International Heart and Vascular Disease Journal. Volume 13, № 45, March 2025
ISSN: 2311-1623 (Print)
ISSN: 2311-1631 (Online)
http://www.heart-vdj.com

Associations of the prevalence of coronary heart disease and psychosocial risk factors in middle-aged men from an open urban population

Kayumova M. M.[1], Gafarov V. V.[2], Bessonova M. I.[1], Troshina I. A.[3], Gorbunova T.Yu.[1], Akimov A. M.[1], Novosyolov A. V.[1], Lebedev E. V.[1], Akimova E. V.[1]

[1] Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia.
[2] Institute of Therapy and Preventive Medicine — Branch of the Institute of Cytology and Genetics, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia.
[3] Tyumen State Medical University, Tyumen, Russia.

AUTHORS

Marina M. Kayumova*, MD, PhD, Senior researcher of the Laboratory of Epidemiology and Prevention of Cardiovascular Diseases, Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0000-0001-5326-119X

Valery V. Gafarov, MD, PhD, Professor, Honored Scientist of the Russian Federation, Head of the Laboratory of Psychological and Sociological Problems of Therapeutic Diseases, Institute of Therapy and Preventive Medicine — Branch of the Institute of Cytology and Genetics, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia. ORCID: 0000-0001-5701-7856

Marina I. Bessonova, MD, PhD, Researcher of the Laboratory of Epidemiology and Prevention of Cardiovascular Diseases, Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0000-0002-2686-3715

Irina A. Troshina, MD, PhD, Professor, Head of the Department of Hospital Therapy, Tyumen State Medical University, Tyumen, Russia. ORCID: 0000-0002-8702-3883

Tatiana Yu. Gorbunova, MD, PhD, cardiologist, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0009-0008-7207-4937

* Corresponding author. Tel.: +7 (905) 823-2837. E-mail: kayumova@infarkta.net

Aleksandr M. Akimov, Candidate of Social Sciences, Senior researcher of the Laboratory of Epidemiology and Prevention of Cardiovascular Diseases, Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0000-0001-5152-8460
Antov V. Novosyolov, Junior researcher of the Laboratory of Epidemiology and Prevention of Cardiovascular Diseases, Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0000-0003-4101-6079
Egor V. Lebedev, Junior researcher of the Laboratory of Epidemiology and Prevention of Cardiovascular Diseases, Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0000-0001-6222-0445
Ekaterina V. Akimova, MD, PhD, Head researcher of the Laboratory of Epidemiology and Prevention of Cardiovascular Diseases, Tyumen Cardiology Research Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia. ORCID: 0000-0002-9961-5616

The aim of the study is to determine the prevalence of coronary heart disease (CHD), sleep disorders, and negative affective states among men aged 55–64 years in an open urban population and to assess the likelihood of developing CHD with high levels of depression, hostility, vital exhaustion, and sleep disorders.

Methods. A cross-sectional study with an 85.0% response rate was conducted on a representative sample of men aged 25–64 years in the city of Tyumen (n=1000). Standard epidemiological methods were used to determine the prevalence of CHD. High levels of depression, hostility, vital exhaustion, and sleep disorders among middle-aged individuals (55–64 years) were identified using algorithms from the WHO MONICA-MOPSY questionnaire.

Results. With a lower prevalence of high levels of depression in the open population and its increase among middle-aged men, the highest likelihood of developing definite CHD (DCHD) and CHD according to extended epidemiological criteria was observed in the general population, with a tendency to decrease in the sixth decade of life. In the presence of high levels of hostility at the age of 55–64 years, the likelihood of developing CHD and DCHD increased by 2 and 5 times, respectively. In the same age category, with a significant increase in vital exhaustion relative to the general population indicator, the likelihood of developing CHD with high levels of vital exhaustion was lower than in the general population, while the likelihood of developing DCHD increased by 12.5 times with its twofold increase in the general population. Among men aged 55–64 years, with a significant increase in sleep disorders, the likelihood of developing CHD in the presence of sleep disorders did not differ significantly from the general population indicator, but there was a twofold increase in the likelihood of developing DCHD.

Conclusion. Thus, the analysis of identifying psychosocial risk factors in middle-aged men and the associations of their high levels with the development of CHD appears necessary for use in forming preventive programs aimed at reducing high cardiovascular risk in an open urban population. These programs should primarily focus on regulating psychological parameters.

