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The Influence of Riskfactors for the Development of Cardiovascular Diseases and Conditions Associated with Atrial Fibrillation on the Frequency of Arrhythmia Recurrence in Women of Working Age

MikhailT. Andriyanov[1*], https://orcid.org/0000-0003-4201-2395
OlgaE. Ilyicheva[1], https://orcid.org/0000-0003-4457-3049

[1]Life safety, disaster medicine, emergency medical care departmentof the South Ural State Medical University of the Ministry of Health of the Russian Federation, Chelyabinsk. 64, Vorovskogo St., Ural Federal District, 454092, Chelyabinsk, Russian Federation

*Corresponding author: e-mail:andriyanov_m@rambler.ru

ABSTRACT

The aim. The authors had the main aim to identify risk factors and conditions associated with atrial fibrillation which can affect the relapse frequency of arrhythmias in women of working age.
Materials and methods. The research was conducted between 2010 and 2013, and 97 women became the object of the study. All patients were divided into two groups, depending on the frequency of atrial fibrillation recurrence. The analysis of clinical and anamnestic data allowed authors to determine the predictors of atria fibrillation.
Results. The authors have detected such parameters as a present of premature hypertension in family history, lifestyle, body mass index, alcohol consumption, increased resting heart rate with established sinus rhythm, a significant increase in the size of the left atrium, and a moderate increase of the left atrial index; type "D" personality, display of stress and subclinical depression. All these factors were analyzed as predictors of arrhythmia frequency development in women of working age.
Conclusions. The predictors of the recurrences development of atrial fibrillation in women of working age were detected hypertension (its development, duration, and present in the family anamnesis), functional changes in the structure of the heart, and an increased heart rate; psycho-social factors, sedentary lifestyle, increased body mass index, and excessive alcohol consumption.

Keywords
Cardiovascular diseases, fibrillation, predictors, adult patients, woman.

Introduction

Atrial fibrillation (AF) is one of the most frequent cardiac arrhythmias that a general practitioner has to deal with daily [1, 2]. AF affects about 2% of the world's population. Scientists and medical practitioners forecast an increase in the prevalence of AF and an increase in the number of relapses in people of working age due to an increase in average life expectancy, an improvement in the diagnosis practices, and a large number of risk factors for this pathology development [3-5].
Recurrent AF forms reduce the patient's quality of life and increase the risk of stroke [2, 6-8]. It is known that both paroxysmal and permanent forms of arrhythmia have the same increasing effect on the stroke risk [9, 10]. In women with recurrent AF, the risk of ischemic stroke is 4.6 times higher than in men, and the risk of death is twice as high [5]. In addition, forming a diagnosis in

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women who complain of chest pain is a more complicated process than in men, since atypical pain manifestations are more common in women [11].
Current recommendations for the AF diagnosis and treatment do not indicate risk factors to affect the frequency of arrhythmia recurrence, and the research works are mainly aimed at studying structural changes in the heart [12]. The influence of the risk-factors is more often studied in patients after surgical treatment of arrhythmias. Analysis of the impact of smoking cessation showed little differences in the prevention of arrhythmia recurrences after catheter ablation. So, the arrhythmia recurrence development decreased to 58% versus 61% in those who continued to smoke [13].
The main aim. To study the influence of risk factors for the development and progression of cardiovascular diseases (CVD), particularly AF in women of working-age.

