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Risk Factors for the Development of Atrial Fibrillation in the Kazakh Patients

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Abstract

BACKGROUND: Atrial fibrillation (AF) is the most common persistent heart rhythm disorder.

AIM: Assessment of clinical predictors of atrial fibrillation in the Kazakh population.

METHODS: An analytical clinical and epidemiological study of 75 patients with AF of Kazakh nationality. Descriptive analysis of medical records was carried out and the results of laboratory and instrumental research methods. Statistical analysis was carried out using the Statistica 6.0 Software package from StatSoft Inc. (USA) and MS Excel.

RESULTS: In the majority of the studied patients (86.7%), atrial fibrillation was associated with hypertension, in 49.3% of patients was diagnosed with coronary artery disease. A permanent form of atrial fibrillation was observed in 63%, in 20% AF manifested itself in the form of paroxysms, in 17% AF was persistent. AF, which arose against the background of CHF, was established in 41.3% of the patients studied by us, while a decrease in LVEF below 40% was observed in 21.3% of the examined patients. In our study, diabetes mellitus was diagnosed as a comorbid pathology in 24% of patients and diabetes mellitus correlated with permanent AF in 66.7%. Thyroid pathology was observed in 9.3% cases. CRHD as a concomitant disease occurred in 12% of cases. In 5.7% of cases, AF was registered as idiopathic (primary) without a history of cardiovascular and concomitant pathology. Smoking as a risk factor was observed in 16%, alcohol consumption, was noted by 8 patients (10.7%). In 40% of cases, patients with AF were obese, 45.3% of the patients were overweight (BMI ≥25).

Introduction

Atrial fibrillation (AF) is the most common persistent heart rhythm disorder, the prevalence of which increases with age [1]. A systematic review of population-based AF studies published from 1980 to 2010 showed a progressive gradual increase in the prevalence of AF worldwide [2]. AF prevalence increased by 44% in the population of Russian Federation from 2010 to 2017 according to statistical analysis conducted by Russian scientists [3]. The results of the study in the city of Almaty and the Almaty region of the Republic of Kazakhstan showed that AF prevalence in the population over 18 years old was 3.3% [4].

The progressive prevalence of AF is becoming a serious threat to public health worldwide, as it is associated with high mortality rate. The main causes of high mortality in patients with AF are the progression of chronic heart failure (CHF) and the development of thromboembolic complications, the most severe of which is the development of cardioembolic cerebral stroke [5].

The etiopathogenesis of AF is quite complex; the studies carried out to date confirm both the influence of clinical factors on the development of AF and the genetic nature of the disease. Clinical factors include organic heart disease and other diseases, the consequence of which may be its structural changes, among them – arterial hypertension (AH), coronary artery disease (CAD), CHF, inflammatory myocardial diseases, cardiomyopathies, obesity, diabetes mellitus, and thyroid pathology [6], [7], [8]. Real clinical practice shows that in 32% of AF cases, AF develops against the background of hypertension. Analysis of hospitalized patients shows that 91% of patients with AF are diagnosed with hypertension [9]. Analysis of the structure of combined cardiovascular pathology showed that 81.9% of hospitalized patients with AF have reliably confirmed CAD [10]. In addition, the causes of AF include chronic obstructive pulmonary disease and obstructive sleep apnea, chronic renal failure, chronic alcoholism, and smoking [11]. Clinical conditions cause slow but progressive structural and electrical remodeling of the atrial myocardium, in turn, these pathophysiological mechanisms lead to the formation of AF. In some cases, AF can occur in the absence of organic heart disease, the

Table 1: Sex and age characteristics of patients with atrial fibrillation

Sex	Age, years						Total n (%)
	Up to 40	41–50	51–60	61–70	71–80	81–90	
Men: n (%)	1 (2.3%)	-	13.(30.2%)	17 (39.5%)	9 (20.9%)	3 (6.9%)	43 (57.3%)
Women: n (%)	-	1 (3.1%)	3 (9.4%)	10 (31.3%)	17 (53.1%)	1 (3.1%)	32 (42.7%)
Total: n (%)	1 (1.3%)	1 (1.3%)	16 (21.3%)	27 (36%)	26 (34.6%)	4 (5.3%)	75 (100%)

p < 0.05.