Keywords: open population, epidemiologic study, psychosocial factors, coronary heart disease.

Conflict of interests: none declared.

Recieved: 28.11.2024
Review date: 12.01.2025
Accepted: 21.01.2025

For citation: Kayumova M.M., Gafarov V.V., Bessonova M.I., Troshina I.A., et al. Associations of the prevalence of coronary heart disease and psychosocial risk factors in middle-aged men from an open urban population. International Heart and Vascular Disease Journal. 2025. 13(45):15-22. DOI: 10.24412/2311-1623-2025-45-18-27

Introduction

According to the results of the WHO-MONICA project, conventional risk factors (RFs) explain only 50% of the occurrence of cardiovascular diseases (CVDs) [1, 2]. It has now been proven that psychosocial factors (PSFs) can be one of the reasons for the negative trend in the deterioration of population health and contribute significantly to the morbidity and mortality from coronary heart disease (CHD) [3–5]. Results from large epidemiological studies have shown that PSFs and

their components (sleep disorders and negative affective states), such as depression, hostility, and vital exhaustion (VE), are associated with a high risk of developing CHD [6–8]. Analysis of literature data has demonstrated a significant prevalence of PSFs, particularly negative affective states, primarily among middle-aged individuals [9–11]. However, PSFs may play a decisive role in shaping the unfavorable epidemiological situation regarding CVDs and mortality from them in Russian populations in recent decades, while the role of non-conventional risk factors (RFs) in relation to CVDs remains insufficiently studied [12–14]. The relationships between high levels of PSFs and the prevalence of CHD in Siberia are understudied and require scientific justification [1, 9]. At the same time, assessing the needs and demands of the population regarding preventive measures, taking into account its psychosocial characteristics, is the basis for developing a concept for the quality of medical and preventive care in healthcare [11, 12].

The aim of the study is to determine the prevalence of coronary heart disease (CHD), sleep disorders, and negative affective states among men aged 55–64 years in an open urban population and to assess the likelihood of developing CHD with high levels of depression, hostility, VE, and sleep disorders.

Methods

A cross-sectional study with an 85.0% response rate was conducted on a representative sample of men aged 25–64 years, selected randomly from electoral lists in Tyumen, totaling 1000 individuals, distributed equally across four decades of life by quartiles (budget topics No. NIOKTR: 122020300112–4 and NIIPM No. FWNR-2024–0002). For the analysis within this study, one decade of life — the age category of 55–64 years — was taken. The inclusion criteria for the population study were: 1) male sex; 2) age groups 25–64 years and 55–64 years; 3) permanent residents of Tyumen. The exclusion criteria for the population study were: 1) female sex; 2) age categories other than 25–64 years and 55–64 years; 3) migrants, military personnel, and prisoners.

Based on the processing of electrocardiograms using the Minnesota Code (MC) and analysis of the WHO questionnaire on exertional angina, an epidemiological diagnosis of CHD was established: 1) according to strict criteria — "definite" CHD (DCHD); 2) according to non-strict criteria — "possible" CHD (PCHD). In accordance with the MC, strict and non-strict criteria for CHD together defined CHD according to extended epidemiological criteria. Depression (D), hostility (H), vital exhaustion (VE), and sleep disorders (SD) were assessed using scales for depression, hostility, vital exhaustion, and sleep disorders, aligned with the WHO MONICA-MOPSY program algorithm [1].

Written informed consent was obtained from each participant for participation in the cardiac screening. The cardiac screening protocol was approved by the ethics committee of the Tyumen Cardiology Research Center.

Statistical Analysis

Statistical analysis was performed using the IBM STATISTICA 21.0 software package. To assess the significance of differences between sample proportions in two groups, Pearson's chi-square test (χ^2) was used. The critical significance level for testing statistical hypotheses was set at $p < 0.05$, taking into account the degrees of freedom.

Age standardization of all studied indicators was performed using the direct method. In cases where the number of participants in any subgroup was less than 10 or exactly equal to 0, comparisons were recalculated using Fisher's exact test. Associations of high levels of PSFs with the prevalence of CHD, its "definite" and "possible" forms, were determined by calculating odds ratios (OR) and their 95% confidence intervals (CI). In each case, the statistical significance of the OR was assessed based on the 95% CI values. If the CI included 1, meaning its upper limit was > 1 and the lower limit was < 1, it was concluded that there was no statistically significant association between the factor and the outcome at a significance level of $p < 0.05$.