Materials and Methods

We have made an observational analytical case-control study from 2010 to 2013 included 97 women with paroxysmal AF. The study was approved by the ethics committee of the State Ural Medical University under the Ministry of Health. All patients provided written consent to participate in the study.
A control group was creat from practically healthy women, without AF attacks or any other pathology. For all of them was carried full testing as clinical and anamnestic examination, standard 12-lead ECG, an echocardiographic (ECHO-CG) heart examination, Doppler ultrasonography of the brachycephalic arteries (DUS), ultrasound examination (US) of the kidneys; laboratory tests, studying psycho-emotional and socio-economic status, consultations of specialists according to indications. Additional tests were performed if there were indications for them: Holter monitoring (HM), exercise stress test, X-ray studies.The observation-groups' patients were in following criteria: age - from 18 to 55 years old; the presence of two or more AF attacks in the year prior to the study; absence of significant hemodynamic disorders during paroxysms; restoration of sinus rhythm spontaneously or with using of antiarrhythmic drugs.
The criteria for excluding patients from the study were: organic valve lesions and other congenital heart defects, acute myocardial infarction, hypokalemia, blood diseases and oncological pathology, pregnancy, congenital or acquired syndromes of prolonged QT interval, refusal to participate in the study.
Depending on the frequency of arrhythmia attacks in the time of following year [14, 15], all patients were divided into 2 groups: with frequent recurrences of AF (more than 1 time per month) - 43 patients; with infrequent recurrences of AF (once a month - once a year) - 54 patients. The groups have been matched by age.
The number of AF relapses was defined as the sum of the ambulance calls and/or visits to the polyclinic with AF recording by the electrocardiography (EGC) within 12 months after the inclusion in the study; the restoration of sinus rhythm was spontaneous or pharmacological.
The research of the influence of risk factors for the development and progression of CVD was studied in account of arterial hypertension (AH), clinically manifesting heart failure (CHF), ischemic heart disease (IHD), thyroid disease with impaired thyroid function, obesity, diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD) [12, 14, 15]. The influence of the risk factors on the AF frequency recurrence was studied in two methods: risk ratio calculation (RR), and the logistic regression method. The results have been compared, and the indicator was considered a predictor if its effect was confirmed using both methods. So we have analyzed as risk factors for the development and progression of CVD:

family anamneses of premature CVD development in first-degree relatives, sedentary lifestyle, inadequate diet, excessive alcohol consumption, tobacco smoking, dyslipidemia, high resting heart rate (HR) [16]. The positive anamnesis in CVD development has been established in the presence of confirmed IHD, ischemic stroke, hypertension (HD), and diabetes in men under 55 years old or women under 65 years old.

The degrees of physical activity were divided into low and adequate. Adequate activity was considered to be 30 minutes a day or more, at least five times a week, equivalent to brisk walking or slow jogging. In all other cases, the lifestyle was considered sedentary.

A diet that corresponded with the following characteristics was considered rational: saturated fatty acids accounted for less than 10% of the daily caloric value and were replaced by polyunsaturated fatty acids. The salt consumption was less than 5 g per day, and the fiber content of whole grains, vegetables, and fruits was between 30 and 40 g per day. The diet contained 200 g of fruits and vegetables per day (2-3 servings). Fish was included at least two times a week, and it had to be oily fish at least once. The total caloric intake had to be limited, but sufficient to maintain (or achieve) normal body weight (body mass index (BMI) <25 kg/m^2). A diet that did not meet the criteria above was considered inadequate [16].

Alcohol was considered to be excessive when more than 10 grams of ethanol was consumed per day. The dose was calculated according to the criteria of the AUDIT test developed by the World Health Organization [16, 17]. Smokers (daily or occasionally) were considered to be those who had smoked more than 100 cigarettes in their lifetime. Those who had not smoked 100 cigarettes were considered to have never smoked [18-20].

Psycho-social risk factors, such as low socioeconomic status, stress at work and in the family, social isolation, depression, anxiety, hostility, and personality type "D" were studied using the questionnaire recommended by the European Society of Cardiology and the European Association for Cardiovascular Prevention and Rehabilitation [21]. The severity of depression and anxiety was assessed using the HADS scale: 0-7 points - the norm (no reliably expressed symptoms of anxiety and depression); 8-10 points - subclinical anxiety/depression; 11 points and above - clinically manifesting anxiety/depression [22].

The level of blood pressure (BP) was determined by the N.S. Korotkov method as the arithmetic mean of two measurements with an interval of 3 minutes, according to the rules for measuring blood pressure: at an outpatient appointment in a sitting position after 5 minutes of rest [23]. HR was measured simultaneously and the results were classified according to the national clinical guidelines of theRussian National Society of Cardiologists (RNSC). Renal ultrasound was performed in all patients to exclude hypertension associated with their pathology. Additionally, a microscopy of urinary sediment was performed. The results of the above examinations, as well as the serum creatinine level and the glomerular filtration rate (GFR), indicated that there was no need to use special methods for examining the kidneys and renal arteries. The diagnosis of secondary endocrine hypertension has been excluded taking into account clinical symptoms and laboratory data. Patients with symptomatic hypertension were excluded from the study.

