EF

Figure 1 shows the aetiology of HF in groups with and without AF. In patients with AF, ischaemic aetiology was lower (21.7% vs. 36,1; p<0.001) and valvular was higher (22% vs. 12.9%; p<0.001) than in those without AF. There was no difference for all other aetiologies.

The prevalence of AF was significantly higher in patients with HFPEF compared to those with systolic HF (59.7% vs. 48.2%; p< 0.001) (Figure 2). Table 2 shows the characteristics of patients with HF-AF by ventricular function. Only 216 of the 851 subjects (25.38%) had HFREF. This subgroup was predominantly male (58.3% vs. 34.5%; p<0.001), had more comorbidities (Charlson index 4.5 vs. 3.59; p<0.001), more ischemic heart disease [prior myocardial infarction (37.5% vs. 14%; p<0.001)] and lower body mass index (BMI) (26.7 vs. 28.4; p<0.001). There were no differences in NYHA functional class between the two groups. Left bundle block QRS morphology was seen more frequently in patients with HF-AF and systolic dysfunction (33.8% vs. 13.9%; p<0.001).

The subgroup of patients with HFREF-AF received more Beta-Blockers (BB), spironolactone, statins and antiplatelets than patients with HFPEF-AF. However, more HFPEF-AF patients received anticoagulant treatment (75.3% vs. 65.3%; p=0.006).

Association between atrial fibrillation and mortality

In elderly patients with HF, one-year mortality was higher in AF patients, but this did not reach statistical significance (22.8% vs. 19.1%; p: 0.094; Figure 3). Factors associated with one-year mortality (univariate analysis; Table 3) were Charlson index, systolic blood

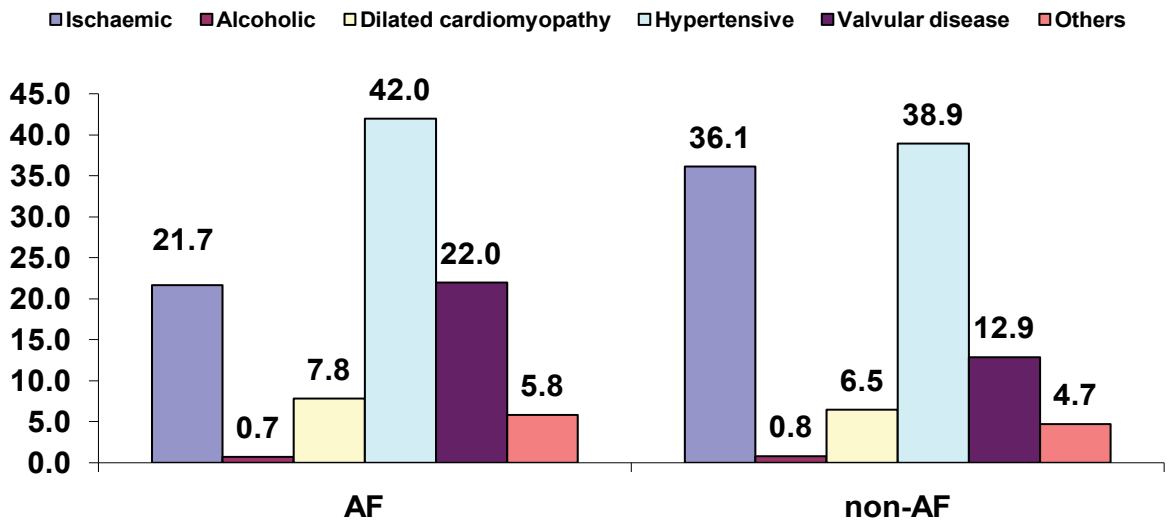

Figure 1: Aetiology of chronic heart failure in elderly patients in the RICA registry presenting due to atrial fibrillation

p<0.001 for ischaemic and valvular aetiologies, non-significant for all others aetiologies (%)