cause of AF is not clinically diagnosed, this form of AF is called isolated or idiopathic [12]. According to published studies, idiopathic AF may be a monogenic syndrome with a classic Mendelian pattern of inheritance [13]. The hereditary predisposition of AF has complex developmental mechanisms. Further identification and study of various monogenic forms of AF made it possible to study the molecular mechanisms of not only familial AF cases, but also its polygenic variants. [14]. In most cases, the variability of AF predisposition genes is represented by single-nucleotide polymorphism. At least 30 loci associated with AF have been identified so far [15], [16], [17], [18].

At present, significant progress has been made in identifying the genetic substrate underlying the development of AF. At the same time, research results depend on factors such as concomitant cardiac and extracardiac diseases, inheritance mechanisms, and ethnicity. Population studies from North America indicate that African Americans have a lower risk of AF than whites, despite a higher susceptibility to AF risk factors [19]. There is reason to believe that people of European descent have a higher risk of developing AF compared to representatives of other races, which partly explains the significantly higher prevalence of AF in developed countries [20]. At the same time, there is currently insufficient systematic population-based epidemiological data on AF in low- and middle-income countries [21]. To date, the assessment of clinical predictors of AF in certain ethnic groups in Kazakhstan has not been sufficiently studied.

Objective of the study

The aim of the study was to study the assessment of clinical predictors of AF in the Kazakh patients.

Materials and Research Methods

An analytical clinical and epidemiological study of 75 patients with AF of Kazakh nationality, long-term residents of the Republic of Kazakhstan, was conducted. The study was carried out in the city hospitals of Karagandy: «General Hospital No.1» SME, «General Hospital No.2» SME, «Municipal Polyclinic No.3» and «Municipal Polyclinic No.5».

Descriptive analysis of medical records was carried out and the results of laboratory and instrumental research methods were evaluated: Electrocardiography (ECG), Holter ECG monitoring, echocardiography, and selective coronary angiography (CAG). A questionnaire was administered among the patients with AF, who participated in the study, to assess the AF risk factors. The questionnaire was developed based on the clinical guidelines of the European Association of Cardiology [22]. Statistical analysis was carried out using the Statistica 6.0 Software package from StatSoft Inc. (USA) and MS Excel. The results obtained are presented as absolute frequencies and weighted percentages. In all procedures of statistical analysis, p = 0.05 was taken as the critical level of significance of the null statistical hypothesis.

Results of the Study

The average age of the patients included in the study was 66.76 ± 9.13 (CI 64.66–68.86). The proportion of the surveyed males was 57.3% and women 42.7%. The distribution by sex and age showed that patients in the age group of 61–70 years (36%) prevailed, of which 39.5% were males. Among women, the largest percentage were patients aged 71–80 years (17%), detailed information is presented in Table 1.

The analysis of the patients included in the study showed the predominance of AH as a main (23.07%) and as a concomitant diagnosis (76.9%) in patients with AF. In a significant number of the studied patients (86.7%), AF was associated with hypertension. At the same time, chronic (permanent) AF prevailed in patients with hypertension (63%). The structure of comorbidities and risk factors for patients with AF is presented in Table 2.

