PREVALENCE OF ATRIAL FIBRILLATION AND PRACTICE PATTERNS OF ANTITHROMBOTIC THERAPY IN A POPULATION-BASED COHORT STUDY OF HEMODIALYIS PATIENTS: THE VIENNA INVESTIGATION OF ATRIAL FIBRILLATION AND THROMBOEMBOLISM IN HEMODIALYSIS PATIENTS (VIVALDI)

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Background:

Atrial fibrillation (AF) is an underestimated comorbidity in hemodialysis (HD) patients that adds significant risk of stroke and thromboembolism to a high burden of disease in end-stage renal disease (ESRD). Data on the prevalence of AF in HD patients derived from patient-level cohort studies are scare. The aim of this study was to investigate the prevalence of AF in a population-based cohort with patient-level data and the distribution of practice patterns of antithrombotic treatment for stroke prevention in AF.

Patients and Methods:

The Vienna InVestigation of AtriaL fibrillation and thromboembolism in patients on hemoDIalysis (VIVALDI) is a population-based cohort study with a cross-sectional baseline data capture phase and an ongoing prospective observational phase, with primary endpoints stroke, thromboembolism, and death. At the seven major hemodialysis centers of Vienna, Austria, 626 patients provided informed consent for participation **(figure 1**). A structured interview with each individual patient was performed, recent ECGs were viewed and medical histories were verified with the electronic records of the HD centers. A baseline blood sample was taken before hemodialysis and frozen for storage in a state-of-the-art biorepository.

Figure 1: Flowchart of patient recruitment

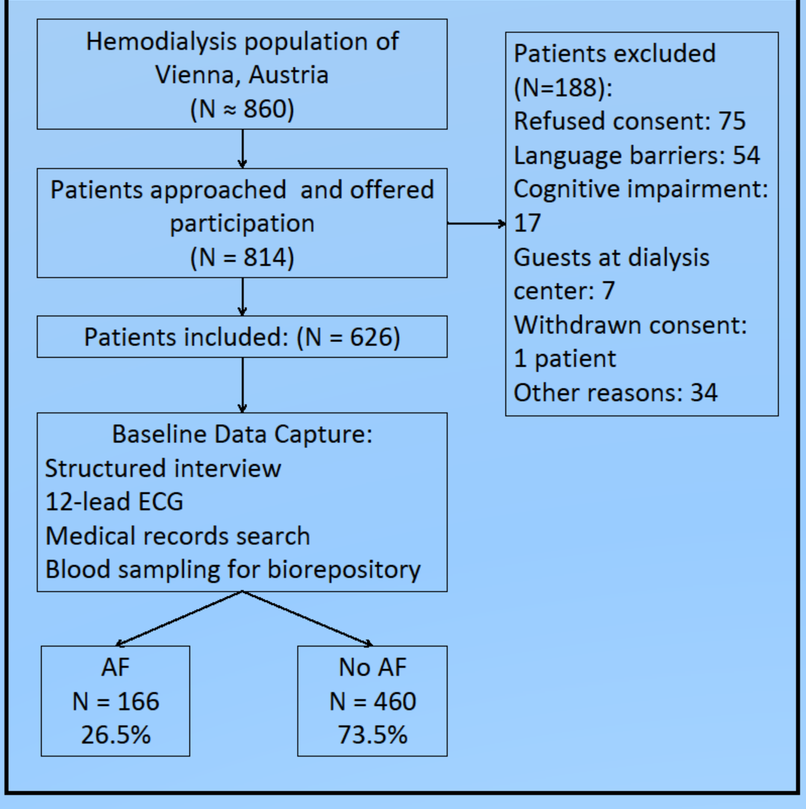

Figure 2: Distribution of the prevalence of atrial fibrillation in the population according to age and HD vintage