A 12-lead ECG was recorded in all patients under observation, using a digital three-channel EGG-300G apparatus, at a tape speed of 50 mm/sec. The ECG data were interpreted according to the standard algorithm to test the ischemia of the myocardium. HM was carried out on the system “Kardiotekhnika-04-AD 3” (“Inkart” Ltd., St. Petersburg). The duration of the recording was 24 hours. HM was recorded in normal conditions for the patient, without restrictions of physical activity, with the obligatory keeping of a journal and documenting the performed activity, the time it was performed, the person’s subjective feelings, including discomfort when it occurred.

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The functional stress test was need for differential diagnosis of IHDand had been performed after a thorough analysis of symptoms, a physical examination, recording an ECG at rest, taking into account indications and contraindications. The test was performed on a system for treadmill-testing according to the R. Bruce protocol with a rapid growth rate of the track speed and incline angle. The test was considered "positive" if the patient's typical chest pain or discomfort was accompanied by the characteristic of ischemia changes in the ST segment. The test was also considered positive in the case of a decrease in the ST segment without pain, or the development of a typical attack of angina pectoris without a change in the ST segment [24].

Structural and functional parameters of the heart were assessed using a Doppler-ECHO 'VIVID-7' ultrasound machine from General Electric with a transducer with a variable frequency of 2-3.5 MHz, and a PW-Doppler from the same company [25]. At the time of the study, the patient was supine, at rest, and all patients had sinus rhythm.

US of the kidneys was performed on a 'Philips HD 15' ultrasound machine with a convex transducer with a frequency of 3.5 MHz in the patient's supine, prone, and lateral (opposite to the examined site) positions. To determine the respiratory mobility of the kidneys, the test was performed at maximum inspiration and expiration; to exclude nephroptosis – the test was performed lying and standing.

Respiratory functions were assessed using the "Super Spirio" multifunctional diagnostic system. The parameters of the peak expiratory flow rate and forced expiratory volume in 1 second were measured. When necessary, measurements were taken before and after taking bronchodilators.

A general urine test and a complete blood count were performed. The results of biochemical tests, with the exception of thyroid hormone levels, were obtained on an automatic computerized analyzer "Cobas e 41" using reagents from "Roshe diagnostics". The hormones level in the blood serum was determined by the radioimmunoassay method using standard test kits ALCOR-BIO. Measurements of all samples were performed on an ELISA analyzer "TECAN SUNRIZE" (Switzerland). The following measurements were considered to be within the normal range: thyroid-stimulating hormone (TSH) - 0.27-4.2 μIU/ml, total triiodothyronine (T3) - 1.3-3.1 nmol/l, free thyroxine (T4) - 2-22 pmol/l.

Dyslipidemia was determined according to the RNSC criteria [26] with an excess of total cholesterol (TC) in the blood serum more than 5 mmol/l, triglycerides (TG) - more than 1.7 mmol/l, low-density lipoprotein cholesterol (LDL-C) - more than 3.0 mmol/l, and a decrease in high-density lipoprotein cholesterol (HDL cholesterol) less than 1.2 mmol/l.

LDL cholesterol was calculated using the W.T. Friedwald (1972):

LDL cholesterol = TC - HDL cholesterol - TG/2.2

The atherogenic index (AI) was calculated using the formula:

AI = (TC - HDL cholesterol) / LDL cholesterol

The presence of IHD was considered reliable in patients with typical clinical manifestations of the disease, with a history of myocardial infarction, with typical changes in the ECG, with positive functional stress test results, and ECHO-CG signs of local left ventricular (LV) asynergy. The functional class in patients with stable angina was determined according to the Canadian Cardiovascular Society classification (modified by the SUCRS RAMS[1]).

CHF was diagnosed according to the criteria of the national recommendations of the Society of Heart Failure Specialists (SHFS), Russian Society of Cardiology (RSC), and Russian scientific medical society of therapists (RSMST) (fourth revision, 2013) [27]. Heart failure (HF) with low

[1]Soviet Union Cardiological Research Center under the Russian Academy of Medical Sciences

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left ventricular ejection fraction (LVEF) and HF with preserved LVEF (HFpLVEF) were identified. The stages of the disease (degree of heart damage) and functional classes (FC) (the dynamic ability of patients to be active) were also distinguished. Patients' FC was determined according to the NYHA classification.