Results

In the open population of a moderately urbanized city in Western Siberia (Tyumen), among men aged 25–64 years, the results of cardiac screening demonstrated a high prevalence of CHD according to extended epidemiological criteria (12.4%). The age-standardized prevalence of DCHD was 6.6%, and PCHD was 5.7%. Among men aged 55–64 years, the prevalence of CHD according to extended epidemiological criteria was significantly higher than the age-standardized indicator (33.2% vs. 12.4%, $p < 0.001$). The prevalence of DCHD and PCHD in men aged 55–64 years also showed statistically significant differences compared

DOI: 10.24412/2311-1623-2025-45-18-27

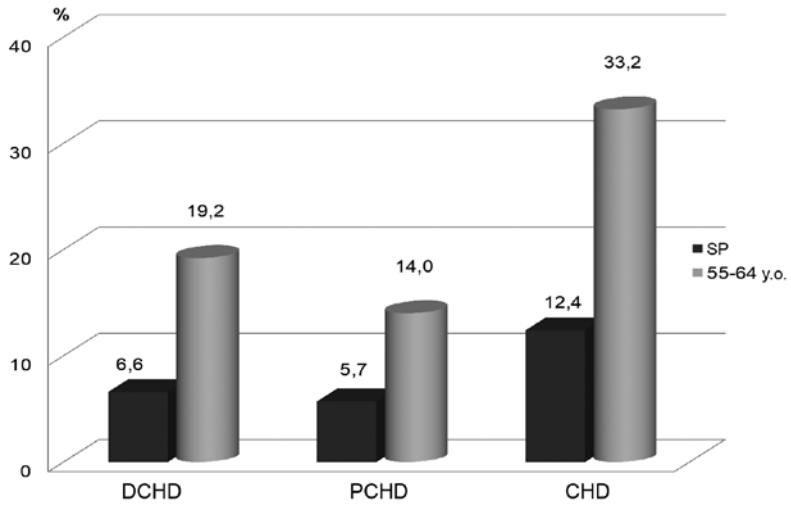

Fig. 1. Prevalence of CHD in middle-aged men, %

to their frequency in the general population (19.2% vs. 6.6%; 14.0% vs. 5.7%, p < 0.001) (Fig. 1).

Figure 2 presents the prevalence of high levels of PSFs in the general male population aged 25–64 years (SP – age-standardized parameter) and the age category of 55–64 years in a comparative aspect. For each of the studied variables, a trend toward an increase in the 55–64 age group relative to the SP was observed, with statistically significant differences for high levels of depression (4.6% vs. 14.6%, p < 0.001), VE (15.9% vs. 31.3%, p < 0.001), and sleep disorders (9.5% vs. 17.3%, p = 0.0081). The highest prevalence of high levels of PSFs, both in the open population and among middle-aged men, was observed for high levels of hostility, while the lowest was for high levels of depression (Fig. 2).

An assessment of the odds of developing different forms of CHD in the age category of 55–64 years and in the general population, depending on high levels of PSFs in men, was conducted.

Thus, with a high level of depression, the likelihood of developing CHD according to extended epidemiological criteria in the general population increased by 21.07 times (OR 21.07 with 95% CI 41.26; 10.76, p < 0.05), and the likelihood of developing DCHD increased by 39.84 times (OR 39.84 with 95% CI 80.90; 19.61, p < 0.05). At the same time, the likelihood of developing PCHD did not differ between high and low levels of depression (p > 0.05). Among men aged 55–64 years, compared to the age-standardized indicator, the likelihood of developing CHD according to extended epidemiological criteria in the general population with a high level of depression increased significantly less — by 14.51 times (OR 14.51 with 95% CI 39.52; 5.33, p < 0.05), as did the likelihood of developing DCHD — by 29.33 times (OR 29.33 with 95% CI 82.11; 10.48, p < 0.05). Similarly to the situation in the gen-