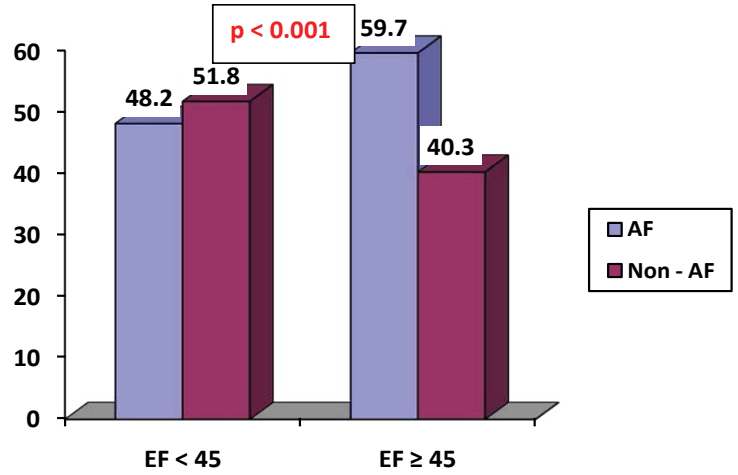

Figure 2: Prevalence of atrial fibrillation in elderly patients (≥ 75 years) in the RICA registry by ejection fraction

AF: Atrial Fibrillation, non-AF: non Atrial Fibrillation

Table 2: Characteristics of elderly patients (≥75 years) in the RICA registry with atrial fibrillation and congestive heart failure by ejection fraction

Variable	n	< 45%	≥45%	p
Number	851	216	635	
Age	216/635	82.3 (4.6)	82.5 (4.5)	0.440
Sex (male,%)	216/635	58.3	34.5	< 0.001
Charlson index	216/635	4.5 (2.9)	3.5 (2.4)	< 0.001
Barthel index	212/615	81.2 (20.7)	79.8 (21.9)	0.430
Body mass index	216/635	26.7 (4.4)	28.4 (5.1)	< 0.001
Heart rate	216/635	89.7 (23.9)	88.3 (24.5)	0.454
Systolic blood pressure (mmHg)	216/635	133.0 (26.4)	140 (23.7)	< 0.001
Diastolic blood pressure (mmHg)	216/635	74.1 (15.6)	76.4 (17.6)	0.127
History				
Arterial hypertension (%)	216/635	88.9	86.1	0.352
Diabetes mellitus (%)	216/635	41.2	40.6	0.936
Smoking (%)	216/635	5.1	3.9	0.440
Hyperlipidaemia (%)	216/635	50.0	40.2	0.013
COPD (%)	216/635	32.9	24.7	0.021
Chronic renal failure (%)	216/635	39.8	31.0	0.019
Prior myocardial infarction (%)	216/635	37.5	14.0	< 0.001
NYHA (%)				
I	5/29	2.3	4.6	0.428
II	110/307	51.2	48.5	
III	87/266	40.5	42.0	
IV	13/31	6.0	4.9	

I-II	100/297	46.3	46.8	0.937
III-IV	116/338	53.7	53.2	
Laboratory parameters, mean (SD)				
Haemoglobin (mg/dl)	216/635	12.2 (1.8)	11.9 (1.9)	0.149
Creatinine (mg/dl)	216/635	1.4 (0.6)	1.4 (3.5)	0.873
MDRD (ml/min/1.73m^2)	216/635	55.4 (23.8)	55.8 (23.6)	0.809
C-reactive protein (mg/dl)	118/331	18.8 (44.2)	22.9 (39.1)	0.337
BNP (pg/ml)	38/102	1265 1001)	834 (826)	0.033
Pro-BNP (pg/ml)	83/275	8478 (9644)	6154 (13014)	0.133
Sodium (mEq/l)	216/635	139.3 (4.4)	138.9 (4.8)	0.281
Potassium (mEq/l)	205/611	4.3 (0.5)	4.3 (0.6)	0.238
Uric acid (mg/dl)	131/385	7.9 (2.6)	7.8 (2.4)	0.767
Electrocardiographic abnormalities (%)				
Left ventricular hypertrophy	216/635	28.7	27.4	0.725
Left bundle branch block	216/635	33.8	13.9	< 0.001
Right bundle branch block	216/635	7.9	15.0	0.007
Echocardiographic characteristics, mean (SD)				
Ejection fraction (%)	216/635	33.6 (6.8)	60.4 (9.1)	< 0.001
Left atrial dimension (mm)	151/429	49.3 (7.6)	49.0 (9.1)	0.761
Posterior wall thickness (mm)	40/155	15.8 (6.6)	11.9 (2.6)	0.019
Mitral regurgitation, moderate-severe	203/584	38.9	22.1	< 0.001
Treatment				
Betablockers	216/635	68.1	56.2	0.002
Diuretics	216/635	91.2	90.4	0.788
ACEI- RAA	216/635	78.2	73.9	0.205
Spironolactone	216/635	46.2	30.1	< 0.001
Digoxin	216/635	36.6	39.8	0.420
Calcium channel blocker	216/635	11.6	24.9	< 0.001
Statin	216/635	48.1	34.2	< 0.001
Antiplatelets	216/635	35.2	20.9	< 0.001
Vitamin K antagonists	216/635	65.3	75.3	0.006
Mortality	216/635	26.4	21.6	0.159