Determination of the type of body weight was carried out using the formula of D. Guerrow (1981): BMI = body weight (kg)/height^2 (m). The results were assessed according to the recommendations of the WHO International Obesity Taskforce (IOTF WHO), 2009 [28].

TSH, T3, and T4 levels were examined to exclude or confirm thyroid dysfunction. If an elevated TSH level was detected, the examination was supplemented by the measurement of the T4 level [29].

DM and its type was diagnosed by an endocrinologist according to the criteria of the National Recommendations "Diabetes mellitus: diagnosis, treatment, prevention" (2011) [30]. In the presence of clinical manifestations of hyperglycemia, the diagnostic criterion was the fasting plasma glucose level (no food intake for at least 8 hours) ≥ 7.0 mmol/l, or the blood plasma glucose level 2 hours after glucose challenge ≥ 11.1 mmol/L when conducting an oral glucose tolerance test. The assessment of the level of insulin resistance was carried out using structural mathematical models based on the measurement of insulin and glucose in fasting blood plasma using the generally accepted HOMA index (Homeostasis Model Assessment).

COPD was diagnosed by a pulmonologist after a clinical examination, and performing all the necessary tests [31]. The presence of CKD was diagnosed according to national guidelines [32].

Statistical processing of the results was carried out on the Windows 7 operating system using the statistical program "STATISTICA 6.0" (Copyright © StatSoft, Inc. 1984-2001, USA). The pattern of distribution of quantitative characteristics was assessed by the Kolmogorov-Smirnov test. For indicators with a normal distribution, the methods of parametric statistics were used (the arithmetic mean and its standard error - Student's t-test, Pearson's linear correlation coefficient). For quantitative indicators that did not have a normal distribution, Me and 25-, 75-percentiles were calculated. The reliability of differences in quantitative indicators was assessed by the Mann-Whitney test, and relative indicators - by the Pearson $\chi 2$ test and Fisher's exact method. Statistical hypotheses were tested at a critical level of $p = 0.05$. The difference was considered significant if $p<0.05$ (the probability of difference exceeded 95%).

Results and Discussion

Family anamnesis of premature hypertension development, lifestyle, alcohol consumption, stress-factors, and present of the type "D" personality were analyzed by us to detect predictors CVDoccurrence (**Table 1**).

Table 1. Risk factors for the development and progression of cardiovascular diseases in women of working-age

Indicator	1 groupfrequent relapses (n = 43)	2 groupinfrequent relapses (n = 54)	Control group (n = 45)
Familyhistoryofprematurehypertension (%) $p_{1-2} = 0.02$; $p_{1-C} = 0.001$; $p_{2-C} = 0.006$	41 (95.4 %)	43 (79.6 %)	21 (46.7 %)
Sedentary lifestyle (%)	39 (90.7 %)	39 (72.2 %)	29 (64.4 %)