Table 2: Clinical characteristics of patients with AF

Risk factors and comorbidities	AF type			Total
	Permanent	Paroxysmal	Persistent	
	1	2	3	4
AH*: n (%)	41 (63%)	13 (20%)	11 (16.9%)	65 (86.7%)
CAD*: n (%)	23 (62.2%)	10 (27%)	4 (10.8%)	37 (49.3%)
TMI*: n (%)	11 (55%)	7 (35%)	2 (10%)	20 (26.7%)
CHF*: n (%)	22 (70.9%)	5 (16.1%)	4 (12.9%)	31 (41.3%)
CVA*: n (%)	4 (40%)	5 (50%)	1 (10%)	10 (13.3%)
DM*: n (%)	12 (66.7%)	5 (27.8%)	1 (5.6%)	18 (24%)
COPD*: n (%)	7 (77.8%)	2 (22.2%)	0 (%)	9 (12%)
AHD*: n (%)	5 (62.5%)	1 (12.5%)	2 (25%)	8 (10.7%)
CRHD*: n (%)	4 (80%)	0 (%)	1 (20%)	5 (6.7%)
DCM*: n (%)	1 (33.3%)	0 (%)	2 (66.6%)	3 (4%)
Thyroid diseases: n (%)	5 (71.4%)	2 (28.6%)	0 (%)	7 (9.3%)
HRD*: n (%)	2 (40%)	0 (%)	3 (60%)	5 (5.7%)
Obesity: n (%)	21 (70%)	6 (20%)	3 (10%)	30 (40%)
Overweight: n (%)	19 (55.9%)	8 (23.5%)	7 (20.6%)	34 (45.3%)
Smoking: n (%)	6 (50%)	2 (16.7%)	4 (33.3%)	12 (16%)
Alcohol consumption: n (%)	2 (25%)	3 (37.5%)	3 (37.5%)	8 (10.7%)

*AH: Arterial hypertension, CAD: Coronary artery disease, TMI: Trancient myocardial ischemia, CHF: Chronic heart failure, CVA: Cerebrovascular accident, DM: Diabetes mellitus, COPD: Chronic obstructive pulmonary disease, AHD: Atherosclerotic heart disease, CRHD: Chronic rheumatic heart disease, DCM: Dilated cardiomyopathy, HRD: Heart rate disease, AF: Atrial fibrillation.

CAD was diagnosed as the main diagnosis in half of the cases (49.3%). Moreover, in 70.3% of the examined patients, the diagnosis was confirmed by selective CAG. In 10.7% of the study participants, without clinical manifestations of CAD, the main diagnosis was atherosclerotic heart disease. Against the background of CAD, chronic AF was observed in 62.2% of the subjects, paroxysmal AF was observed in 27.2% of cases, and persistent AF in 10.8%.

In 26.7% of cases, patients with CAD suffered myocardial infarction (TMI), in 13.3% of the examined patients, a history of acute cerebrovascular accident was indicated. Evaluation of the interventions performed on the surveyed patients showed that percutaneous coronary interventions were performed in 13.3% of patients with CAD and coronary artery bypass grafting in 6.7% of patients. The types of the previous surgical interventions on the heart and blood vessels are presented in Figure 1.
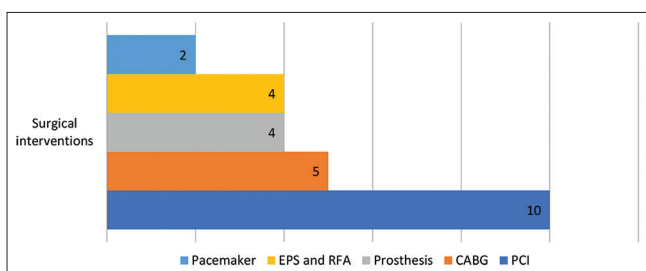

Figure 1: Previous surgical interventions in patients with atrial fibrillation

Dilated cardiomyopathy associated with AF was diagnosed in 4%, mainly as a persistent form in 66.7%. AF, which arose against the background of CHF, was established in 41.3%, while a decrease in the left ventricular ejection fraction (LVEF) below 40% was observed in 21.3% of the examined. It should be emphasized that in almost 51% of the subjects, the LVEF was intact and exceeded 50%. According to trasthoracic echocardiography, left atrial dilatation was registered in 56%. The main indicators of echocardiography are presented in Table 3.

