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FREQUENT EXTRASYSTOLIC ARRHYTHMIA: PERCEIVED PSYCHOLOGICAL WELL-BEING EVALUATION

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SUMMARY

Background: *To estimate quality of life (QOL) in patients with frequent extrasystolic arrhythmia (ES) using the SF-36 Health Status Survey.*

Materials and methods: *The patient group consisted of 634 individuals (42-79 y.o) with ES >700 per 24 hours, as diagnosed by Holter ECG, and the control group included 106 patients (38-79 y.o.) with ES <700 per 24 hours. None of the patients had atrial fibrillation. The "early" ES subgroup A (n=192) experienced ES preceding the transmitral blood flow peak in the cardiac cycle (peak E) according to pulsed wave Doppler in transthoracic echocardiography (EchoCG). The "late" subgroup B (n=442) had ES after the transmitral blood flow peak, irrespective of the electric topic localization. Laboratory and instrumental methods included standard lipidograms, Holter ECG, EchoCG, Doppler ultrasound of brachiocephalic arteries, and coronary angiography. For QOL evaluation, we used the SF-36 Health Status Survey.*

Results: *The patient groups did not differ with respect to main laboratory findings, instrumental parameters, and comorbidities, with the exception of type and quantity of ES. Physical and mental health to the SF-36 Health Status Survey indicated lower summary point scores in patient subgroup A ("early" ES) in comparison with the control group. The parameters were non-significantly lower in subgroup B.*

Conclusions: *The SF-36 Health Status Survey serves to assess the QOL in patients with ES. Frequent ES, especially its "early" variant in which ventricular systole precedes the transmitral blood flow peak in the biomechanic cardiac cycle is a predictor for lower QOL scores in patients with cardiovascular pathology.*

Key words: *extrasystolic arrhthmia – frequent extrasystoles - quality of life*

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INRODUCTION

Several research groups have investigated the quality of life (QOL) in patients with cardiological pathologies, with the generally finding that chronic heart failure in patients with comorbidities is detrimental to QOL (Aagaard et al. 2015, Galati et al. 2022, 2023) [CP2]. Reduced QOL is also reported association with arterial hypertension (Germanova et al. 2023), patients with hemodynamically insignificant stenosis of the carotid bifurcation (Germanova et al. 2023), and in those with percutaneous interventions (Siudak et al. 2022). Among the various heart arrhythmias, QOL is mostly studied in the context of atrial fibrillation (AF) and its treatment. Indeed, AF has a strong association with decreased QOL, in relation to the severity of cardiovascular symptoms (Sadlonova et al. 2024, Rowin et al. 2024). Aggressive medical treatment of AF in hypertrophic cardiomyopathy patients improves QOL (Naccarelli et al. 2024), whereas surgical ablation in heart arrhythmias improved the QOL in patients with heart failure (Aagaard et al. 2015, Brahier et al. 2024).

Extrasystolic arrhythmia (ES) is the most common form of heart arrhythmia the world over, occurring occasionally in up to 95% of the total population. In every clinical situation with medically significant ES, the cardiologist must choose an optimal treatment strategy involving antiarrhythmic drugs. In our previous publications on this topic, we reported on the hemodynamics, heart biomechanics, and kinetics in elastic versus muscular-elastic artery types, which revealed a pathophysiological basis for the more[CP2] frequent occurrence of ischemic arterial vascular events in patients with ES (Germanova et al. 2020, 2022). However, ES need not be associated with overt clinical manifestations (Al-Khatib et al. 2018). The typical complaints reported by ES patients are sensations of palpitation or a transient pressure in the chest, a feeling of freezing of the heart rhythm, or a feeling of a lump in the throat. The symptoms may appear or intensify after active physical exercise or before falling asleep at night. Obviously, patients with higher frequency of ES are more perturbed by symptoms, but even a low rate of ES (<700 per 24 hours) can be disconcerting of uncomfortable.