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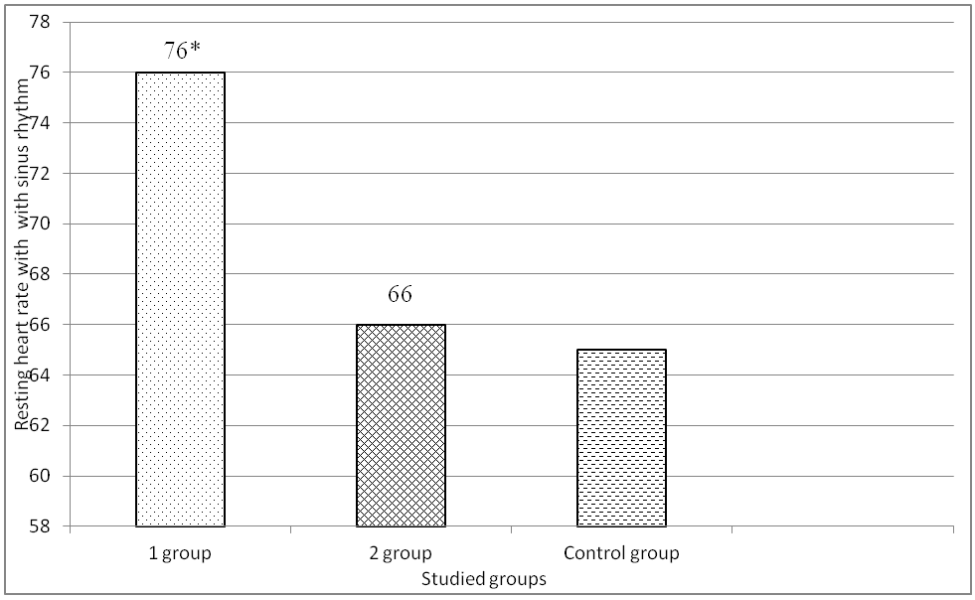
$p_{1-2} = 0.02$; $p_{1-C} = 0.003$; $p_{2-C} = 0.27$			
Excessive alcohol consumption (%) $p_{1-2} = 0.02$; $p_{1-C} = 0.02$; $p_{2-C} = 0.59$	9 (20.9 %)	3 (5.6 %)	2 (4.4 %)
Stress at work or in the family (%) $p_{1-2} = 0.009$; $p_{1-C} = 0.11$; $p_{2-C} = 0.84$	31 (72.1 %)	25 (46.3 %)	25 (55.6 %)
Personality type «D» (%) $p_{1-2} = 0.02$; $p_{1-C} = 0.02$; $p_{2-C} = 0.53$	15 (34.9 %)	8 (14.8 %)	6 (13.3 %)

$_1$ –the first observation group; $_2$ –the second observation group; $_C$ –a control group.

We also examined the heart rate in the studied cohort at rest with established sinus rhythm in all groups (**Fig. 1**).



Note: * – statistically significant differences ($p < 0.05$) between groups 1 and 2 and the control group;

Fig. 1. Resting heart rate with established sinus rhythm in women of working age with recurrent atrial fibrillation (Me)

And this we have considered as a cardiovascular risk factor, and this prevailed in the first group compared to the second one (30.2% and 9.3%, respectively, $p_{1-2} = 0.009$).
Analysis of anxiety and depression manifestations in women of working age also showed differences between the groups with frequent and infrequent arrhythmia recurrences(**Table 2**).

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Table 2. Indicators of anxiety and depression in women of working age with recurrent atria fibrillation

Indicator	1 groupfrequent relapses (n = 43)	2 groupinfrequent relapses (n = 54)	Controlgroup (n = 45)
Average scale indicator for depression in the group (25-; 75-percentiles) $p_{1-2} = 0.008$; $p_{1-C} = 0.006$; $p_{2-C} = 0.62$	8.0 [7.0–10.0]	8.0 [5.0–8.0]	8.0 [4.0–8.0]
Average scale indicator of anxiety in the group (25-; 75-percentiles) $p_{1-2} = 0.002$; $p_{1-C} = 0.0001$; $p_{2-C} = 0.001$	8.0 [8.0–9.0]	8.0 [8.0–8.0]	8.0 [4.0–8.0]
Subclinical depression (abs., %) $p_{1-2} = 0.04$; $p_{1-K} = 0.02$; $p_{2-K} = 0.41$	32 (74.4%)	30 (55.6%)	23 (51.1%)

$_1$ –the first observation group; $_2$ –the second observation group; $_C$ –a control group.

Subclinicalanxiety occurred equally often in both groups of women ($p_{1-2} = 0.13$), and we have no found women with clinically manifesting depression or anxiety.

Analysis of risk factors contributing to the CVD development in women of working-age showed that sedentary lifestyle, excessive alcohol consumption, stress factors at job-place, and in the family, subclinical depression occuration (especially with type "D" personality) have a negative influence. Resting heart rate of more than 80 beats per minute should also be noted. **Figure 2** shows the relative risk of frequent recurrences of AF in women of working-age.