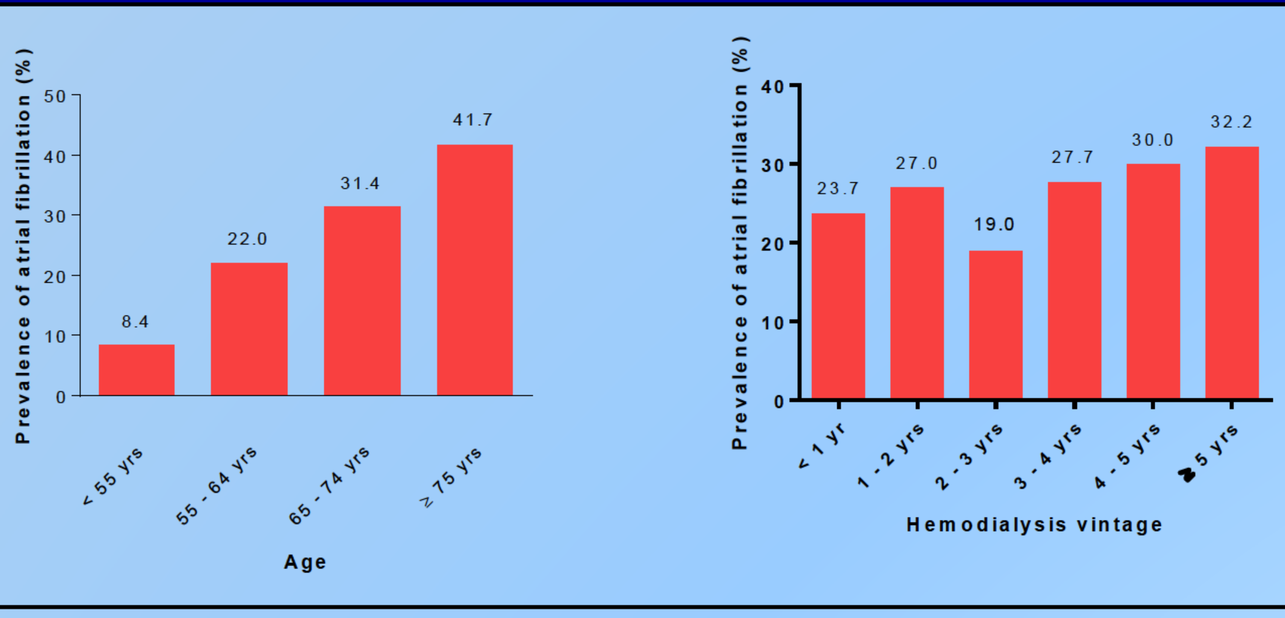

Table 1: Baseline population characteristics

Characteristics	Full population	Non-AF cohort	AF cohort	p-value*
Patients, n (%)	626 (100)	460 (73.5)	166 (26.5)	---
Male sex (%)	397 (63.4)	279 (60.7)	118 (71.1)	0.017
Age, median (25th – 75th percentile)	66 (55 – 75)	63.5 (50 – 73)	71.5 (64 – 78)	<0.001
BMI, median (25th – 75th percentile)	25.7 (22.4 – 29.6)	25.6 (22.2 – 29.4)	25.9 (22.7 – 29.7)	0.734
Etiology of ESRD, n (%)				
Diabetic NP	160 (25.6)	117 (25.4)	43 (25.9)	0.906
Vascular NP	121 (19.3)	82 (17.8)	39 (23.5)	0.113
Glomerular nephritis	82 (13.1)	65 (14.1)	17 (10.2)	0.203
Atrophic NP	57 (9.1)	41 (8.9)	16 (9.6)	0.781
Cystic non-hereditary NP	36 (5.8)	26 (5.7)	10 (6.0)	0.860
Hereditary NP	31 (5.0)	26 (5.7)	5 (3.0)	0.179
Nephrectomy	20 (3.2)	10 (2.2)	10 (6.0)	0.016
Iatrogenic/toxic NP	28 (4.5)	19 (4.1)	9 (5.4)	0.491
Other causes	91 (14.5)	74 (16.1)	17 (10.2)	0.067
Dialysis history, n (%)				
History of renal transplantation	90 (14.4)	64 (13.9)	26 (15.7)	0.582
Previous peritoneal dialysis	46 (7.3)	35 (7.6)	11 (6.6)	0.606
Current vascular access				
AV fistula	329 (52.6)	244 (53.0)	85 (51.2)	0.684
AV graft	72 (11.5)	57 (12.4)	15 (9.0)	0.246
Central venous catheter	221 (35.3)	157 (34.1)	64 (38.6)	0.307
others	4 (0.7)	2 (0.4)	2 (1.2)	0.286
Dialysis parameters, median (25th – 75th percentile)				
Remaining diuresis, ml	500 (0 – 1000)	500 (0 -1000)	350 (0 – 1000)	0.295
Inter-dialytic weight gain, kg	2.0 (1.1 – 3.0)	2.1 (1.1 – 3.1)	1.9 (1.2 – 2.6)	0.135
Hemodialysis vintage, years	2.7 (1.0 – 5.0)	2.5 (1.0 – 5.0)	3.0 (1.1 – 6.0)	0.084
Comorbidities, n (%)				
History of stroke or TIA	127 (20.3)	82 (17.8)	45 (27.1)	0.011
History of myocardial infarction	105 (16.8)	69 (15.0)	36 (21.7)	0.048
Coronary heart disease	233 (37.2)	150 (32.6)	83 (50.0)	<0.001
Artificial heart valve	43 (6.9)	22 (4.8)	21 (12.7)	0.001
History of VTE	61 (9.7)	36 (7.8)	25 (15.1)	0.007
Deep vein thrombosis	44 (7.0)	27 (5.9)	17 (10.2)	0.075
Pulmonary embolism	32 (5.1)	18 (3.9)	14 (8.4)	0.037
Peripheral artery disease	197 (31.5)	139 (30.2)	58 (34.9)	0.261
Diabetes	237 (37.9)	168 (36.5)	69 (41.6)	0.244
Hypertension	576 (92.0)	423 (92.0)	153 (92.2)	0.931
Congestive heart failure	184 (29.4)	114 (24.8)	70 (42.2)	<0.001
Cancer history or active	152 (24.3)	96 (20.9)	56 (33.7)	<0.001
Smokers	306 (48.9)	230 (50.0)	76 (45.8)	0.351
Current antithrombotic therapy, n (%)				
LMWH s.c. on non-HD days	59 (9.4)	26 (5.7)	33 (19.9)	<0.001
Vitamin K antagonist	77 (12.3)	27 (5.9)	50 (30.1)	<0.001
Antiplatelet agent	345 (55.1)	254 (55.2)	91 (54.8)	0.930