COPD: Chronic Obstructive Pulmonary Disease, LV: Left Ventricular End-Diastolic Volume, RV: Right Ventricular End-Diastolic Volume, PAP: Pulmonary Arterial Pressure, ACEI-RAA: Angiotensin-Converting Enzyme Inhibitor, Renin-Angiotensin Antagonist

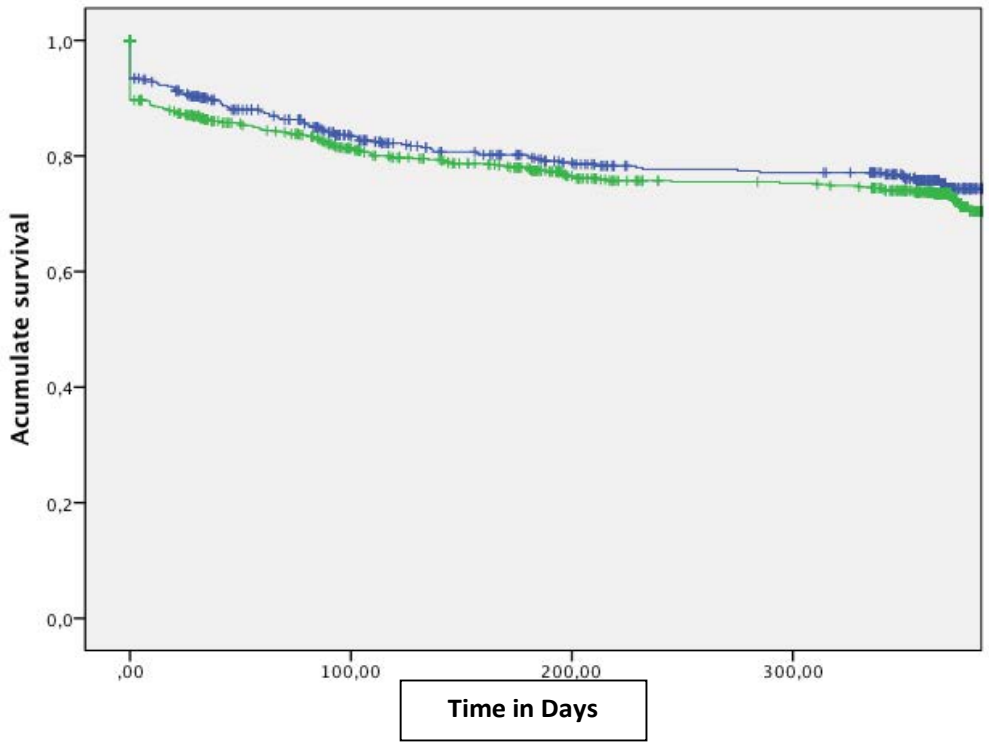

Figure 3: Kaplan-Meier curves of patients with HF according to presence of atrial fibrillation.
Green: heart failure and atrial fibrillation, Blue: heart failure with no atrial fibrillation

pressure and haemoglobin. There was no difference in mortality according to HF aetiology such as ischaemia, hypertension or valvular disease.

In the multivariate analysis (Table 4) Charlson index, systolic blood pressure, haemoglobin levels and functional class remained significant. On the other hand, one-year mortality was higher in

Table 3: Univariate analysis. Proportional hazards model: mortality in patients ≥75 years