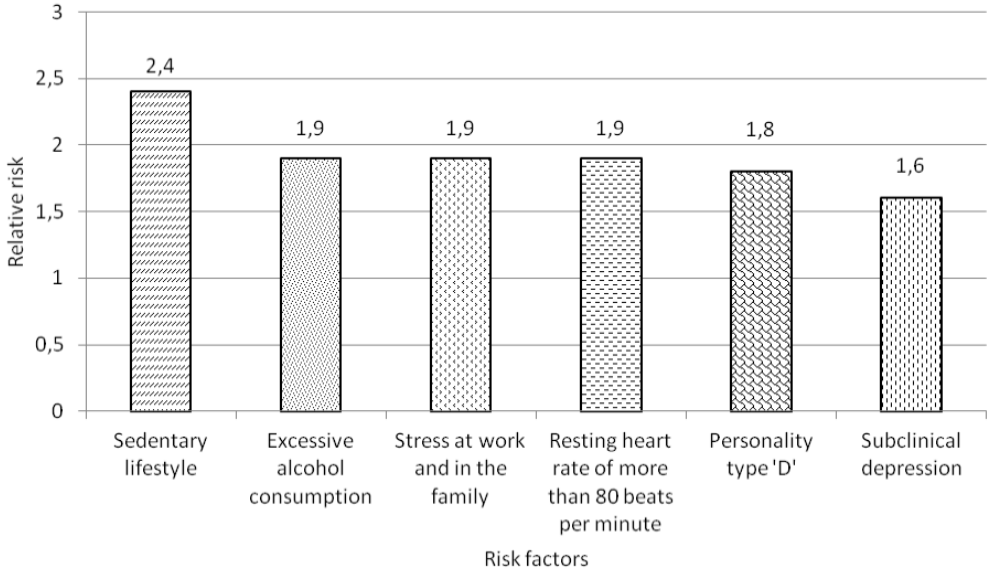

Fig. 2. Relative risk of frequent recurrence of atrial fibrillation in women of working age, depending on the impact of influencing risk factors

Sedentary lifestyle has the greatest impact on the frequency of AF attacks (RR = 2.4; 95% CI [1.1 - 5.8]). The next most important etiological factor was excessive alcohol consumption (RR = 1.9; 95% CI [1.2 - 2.8]), as well as stress at work and in the family (RR = 1.9; 95% CI [1,1 - 3.2]). A

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resting heart rate of more than 80 beats per minute requires special attention (RR = 1.9; 95% CI [1.3 - 2.7]). Manifestation of type "D" behavior is a significant risk factor for arrhythmia manifestations (RR = 1.8; 95% CI [1.2-2.7]), as is subclinical depression (RR = 1.6; 95% CI [1,1 - 2.8]).

The study of the structural and functional state of the heart in women of working age with recurrent AF made it possible to establish deviations in such indicators as the diameter of the left atrium (LA) along the short axis, left atrial index (LAI), LA size, end-systolic volume, the thickness of the posterior wall of the left ventricle, left ventricular ejection fraction (**Table 3**).

Table 3. Structural and functional state of the myocardium in women of working age with recurrent atria fibrillation

Indicator	1 groupfrequent relapses (n = 43)	2 groupinfrequent relapses (n = 54)	Control group (n = 45)
Leftatriumdiameteralongtheshortaxis (cm) (Me, 25-; 75- percentiles) $p_{1-2} = 0.01$; $p_{1-C} = 0.0001$; $p_{2-C} = 0.0001$	4.9 [4.2–5.3]	4.5 [4.3–4.8]	3.8 [3.7–3.9]
Leftatriaindex (cm/m^2) (Me, 25-; 75-percentiles) $p_{1-2} = 0.04$; $p_{1-C} = 0.0001$; $p_{2-C} = 0.0001$	2.6 [2.3–2.7]	2.4 [2.3–2.5]	2.1 [2.1–2.2]
Moderately increased size of the left atrium, (abs), (%) $p_{1-2} = 0.001$	4 (9.3%)	25 (46.3%)	-
Significantly increased size of the left atrium, (abs), (%) $p_{1-2} = 0,001$	28 (65.1%)	20 (37.0%)	-
Insignificantincreaseintheleftatriaindex, (abs), (%) $p_{1-2} = 0.02$	17 (39.5%)	34 (63.0%)	-
Moderateincreaseintheleftatriaindex, (abs), (%) $p_{1-2} = 0.001$	13 (30.2%)	3 (5.6%)	-
End-systolicvolume (ml) $p_{1-2}= 0.008$; $p_{1-C}= 0.0001$; $p_{2-C}= 0.0001$	45.5 [39 49]	40.0 [35–46]	35.0 [30–38]
Left ventricular posterior wall thickness (cm), 95% CI $P_{1-2} = 0.008$; $P_{1-C} = 0.001$; $P_{2-C} = 0.001$	1.1 [1.0–1.2]	1.0 [1.0–1.1]	0.9 [0.9 0.9]
LV ejection fraction (%), 95% CI $p_{1-2}= 0.03$; $p_{1-K}= 0.01$; $p_{2-K}= 0.72$	60.5 [59.9–62.0]	61.0 [60.6–62.2]	62.0 [60.8–62.5]

$_1$ –the first observation group; $_2$ –the second observation group; $_C$ –a control group.