Results:

The overall prevalence of AF was 26.5% (71.1% male, median age 72 years, 64 - 78) with a median HD vintage of 3 years **(table 1**). The prevalence of AF increased with the age of study participants (**figure 2**) and with increasing time on HD treatment, denoted HD vintage. The diagnosis of AF was statistically associated with increased age (odds ratio [OR] 1.05 for every year, 95% confidence interval 1.03 – 1.06), male sex (1.92, 1.18 – 3.14), history of coronary heart disease (2.03, 1.31 – 3.14), presence of artificial heart valves (2.24, 1.02 - 4.89), history of venous thromboembolism (1.94, 1.00 - 3.75), congestive heart failure (1.59, 0.99 - 2.53) and history or active cancer (1.65, 1.02 - 2.68) in univariate logistic regression **(table 2).** In a multivariable logistic regression model, male sex, age and HD vintage were independently associated with AF **(table 2).** In 60% of AF patients, AF was diagnosed close to or after ESRD and in 40% it had been present before diagnosis of ESRD. Further baseline population characteristics and their respective associations with AF are shown in **table 1.**

Antithrombotic treatment was applied in 84.4% of AF patients (28.9% with anticoagulant agents, in 33.7% with antiplatelet agents, and in 21.1% with both). Among the anticoagulant agents used, 60.2% were vitamin-K-antagonists, 38.6% were low-molecular-weight heparins on non-HD-days, and 1.2% were fondaparinux. Twenty-six AF patients (15.6%) received no antithrombotic therapy, except during HD sessions.

Table 2: Logistic regression model of factors associated with atrial fibrillation (N=559)

Risk factors	Univariable OR (95%CI)	p	Multivariable OR (95%CI)	p
Male sex	1.92 (1.18 - 3.14)	0.009	2.18 (1.28 - 3.70)	0.004
Age, per year	1.05 (1.03 - 1.06)	<0.001	1.05 (1.03 - 1.07)	<0.001
HD vintage, per year	1.06 (1.02 - 1.11)	0.003	1.08 (1.03 - 1.13)	0.001
Stroke/TIA	1.56 (0.93 - 2.60)	0.090	1.14 (0.66 - 1.98)	0.631
Coronary heart disease	2.03 (1.31 - 3.14)	0.002	1.41 (0.87 - 2.27)	0.160
Artificial heart valve	2.24 (1.02 - 4.89)	0.043	1.44 (0.62 - 3.34)	0.400
VTE	1.94 (1.00 - 3.75)	0.049	1.89 (0.93 - 3.85)	0.081
Congestive heart failure	1.59 (0.99 - 2.53)	0.052	1.24 (0.75 - 2.03)	0.403
Cancer history/active	1.65 (1.02 - 2.68)	0.043	1.21 (0.72 - 2.03)	0.481

Conclusions:

The prevalence of AF is high amongst HD patients and seems to increase with HD vintage. AF is associated with patient age, sex and distinct medical comorbidities. Practice patterns of antithrombotic treatment indicate the expected lack of consensus for stroke prevention in AF for HD patients. Evidence-based and HD-specific risk evaluation strategies are crucial for guiding initiation and duration of anticoagulation treatment in this high-risk population.

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