Variables	RR	(95% CI)	(95% CI)	p
AF	1.025	.717	1.468	0.890
Sex (male)	1.248	.910	1.712	0.169
Charlson index	1.067	1.005	1.134	0.035
Heart rate	.999	.992	1.005	0.670
SBP	.992	.987	.997	0.003
Hypertension	.989	.646	1.514	0.958
Diabetes	1.253	.917	1.713	0.156
MI	1.185	.837	1.678	0.339
Dyslipidaemia	.868	.648	1.163	0.343
COPD	1.136	.820	1.573	0.443
NYHA (II)	1.515	.607	3.779	0.374
NYHA (III)	2.407	.966	5.999	0.059
NYHA (IV)	2.693	.891	8.140	0.079
Haemoglobin	.923	.857	.993	0.032
EF< 45%	1.044	.758	1.438	0.791
LA diameter	1.003	.986	1.021	0.710
Severe MR	1.042	.755	1.438	0.802
Antiplatelets	1.304	.925	1.838	0.129
Digoxin	1.224	.883	1.696	0.225
Vitamin K antagonists	1.171	.820	1.671	0.386

SBP: Systolic Blood Pressure, MI: Myocardial Infarction, COPD: Chronic Obstructive Pulmonary Disease, NYHA: New York Heart Association, EF: Ejection Fraction; LA: Left Atrial, MR: Mitral Regurgitation

Table 4: Multivariate analysis in patients >75 years. Proportional hazards model

Variable	RR	(95%CI)	p
Sex (male)	1.32	0.99-1.76	0.059
Charlson index	1.095	1.041-1.153	0.00
SBP	0.992	0.987-0.097	0.002
NYHA (II)	1.642	0.665-4.05	0.282
NYHA (III)	2.598	1.055-6.401	0.038
NYHA (IV)	2.926	0.977-8.763	0.055
Haemoglobin	0.917	0.853-0.986	0.019

SBP: Systolic Blood Pressure, NYHA: New York Heart Association

HFREF-AF patients than in those with HFPEF-AF, but the difference was not statistically significant (26.4% vs. 21.6%; p= 0.19).

Discussion

The Spanish Heart Failure Registry (RICA) collects HF patients admitted to internal medicine departments of Spanish hospitals. Minimum follow-up time is 12 months. Typically of patients seen by internists, most are over 75 years of age, most are women and most have HFPEF [21]. Of the 1,473 patients ≥ 75 years of age (71.8% of the whole group), AF was found in 57.8% of the subjects. AF, like HF, affects millions of patients and markedly increases in prevalence with age [22,23]. Accordingly, in our series, the prevalence of AF is significantly higher in individuals of 75 years and over (57.8% vs. 45.3%; p<0.001).

The prevalence of AF increases as the severity of HF increases [22], and in our registry the rate of baseline AF in the patients with HF was significantly higher in patients with advanced functional classes of the NYHA. However, it is remarkable the high overall prevalence of AF in our population probably by the combination of HF and advanced age. In other Spanish series [23] and other reports of patients hospitalised with heart failure [21], differences in HF aetiology were found between patients with and without AF. Of particular interest in these studies was the greater role of ischemic heart disease in the non-AF HF group and valvular heart disease in the HF group with AF, also found in our study. Systolic blood pressure (SBP), previously reported by our group as a prognostic marker [18], was lower in our HF-AF patients than in patients with HF without AF. Left atrium (LA) dimensions are related to the persistence and recurrence of AF [24] and, accordingly, patients with larger LA can be expected to have more AF, as was found in our series.

In line with other series, our patients with HF-AF and preserved EF were predominantly female, with higher BMI, lower prevalence of previous myocardial infarction, and lower frequency of LBBB QRS morphology on electrocardiogram [25].

Importantly, the rate of anticoagulant treatment in patients with AF generally decreases as age increases [26], but in our HF-AF patients the rate of anticoagulation was very high (74.4%), especially considering the older age of the patients. This was considerably higher than in many published series that report ranges from 39.7% to 58.7% [27,28] in patients of all ages, with rates as low as 5.7% or 11.5% [29,30] in elderly patients.

When other medical treatments were analysed, we found that a higher proportion of our patients with HF-AF received digoxin than patients with HF and no AF, entirely attributable to the presence of arrhythmia. It is also noteworthy that many patients with AF received BB as antiarrhythmic treatment for rate control, similarly to findings in other series of patients [25].

When comparing patients with HF-AF according to systolic function, we found that subjects with HF-AF and reduced EF received BB more frequently than patients with preserved EF, probably because in the first group these were used as agents for slowing heart rate and as basic treatment of HF, while in the second group, BB may have been used primarily for managing rate control. There was no difference in the use of digoxin in the two subgroups and statins were employed more in HFREF-AF, probably because of the higher prevalence of a history of prior myocardial infarction in this group. We have no explanation for the lower frequency of use of anticoagulants in patients with AF and HFREF, but the lower frequency of anticoagulation is offset by the increased use of antiplatelets in this subgroup. Nor can we explain the high rate of anticoagulation in patients with HF and no AF, even considering that valvular aetiology, which might explain the use of these agents in some patients, was present in 12.9% of these cases.