The Aim of this investigation was to ascertain QOL according to the SF-36 Health Status Survey in cardiac patients stratified by ES frequency (< or > 700 per 24 hours[CP3]).

Table 1. Clinical characteristics of the groups

Parameter	Cathegory	Group			Statistics
		A (N=192)	B (N=442)	Control (N=106)	
Age, y.o. Median, (Q1, Q3)[1]		64 (59; 69)	64 (58; 68)	62 (55; 67)	H=5.755, p=0.056
Sex, n (%)[2]	W	94 (49.0)	216 (48.9)	52 (49.1)	χ^2=0.001, df=2, p=0.999
	M	98 (51.0)	226 (51.1)	54 (50.9)	
Smoking, n (%)[2]	Yes	39 (20.3)	97 (22.0)	22 (20.8)	χ^2=0.239, df=2, p=0.887
Arterial hypertension, n (%)[2]	1 grade	78 (40.6)	174 (39.4)	44 (41.5)	χ^2=1.358, df=4, p=0.852
	2 grade	98 (51.0)	224 (50.7)	55 (51.9)	
	No	16 (8.3)	44 (10.0)	7 (6.6)	
Body mass index, Median, (Q1, Q3)[1]		27 (24.0; 31.0)	27 (23.0; 31.0)	27 (23.0; 30.0)	H=0.033, p=0.983
COPD, n (%)[2]	Yes	36 (18.8)	88 (19.9)	17 (16.0)	χ^2=0.847, df=2, p=0.655
Diabetes Mellitus 2 type, n (%)[2]	Yes	20 (10.4)	48 (10.9)	18 (17.0)	χ^2=3.486, df=2, p=0.175
NYHAI, n (%)[2]	Yes	115 (59.9)	238 (53.9)	61 (57.6)	χ^2=2.116, df=2, p=0.347
NYHAII, n (%)[2]	Yes	77 (40.1)	204 (46.2)	45 (42.5)	χ^2=2.116, df=2, p=0.348
Stable angina, n (%)[2]	I class	95 (49.5)	220 (49.8)	54 (50.9)	χ^2=0.452, df=4, p=0.978
	II class	65 (33.9)	154 (34.8)	34 (32.1)	
	No	32 (16.7)	68 (15.4)	18 (17.0)	
MI in anamnesis, n (%)[2]	Yes	38 (19.8)	87 (19.7)	21 (19.8)	χ^2=0.676, df=4, p=0.954
IS, TIA in anamnesis, n (%)[2]	Yes	13 (6.8)	34 (7.7)	7 (6.6)	χ^2=0.256, df=2, p=0.880
Distal arterial embolism in anamnesis, n (%)[2]	Yes	1 (0.5)	3 (0.7)	1 (0.9)	χ^2=0.182, df=2, p=0.913
Hypokinesis of the left ventricle, n (%)	Yes	48 (25.0)	131 (29.6)	20 (18.9)	χ^2=5.516, df=2.000, p=0.063
Any stenosis in coronary angiography, n (%)	Yes	160 (83.3)	374 (84.6)	88 (83.0)	χ^2=0.263, df=2.000, p=0.877
Hemodynamically insignificant carotid stenosis, n (%)	Yes	67 (34.9)	156 (35.3)	38 (35.9)	χ^2=0.027, df=2.000, p=0.986
Plaque Type III, n (%)	Yes	31 (16.2)	69 (15.6)	16 (15.1)	χ^2=0.061, df=2.000, p=0.970
Hemodynamically insignificant lower extremities stenosis, n (%)	Yes	21 (10.9)	53 (12.0)	13 (12.3)	χ^2=0.174, df=2.000, p=0.917