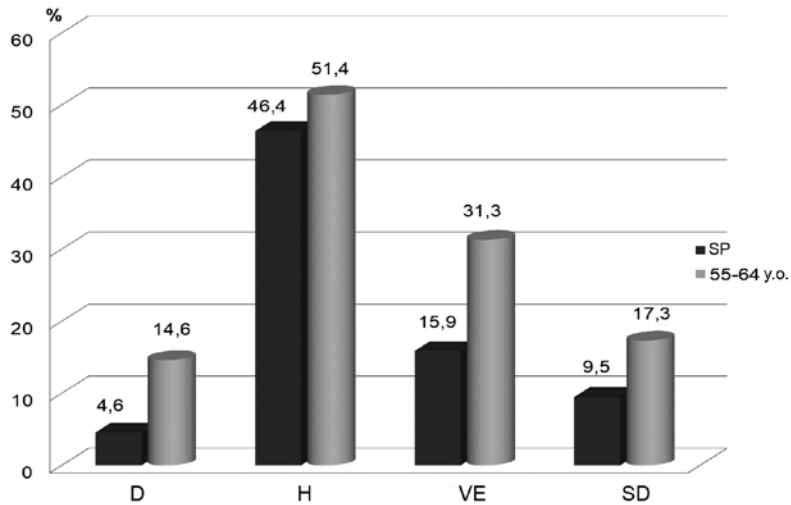

Fig. 2. High levels of PSF in middle-aged men, %

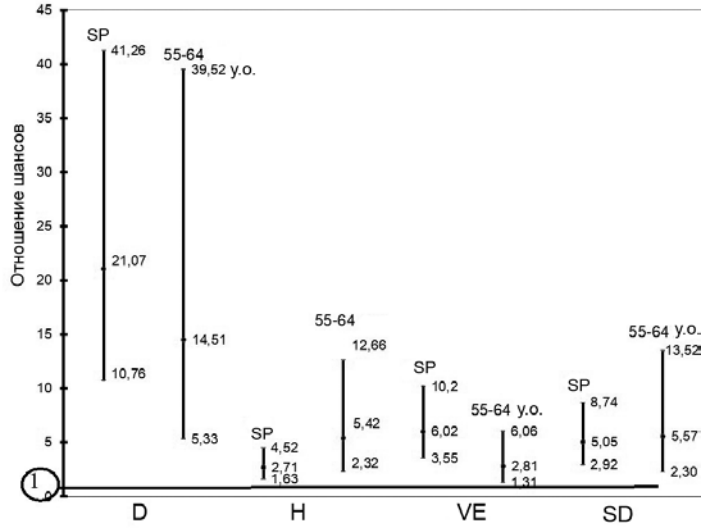

Fig. 3. The odds ratio of developing CHD at high PSF levels

eral population, the likelihood of developing PCHD did not differ between high and low levels of depression in men aged 55–64 years (p > 0.05) (Fig. 3, 4).

With a high level of hostility, statistically significant differences in the likelihood of developing CHD according to extended epidemiological criteria in the general population were maintained, although it was significantly lower (OR 2.71 with 95% CI 4.52; 1.63, p < 0.05). A similar trend was observed for the likelihood of developing DCHD (OR 4.65 with 95% CI 10.12; 2.14, p < 0.05). The likelihood of developing PCHD did not differ between high and low levels of hostility (p > 0.05). In the age group of 55–64 years, compared to the SP, the likelihood of developing CHD according to extended epidemiological criteria in the general population with a high level of hostility was significantly higher (OR 5.42 with 95% CI 12.66; 2.32, p < 0.05). At the same time, the likelihood of developing DCHD in the 55–64 age group with a high level of hostility increased by 25.85 times, with statistical significance in the OR calculation (OR 25.85 with 95% CI 202.60; 3.30, p < 0.05). Similarly to the situation in the general population, the likelihood of developing PCHD did not significantly differ between high and low levels of hostility in the 55–64 age group (p > 0.05).

With a high level of VE, the likelihood of developing CHD according to extended epidemiological criteria in the general population increased by 6.02 times (OR 6.02 with 95% CI 10.20; 3.55, p < 0.05), and the likelihood of developing DCHD increased by 14.11 times (OR 14.11 with 95% CI 31.67; 6.29, p < 0.05). At the same time, the likelihood of developing PCHD did not differ between high and low levels of VE (p > 0.05). Among men aged 55–64 years, compared to the SP, the likelihood of developing CHD according to extended epidemiological criteria in the general population