The structural and functional heart changes in women of working age with recurrent atrial fibrillation influenced the frequency of arrhythmia recurrences (**Table 4**).

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Table 4. Theinfluence of the revealed differences in the structural and functional state of the myocardium on the frequency of recurrence of atria fibrillation in women of working age (RR)

Indicators	Relative risk 1-2 group
Insignificant increase in left atria diameter (95% CI)	0.8 [0.4–1.8]
Moderate increase in left atria diameter (95% CI)	0.2 [0.1–0.6]
Significant increase in left atria diameter (95% CI)	1.9 [1.2–3.1]
Insignificant increase in left atria index (95% CI)	0.6 [0.4–0.9]
Moderate increase in left atria index (95% CI)	2.2 [1.5–3.2]

$_1$ –the first observation group; $_2$ –the second observation group; $_C$ –a control group.

The size of the LA has an impact on the AF recurrence frequency. The greatest influence is exerted by a moderate increase in LAI (RR = 2.2; 95% CI [1.5-3.2]) and a significant increase in LA diameter along the short axis (RR = 1.9; 95% CI [1.2-3.1]).

We have found differences in the groups with frequent and infrequent relapses of AF in the number of patients with hypertension (p_{1-2} = 0.001), the duration of the established history of hypertension (P1-2 = 0.0001), as well as BMI. BMI in the group of women with frequent recurrences of arrhythmias exceeded those of the second group (p_{1-2} = 0.01).

Obesity was more common in the first group compared to the second one (p_{1-2} = 0.02). The revealed differences influenced the frequency of AF relapses: AH (RR = 2.6; 95% CI [1.6-3.7]), obesity (RR = 1.7; 95% CI [1.1-2.5]). Have to be noted, members of the control group had no hypertension and signs of obesity development.

The clinical manifestations of CHF, IHD, diseases of the thyroid with its impaired function, DM, COPD, and CKD had no significant influence on the frequency of AF relapses in women of working age. It can be explained by the age of the examined women and the insignificant amount of these diseases in the tested group.

To establish a statistical correlation between the studied CVD risk factors and the frequency of AF relapses in women of working-age, the method of logistic regression analysis was used **(Table 5)**.

Table 5. The influence of the examined risk factors of cardiovascular diseases on the frequency of recurrence of atria fibrillation in women of working age by means of the logistic regression method

Indicators*	Beta	Std.Err.of Beta	β	Std.Err.of β	r^2	Significance level P
Family anamnesis of hypertension	0.21	0.1	0.32	0.15	0.04	0.04
Sedentary lifestyle	0.23	0.1	0.29	0.12	0.05	0.02
Excessive alcohol consumption	0.23	0.1	0.35	0.15	0.05	0.02
Restingheartrateover 80	0.3	0.1	0.3	0.12	0.06	0.008

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beatsperminute						
Stress at work and in the family	0.26	0.1	0.26	0.1	0.07	0.01
Personality type «D»	0.21	0.1	0.25	0.12	0.04	0.04
Significant increase in left atria diameter	0.3	0.1	0.3	0.1	0.09	0.003
Moderate increase in left atria index	0.33	0.1	0.44	0.13	0.12	0.001
Arterial hypertension	0.39	0.1	0.43	0.1	0.15	0.0001
Durationofhistoryofarterial hypertension	0.39	0.09	0.09	0.02	0.15	0.0001
Obesity	0.24	0.01	0.24	0.1	0.02	0.04

* Frequency of AF relapses: the effect of hypertension in the family anamnesis p = 0.04, of a sedentary lifestyle - p = 0.02, excessive alcohol consumption p = 0.02, resting heart rate over 80 beats per minute p = 0.008, stress at job-place and in the family p = 0.01, occurrence of the type "D" personality p = 0.04; significant increase in the diameter of the LA p = 0.003, a moderate increase in the LA index p = 0.001, development of AH p = 0.0001, the duration of the arterial hypertension present p = 0.0001; obesity - p = 0.04.