Our secondary objective was to analyse if AF was associated with increased risk of one-year mortality in elderly patients with HF and both reduced and preserved EF in our national registry. Most studies have found that AF is associated with an increased risk of mortality in patients with HF [22,31]. Khazanie et al. [32] have shown that in elderly patients (>70 years) existing AF was associated with an increased risk of mortality at three years, as well as with adverse events such as all-cause readmissions, readmission for HF and stroke, compared to subjects without AF. They also found that new onset AF was associated with increased mortality at one year. Olsson et al. in the CHARM program also noted that patients with HF and AF had higher mortality from all causes, both in HFPEF and in HFREF [15], and McManus et al. found in about 30,000 patients (more than 12,000 > 75 years) with a follow-up of 1.8 years that AF was a potent risk factor for mortality and adverse events both in HFPEF and HFREF [25]. In RICA patients, one-year mortality in HF-AF subjects was slightly greater than in patients with HF and no AF (22.8% vs. 19.1%), but the difference was not significant. One possible explanation for the lack of relationship between AF with higher mortality is that monitoring was only one year, too short compared with other series with more longer follow-up [15].

The association of AF with a higher risk of 30-day mortality (HR, 1.16; 95% CI, 1.08-1.25) has been reported among patients with preserved EF but not among patients with reduced EF [33], although other authors have found similar rates of death and cardiovascular events in patients with HF-AF with preserved or reduced systolic function [25]. In RICA registry patients, one-year mortality was slightly increased in HF-AF patients with reduced EF, but the difference was not significant.

Charlson index, SBP, haemoglobin levels and NYHA functional class were associated with one-year mortality, findings that were already observed in hospitalized HF patients and published by our group [18,34].

This study has several limitations. Firstly, patients who die during the index admission are not included in the registry and therefore cannot be subject to this analysis and secondly, mortality is analysed as a whole, regardless of cardiovascular or non-cardiovascular causes. The main target of the RICA registry was HF and consequently many important characteristics of AF, such as AF type, $CHADS_2$ or $CHADS_2$Vasc and duration of arrhythmia, were not taken into consideration. AF was compared to non-AF, but other rhythms, such as pacemaker rhythms, were ignored. The diagnosis of AF was established in the admission EKG ("baseline AF"). We have no EKG monitoring so we cannot set the frequency of occurrence of AF (new AF) during follow-up.

In conclusion, we found that patients hospitalized for heart failure in internal medicine departments of Spanish hospitals are predominantly older and mainly women. Prevalence of AF in elderly patients admitted with heart failure is high. Patients with HF and AF, compared with patients with HF and no AF, have increased comorbidity, as measured by the Charlson index, poorer functional capacity, as measured by the Barthel index, higher prevalence of valvular disease and less ischemic heart disease, and are more frequently in higher functional classes of NYHA (III and IV). One remarkable finding is the high rate of anticoagulation in our HF-AF patients. In elderly hospitalized patients with heart failure no association was found between AF and one-year mortality.

Conflict of Interests

The authors declare that they have no current or potential conflict of interests, including any financial, personal or other relationships with other individuals or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, the paper entitled "ATRIAL FIBRILLATION IN ELDERLY PATIENTS WITH HEART FAILURE."

Appendix

RICA Registry members: Anarte L, Aramburu O, Arévalo-Lorido JC, Bas F, Brase A, Carrera M, Cepeda JM, Cerqueiro JM, Conde A, Dávila MF, Díez-Manglano J, Epelde F, Formiga F, Franco J, Gallego J, González-Franco A, Guisado ME, Herrero A, López-Castellanos G, Manzano L, Martínez-Zapico A, Montero-Pérez-Barquero M, Murado I, Oropesa R, Pérez-Bocanegra C, Pérez-Calvo JI, Quesada MA, Quirós R, Rodríguez-Ávila EE, Ruiz-Laiglesia F, Ruiz-Ortega R Salamanca P, Sánchez-Marteles M, Satué JA, Serrado A, Suárez I, Trullàs JC, Urrutia A.

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