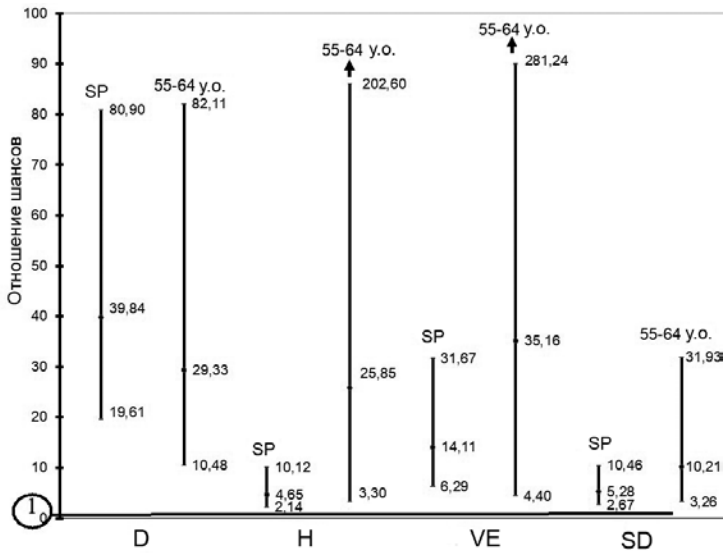

Fig. 4. The odds ratio of developing DCHD at high PSF levels

DOI: 10.24412/2311-1623-2025-45-18-27

with a high level of VE increased significantly less — by 2.81 times (OR 2.81 with 95% CI 6.06; 1.31, $p < 0.05$). However, the likelihood of developing DCHD in the 55–64 age group with a high level of VE increased by 35.16 times (OR 35.16 with 95% CI 281.24; 4.40, $p < 0.05$). The likelihood of developing PCHD did not differ between high and low levels of VE in the 55–64 age group ($p > 0.05$).

With sleep disorders (SD), the likelihood of developing CHD according to extended epidemiological criteria in the general population increased by 5.05 times (OR 5.05 with 95% CI 8.74; 2.92, $p < 0.05$), the likelihood of developing DCHD increased by 5.28 times (OR 5.28 with 95% CI 10.46; 2.67, $p < 0.05$), and the likelihood of developing PCHD increased by 3.13 times (OR 3.13 with 95% CI 6.65; 1.47, $p < 0.05$). Among men aged 55–64 years, compared to the SP, the likelihood of developing CHD according to extended epidemiological criteria in the general population with SD increased by 5.75 times (OR 5.75 with 95% CI 13.52; 2.30, $p < 0.05$), and the likelihood of developing DCHD increased by 10.21 times (OR 10.21 with 95% CI 31.93; 3.48, $p < 0.05$). At the same time, the likelihood of developing PCHD did not differ between the presence and absence of SD in middle-aged men ($p > 0.05$).

Discussion

When using epidemiological criteria to define CHD in the presence of PSFs, the odds of CHD detection were higher, with the highest likelihood observed for the "definite" form of CHD and the lowest for the "possible" form of CHD. The results regarding the prevalence of PSFs are comparable to data from Novosibirsk and Tomsk studies, which were conducted using the same protocol as this study. A comparative analysis with data from Novosibirsk researchers shows that in the Tyumen population, a high level of depression predominated among middle-aged men, likely influenced by factors of chronic social stress prevalent in this age category [9, 13]. The adverse effects of depressive disorders on the development of CVDs may be mediated through platelet mechanisms. Increased susceptibility to platelet activation and the secretion of their products are considered one of the most important links in the pathogenesis, explaining the vulnerability of individuals with such conditions to developing cardiovascular pathology. As a result, theoretical assumptions about the significance of negative affective disorders in the development and progression of CVDs have a material basis [15–16]. In the presence of a high level of depression among men aged 25–64 years in Tyumen, the prevalence of CHD increased more than 20-fold.

The results of this study regarding the higher level of hostility and the significant increase in the likelihood of developing CHD among middle-aged men are consistent with data from a Finnish study, where similar findings were reported. Currently, many researchers believe that hostility (as one of the key components of Type A personality) has a greater influence on the onset of the disease and acute triggering factors (spasm, thrombosis, plaque rupture) and a lesser influence on vascular atherosclerosis. Thus, hostility may provoke acute coronary spasm and serve as a reliable prognostic marker for the development of myocardial infarction (MI) in general population groups, although its role as a prognostic marker for the progression of atherosclerosis and, consequently, the development of arterial hypertension (AH) and stroke remains undefined [10].