To identify predictors of frequent AF recurrence in women of working-age, we have compared the results of the influence of the studied risk factors and chronic diseases of internal organs with the frequency of AF recurrence (**Table 6**).

Table 6. Predictors of frequent recurrence of atria fibrillation in women of working age

Factor	The result of calculating the relative risk (RR)	Logistic regression method (level P)
Sedentary lifestyle (95% CI)	2.4 [1.1–5.8]	P = 0.02
Excessive alcohol consumption (95% CI)	1.9 [1.2–2.8]	P = 0.02
Resting heart rate over 80 beats per minute	1.9 [1.3–2.8]	P = 0.008
Stress at work and in the family (95% CI)	1.9 [1.1–3.2]	P = 0.01
Personality type «D» (95% CI)	1.8 [1.2–2.7]	P = 0.04
Arterial hypertension (95% CI)	2.6 [1.6–3.7]	P = 0.0001
Significantincrease in LA diameter (95% CI)	2.0 [1.2 – 3.2]	P = 0.003
Moderate increase of LAI (95% CI)	2.2 [1.5 – 3.2]	P = 0.001
Obesity (95% CI)	1.7 [1.1–2.5]	P = 0.04

Discusions

The obtained data made us possible to establish predictors of AF relapses in women of working-age: AH had RR = 2.6, p = 0.0001; a resting heart rate of more than 80 beats per minute RR = 1.9, p = 0.008. It should be clarified that in the current recommendations, a resting heart rate of more than 80 beats per minute is considered to be a cardiovascular risk factor [32]. In particular, M.D. Smirnova et al. indicated resting heart rate had no just an independent risk factor for CVD in general but also an AF development [33].

The psycho-social factors and lifestyle of the patients are of particular importance: sedentary lifestyle influences on it (RR = 2.4, p = 0.02) and obesity (RR = 1.7, p = 0.04), excessive alcohol consumption (RR = 1.9, p = 0.02), stressful situations at job-place and in the family (RR = 1.9, p = 0.01), and occurrences of type "D" personality (RR = 1.8, p = 0.04). It should be noted that the subclinical manifestation of anxiety was registered equally often in both test-groups of women. Although, the works of A.S. Isaeva have data on the low specificity of tests for determining anxiety in women when compared to those in men [11].

An analysis of the family anamnesis of CVD deserves special attention. Literary sources confirm the fact that this indicator is rarely taken into account in the process of not only making a diagnosis but also in creating an individual therapy prescription plan. Although E.Ya. Grechanina et al reported that diseases of the cardiovascular system are interconnected and there is a need to create national databases of hereditary manifestations of CVD [34].

Naturally, the functional state of the heart is an extremely important indicator of the work of both the myocardium and the entire cardiovascular system. It was found that a significant increase in the LA diameter (RR = 2.0, p = 0.003) and a moderate increase in LAI (RR = 2.2; p = 0.001) are predictors of the risk of frequent recurrence of AF in women of working age.

Conclusion

1. The risk factors for the CVD development and progression influence on the frequency of AF recurrence in women of working-age were: early development of hypertension in first-degree relatives (p = 0.04), a sedentary lifestyle (RR = 2.4; p = 0.02), excessive alcohol consumption (RR = 1.9, p = 0.02), increased resting heart rate of more than 80 per minute (RR = 1.9, p = 0.009).
2. The structure of psycho-social factors that influence the frequency of AF recurrence in women of working-age included stress at job-place and in the family (RR = 1.9, p = 0.01), type “D” personality (RR = 1.8, p = 0.04), subclinical depression (RR = 1.6, p = 0.04).
3. A significant increase in the LA diameter (RR = 2.0, p = 0.003) and a moderate increase in LAI (RR = 2.2, p = 0.001) affect the frequency of AF recurrence in women of working age.
4. AH (RR = 2.6, P = 0.001), a longer history of AH (p = 0.0001), obesity (RR = 1.7, P = 0.04) influenced the AF recurrence frequency in women of working-age.

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