[1]Kruskal-Wallis test; [2] χ^2-Pearson test

MATERIALS AND METHODS

Our study groups derive from 634 patients (42-79 y.o) with ES ≥ 700 per 24 hours, as diagnosed by Holter ECG, along with a control group of 106 patients with ES < 700 per 24 hours, seen at the Samara State Medical University cardiology clinic during 2016-2022 [CP4]. None of the patients included in the study had AF. The main patient group was stratified into subgroup A of (n=192) patients with "early" ES ventricular systole preceding the transmitral blood flow peak in the biomechanical cardiac cycle (peak E according to pulsed wave Doppler in transthoracic echocardiography (EchoCG) and subgroup B with "late" ES of (n=442) occurring after the transmitral blood flow peak. Group stratification was independent of the electrotopic[CP5] localization of the ES, but based on the biomechanical cardiac cycle. As such, the patients subgroups A and B could have ventricular and/or supraventricular ES. Laboratory and instrumental methods included standard clinical investigations: lipidograms, Holter ECG, EchoCG, Doppler ultrasound of brachiocephalic arteries, and coronary angiography. Written informed consent was obtained from all participants prior to enrollment in the study.

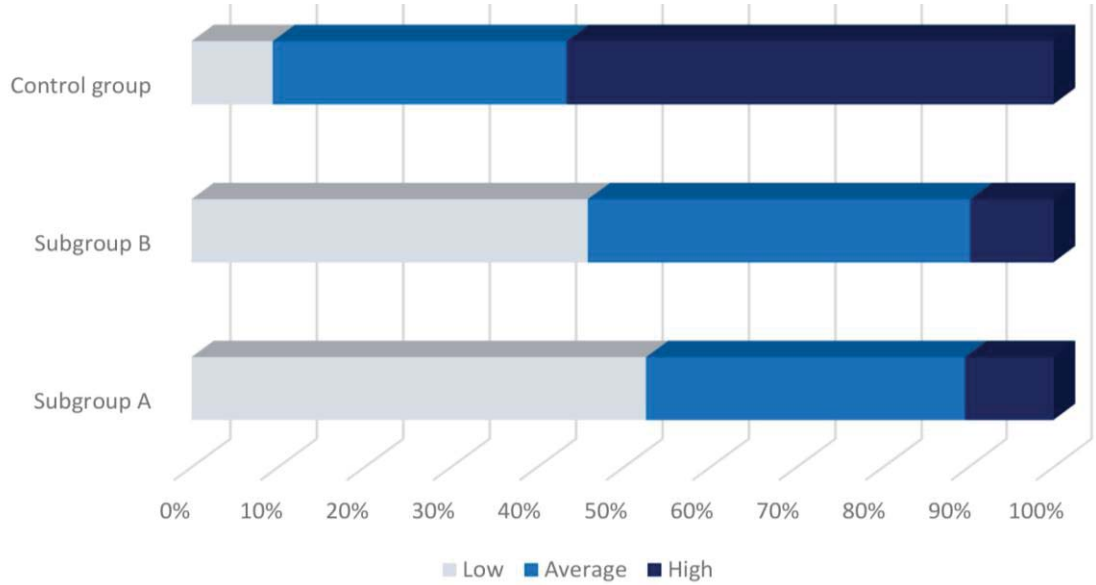

Figure 1. Distribution of patients of subgroups A, B and control group in assessing PH and MH according to the SF-36 Health Status Survey (χ^2 =165.5; df=3, p<0.001)

To evaluate the QOL in the ES subgroups and the control group, we used the nonspecific international SF-36 Health Status Survey (Ware et al. 1993, 2003, Lins et al. 2016) in the Russian language version. The survey includes 36 questions pertaining to physical and mental well-being, with total score ranging from 0 to 100, where 100 represents full health.

Our study design follows principles of evidence-based medicine, and was conducted according to the principles of the Declaration of Helsinki. The study protocol was approved by the Ethics Committee of Samara State Medical University (Protocol № 239, dated 10.11.2021). We considered group differences in parameters of p≤0.05 to suffice for rejection of the null hypothesis. Statistical analysis was performed using MedCalc® Statistical Software version 20.118 (MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2022), GraphPad Prism for Windows, version 10.1.0 (GraphPad Software, San Diego, California USA, www.graphpad.com) and the free software environment R (https://cran.rstudio.com/).