Population patterns regarding PSFs in a moderately urbanized Siberian city (Tyumen) are also concerning, particularly the high prevalence of VE among middle-aged men — for men, the vulnerable age period for high levels of VE in the population was the 55–64 age group. According to the data from this study, results from the male population of Novosibirsk showed that the proportion of individuals with CHD was significantly higher in the presence of VE than without it. This effect is amplified, as shown by both Tyumen and Novosibirsk studies, by a significant predominance in this group of other negative affective states, sleep disorders, low education levels, and unskilled heavy physical labor [17, 18].

In the open population of Tyumen, the standardized prevalence of sleep disorders among men aged 25–64 years was high but comparable to the results obtained in the male population of Novosibirsk [1]. According to a number of researchers, sleep disorders are a sign of vital exhaustion, depression, anxiety, and, accordingly, a predictor of the development of cardiovascular pathology [12]. When sleep quality decreases, its primary function as a restorative process is disrupted, preventing the body from fully adapting to changing external and internal conditions, ultimately leading to the development of cardiovascular pathology [19]. Assessing self-reported sleep quality allows for the evaluation of the population frequency of

sleep disorders, identification of sleep-related problems in various population groups, and identification of groups at increased risk of developing CVDs. High levels of sleep disorders in the Tyumen male population aged 25–64 years were 5 times more common in men with CHD than in men without CHD; the same pattern was observed for men with DCHD. In individuals with PCHD, reduced sleep quality was detected 3 times more often than in the general population. This situation is likely natural, as, according to the literature, the vast majority of patients with chronic sleep disorders attribute their ailments to life circumstances, most often citing personal problems. In older adults, sleep disorders arise due to general dissatisfaction with life, fear of death, and negative attitudes toward aging. Our findings are supported by data from other researchers regarding sleep disorders as a predictor of CVDs — arterial AH, MI, and stroke. Numerous experimental, clinical, and epidemiological studies have shown associations between sleep disorders and both negative affective states and the development of CHD. It has been demonstrated that anxiety-depressive syndrome manifests as increased cortical activation, contributing to a state of dysfunctional arousal, which leads to difficulty falling asleep and maintaining sleep [19, 20]. The close relationship between sleep disorders and negative affective states is confirmed by global epidemiological studies, which show that sleep problems appear earlier than other manifestations of these states. This is why subjective sleep assessment is of great importance for predicting the future development of depression and VE [1].

Conclusion

In the open population of Tyumen, among men aged 55–64 years with high levels of PSFs (depression, hostility, vital exhaustion, sleep disorders), an increase in the odds of developing definite CHD and CHD according to extended epidemiological criteria was observed.

The analysis of identifying PSFs in middle-aged men and the associations of their high levels with the development of CHD appears necessary for use in forming preventive programs aimed at reducing high cardiovascular risk in an open urban population. These programs should primarily focus on regulating psychological parameters.

Conflict of interests: none declared.