Table 3: Echocardiographic parameters in patients with AF

Indicators n (%)	AF type			
	Total	Permanent	Paroxysmal	Persistent
LV EF* ≥ 50%	38 (50.7%)	22 (57.9%)	8 (21%)	8 (21%)
LV EF 49-40%	21 (28%)	14 (66.7%)	5 (23.8%)	2 (9.5%)
LV EF ≤ 40%	16 (21.3%)	11 (68.8)	2 (12.5%)	3 (18.8%)
LA* ≥ 40мм	42 (56%)	25 (59.5%)	8 (19%)	9 (21.4%)
LA dilation	15 (20%)	11 (73.3%)	4 (26.7%)	0 (%)
Dilation of all chambers	6 (8%)	4 (66.7%)	0 (%)	2 (33.3%)

*LV EF: Left ventricular ejection fraction, LA: Left atrium, AF: Atrial fibrillation.

Valvular heart disease of rheumatic genesis was observed in 6.7 of patients. Diabetes mellitus was diagnosed as a comorbid pathology in 24% of patients and diabetes mellitus correlated with permanent AF in 66.7%. In 40% of cases, patients with AF were obese, in 45.3% were overweight (BMI ≥ 25–30). Quantitative

Table 4: Indicators of lipid profile and anthropometric data

Indicator	Total	Average	CI–95%	CI 95	Standard deviation
Age (years)	75	66.76	64.66	68.86	9.13
Weight (kilo)	75	81.00	77.81	84.19	13.85
Height (cm)	75	166.6	164.61	168.59	8.66
Total cholesterol mmol/l	75	4.67	4.39	4.96	1.24
LDL* mmol/l	75	2.92	2.68	3.16	1.04

*LDL: Low density lipoprotein.

anthropometric indicators and lipid profile indicators are shown in Table 4.

The average value of total peripheral blood cholesterol was 4.67 ± 1.24 mmol/l (CI 64.66–68.86), the LDL level averaged 2.92 ± 1.04 mmol/l (CI 64.66–68.86).

Chronic obstructive pulmonary disease as a concomitant disease occurred in 12% of cases. Thyroid pathology was observed in 9.3%, among them in three cases, diffuse-toxic goiter was diagnosed, in two cases, hypothyroidism was diagnosed. According to the results of the survey, smoking as a risk factor was observed in 16%, alcohol consumption, with a frequency of 1–2 times a month, was noted by 8 patients (10.7%). In 5.7% of cases, AF was registered as idiopathic (primary) without a history of cardiovascular and concomitant pathology.

The mean score on the CHA2DS2-Vasc scale in the patients included in the study was 3.05 points, the mean risk of bleeding on the HAS-BLED scale was 1.8 points. The distribution of patients by risk of stroke and bleeding is shown in Figure 2.
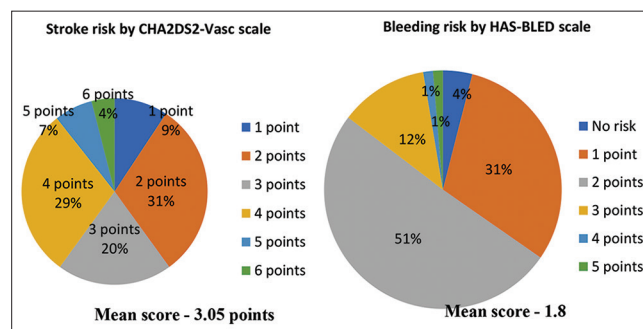

Figure 2: Risk of stroke and bleeding in patients with atrial fibrillation

About 31% had 2 points on the CHA2DS2-Vasc scale, while 9% of the cases patients had 1 point. At the same time, the risk of bleeding on the HAS-BLED scale of more than 3 points was observed in 12% of patients with AF. In most cases, the risk of bleeding did not exceed 2 points (51%).

Given the high risks of ischemic stroke, most of the patients 90.7% received anticoagulant therapy. About 53.3% of patients took rivaroxaban as an anticoagulant. Antithrombotic agents that patients received are shown in Figure 3.