RESULTS

The patient groups A and B and the control group did not differ with respect to clinical, laboratory, and instrumental data (Table 1).

The SF-36 Survey gives subscores for parameters of physical health (PH) and mental health (MH). Physical Functioning refers to the possibility to perform physical activities such as walking, self-care, and stair climbing. The Body Pain Score reflect impacts on the patient's ability to carry out daily activities. Vitality indicates the feeling of being full of energy. Role-Physical Functioning refers to the impact of physical condition on daily activities. General Health evaluates the state of health a present and in comparison with one year before. Social Functioning is closely connected with ability to communicate with peers. Emotional Role is an evaluation of a limitation of daily activities due to emotional state. Mental Health (MH) characterizes the current mood, especially being nervous, down in the dumps, feeling peaceful, sad or happy. The net scores in the preceding subscales are interpreted as follows: ≥ 60 points is high, 30-59 points is average, and 0-29 points is low PH and MH.

According to the results of the SF-36 Health Status Survey, comparison of PH/MH among the main subgroups showed a significantly lower net scores compared to controls in the patient (≥ 700 ES per 24 hours) subgroup A, namely the "early" variant in whom the ES preceded the transmitral blood flow peak in cardiac cycle.

The distribution of patients by group is shown in Figure 1.

Anxiety and depression scores were higher in the female subgroup compared to men. Patients with corrected ES, who had undergone antiarrhythmic therapy, showed higher QOL scores for physical activity and social functioning, but lower general health. Upon inquiry, most of such patients reported that their diagnosis and the requirement for taking daily medication made them self-conscious about their state of health.

DISCUSSION

Despite medical and surgical treatment, ES remains a problem for millions of people all over the world. In each clinical case, there is always a place for dialog between the attending cardiologist and a psychotherapist, given the frequency of co-morbidities and non-specific complaints in ES. Frequent ES, here

defined as ≥700 per 24 hours, is associated with the higher risk of arterial ischemic events, i.e., stroke, myocardial infarction, and distal arterial embolism (Germanova et al. 2022). Most prior investigations have proposed that frequent ES predicts for the more serious heart arrhythmias (atrial fibrillation and atrial flatter) that are themselves associated with risk for cardio-embolic complications. However, in our previous research, we also explained this phenomenon in relation to the hemodynamic changes occurring in ES, especially with respect to the characteristics of the first post-extrasystolic wave (Germanova et al. 2020, 2022). Increased hemodynamic and kinetic parameters of the main arteries can become key factors in the occurrence of vascular complications. We designated this phenomenon as "hydraulic shock", underlining the importance of the additional mechanical impact of the increased pulse wave of the first post-extrasystolic contraction.

In this study we focused on the relationship between worsening QOL in patients with frequent ES, even without concomitant AF. Results showed a statistically significant strong relationship between lesser QOL and the occurrence of ≥ ES 700 per 24 hours, most distinctly so for the "early" A subtype, in whom the ventricular systole of ES preceded the transmitral blood flow peak in the cardiac cycle. Medical correction of arrhythmia, as well as treatment of comorbid cardiovascular pathology, including timely performance of coronary angiography and angioplasty can contribute to maintaining a higher social functioning of this category of patients.

CONCLUSIONS

- Frequent ES, especially its "early" variant, in whom the ventricular systole precedes the transmitral blood flow peak in the biomechanical cardiac cycle, is a predictor for lower QOL scores in patients with cardiovascular pathology.
- The SF-36 Health Status Survey is a questionnaire that can be used to assess the QOL in patients with ES.

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Conflict of interest:

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Contribution of individual authors:

Olga Germanova, Natalia Kuvshinova: search and analysis of literature, collection of clinical data, data interpretation, writing the first draft.

Tatiana Ashcheulova, Xenia Gonda, Giuseppe Tavormina & Giuseppe Galati: search and analysis of literature, data interpretation, and editing.

All authors approved the final version of the article before its submission.

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