References

1. Gafarov VV, Akimova EV, Trubacheva IA et al. The contribution of psychosocial factors to survival, the risk of developing cardiovascular diseases among people 25–64 years old in Siberia (Novosibirsk, Tyumen, Tomsk): results of cross-sectional and cohort studies 1981–2020. Atherosclerosis. 2024; 20(4): 397–412. Russian. DOI: 10.52727/2078-256X-2024-20-4-397-412
2. Duarte Junior MA, Pintos CS, Martínez-Gómez D et al. Lifestyle behaviors, social and economic disadvantages, and all-cause and cardiovascular mortality: results from the US National Health Interview Survey. Front Public Health. 2024 Feb 28;12:1297060. DOI: 10.3389/fpubh.2024.1297060
3. Curry SJ, Krist AH, Owens DK et al. US Preventive Services Task Force. Risk Assessment for Cardiovascular Disease with Nontraditional Risk Factors: US Preventive Services Task Force Recommendation Statement. J. Am Med Assoc. 2018;320(3):272–280. DOI: 10.1001/jama.2018.8359
4. De Hert M, Detraux J, Vancampfort D. The intriguing relationship between coronary heart disease and mental disorders. Dialogues Clin. Neurosci. 2018; 20(1): 31–40. DOI: 10.31887/DCNS.2018.20.1/mdehert
5. Cocchio S, Baldovin T, Furlan P et al. Is depression a real risk factor for acute myocardial infarction mortality? A retrospective cohort study. BMC Psychiatry. 2019;19:2–8. DOI: 10.1186/s12888-019-2113-8
6. Arrebola-Moreno M, Petrova D, Garrido D et al. Psychosocial markers of pre-hospital decision delay and psychological distress in acute coronary syndrome patients. Br J Health Psychol. 2020; 25(2):305–323. DOI: 10.1111/bjhp.12408
7. Mamedov MN Dynamics of risk factors and cardiovascular diseases: analytical review of international and Russian data for 2017. International Heart and Vascular Disease Journal. 2018;6(19):32–37. Russian.
8. Yao B-C., Meng L-B., Hao M–L., et al. Chronic stress: a critical risk factor for atherosclerosis. J. Int. Med. Res. 2019;47 (4):1429–1440. DOI:10.1177/0300060519826820
9. Akimova EV, Gafarov VV, Gakova EI et al. Relationship between depression and coronary artery disease in an open female and male population of a middle-urbanized city of Western Siberia. Cardiovascular therapy and prevention. 2021;20(2):2557. Russian. DOI: 10.15829/1728-8800-2021-2557
10. Akimova EV, Bessonova MI, Kayumova MM, Akimov AM The risk of cardiovascular disease development depending on psychosocial factors from the perspective of hostility research: gender aspect. International Heart and Vascular Disease

Journal. 2022;10(35):5–12. Russian. DOI: 10.24412/2311-1623-2022-35-5-12

11. Pogosova NV, Boytsov SA, Oganov RG et al. Clinical-Epidemiological Program of Studying Psychosocial Risk Factors in Cardiological Practice in Patients With Arterial Hypertension and Ischemic Heart Disease: First Results of a Multicenter Study in Russia. Cardiology. 2018;58(9):47–58. Russian. DOI: 10.18087/cardio.2018.9.10171
12. Gomanova LI, Balanova YuA, Kutsenko VA et al. Psycho-emotional stress as a risk factor for the development of non-communicable diseases. The Russian Journal of Preventive Medicine. 2023;26(8):114–120. Russian. DOI: 10.17116/profmed20236081114
13. Kayumova MM, Bessonova MI, Gafarov VV et al. Associations of depression with parameters of attitude towards medical care in an open urban population, gender aspect. Vrach. 2023;34(8):48–53. Russian. DOI: 10.29296/25877305-2023-08-09
14. Chinnaiyan K. Role of stress management for cardiovascular disease prevention. Curr Opin Cardiol. 2019; 34 (5): 531–535. DOI:10.1097/HCO.0000000000000649
15. Mamedov MN, Mitchenko EI, Serpitis P, et al. Updated European recommendations for the prevention of cardiovascular diseases. Analytical review. International Journal of Heart and Vascular Diseases. 2022;10(33):4–11. Russian. DOI: 10.24412/2311-1623-2022-33-4-11
16. Souilhol C, Canic J, Fragiadaki M, et al. Endothelial responses to shear stress in atherosclerosis: a novel role for developmental genes. Nat Rev Cardiol. 2020;17(1):52–63. DOI:10.1038/s41569-019-0239-5
17. Gafarov VV, Voevoda MI, Gromova EA, et al. Cardiovascular diseases and vital exhaustion: a prospective study in Russia/Siberia (WHO MONICA program-psychosocial). Russian Journal of Cardiology. 2016;4:115–123. Russian. DOI: 10.15829/1560-4071-2016-4-eng-115-123
18. Pester MS, Gonzalez A, Schmaus J. et al. Sex differences in the association of vital exhaustion with regional fat deposition and subclinical cardiovascular disease risk. J Psychosom Res. 2022; 157: 110785. DOI: 10.1016/j.jpsychores.2022.110785
19. Yakupov EZ, Troshinalu V Anxiety, insomnia, depression — in conjunction with or opposite to functional disorders. Journal of Neurology and Psychiatry. S. S. Korsakov. 2016;116(5): 119–124. Russian. DOI:10.17116/jnevro201611651119-124
20. De Hert M, Detraux J, Vancampfort D The intriguing relationship between coronary heart disease and mental disorders. Dialogues Clin. Neurosci. 2018;20(1):31–40. DOI: 10.31887/DCNS.2018.20.1/mdehert