In general, the classification characteristic showed that in most cases (63%), there were patients with permanent AF, in 20% of cases AF manifested itself in the form of paroxysms, and in 17% of cases AF was persistent.
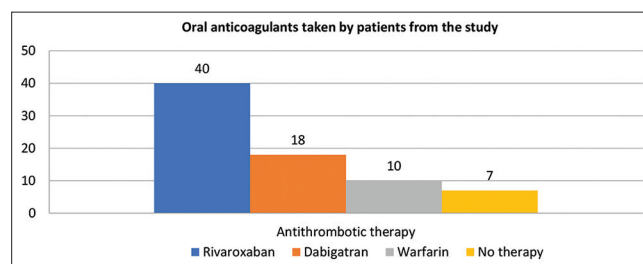

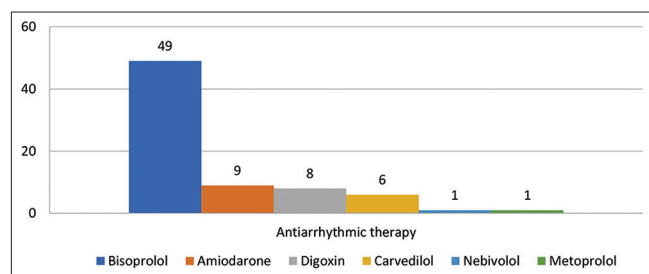*Figure 3: Antithrombotic therapy in patients with atrial fibrillation*

Figure 4: Structure of antiarrhythmic therapy in patients with AF

The structure of the antiarrhythmic therapy performed is shown in Figure 4.

The most frequent strategy in the treatment of patients was aimed at heart rate control. At the same time, in 65.3% of cases, patients received a beta-receptor blocker bisoprolol as an antiarrhythmic drug.

Conclusion

Thus, in most of the studied patients (86.7%), AF was associated with AH, in 49.3% of patients was diagnosed with CAD, which corresponds to the data of foreign and Russian scientists [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33]. A permanent form of AF was observed in 63%, in 20% AF manifested itself in the form of paroxysms, in 17% AF was persistent. The prevalence of permanent (chronic) AF was observed in the older age group (76%). According to the results of multivariate analysis, the presence of CHF increases the risk of AF by 3 times [34]. AF, which arose against the background of CHF, was established in 41.3% of the patients studied by us, while a decrease in LVEF below 40% was observed in 21.3% of the examined patients. According to some data, diabetes is a significant risk factor for the development of AF [35], [36]; however, in a multivariate analysis, only in 3% of cases the development of AF could be associated with diabetes as a risk factor [37]. In our study, diabetes mellitus was diagnosed as a comorbid pathology in 24% of patients and diabetes mellitus correlated with permanent AF in 66.7%. According to published data, thyroid disease occurs in patients with AF in 7–12% [38]. In our patients, thyroid pathology was observed in 9.3% cases. Several studies have found that AF develops in 10–15% of patients with COPD [39]. Among the studied CRHD as a concomitant disease occurred in 12% of cases. In 5.7% of cases, AF was registered as idiopathic (primary) without a history of cardiovascular and concomitant pathology. Analysis of the results of the ARIC study showed that currently, the proportion of smokers among people with AF is small and amounts to about 10% [37]. Alcohol is a recognized risk factor for both new episodes of AF and isolated episodes of AF [40], [41]. According to the results of the survey, smoking as a risk factor was observed in 16%, alcohol consumption, with a frequency of 1–2 times a month, was noted by 8 patients (10.7%). According to the results of our study, in 40% of cases, patients with AF were obese, 45.3% of the patients were overweight (BMI ≥ 25). At the same time, the incidence of obesity as a risk factor for AF is significantly lower, in contrast to the results of foreign studies [40], [41]. Although one of the components that influenced this result could be a small sample size, which necessitates further research among the population in a comparative aspect, considering ethnicity.

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