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The risk of cardiovascular disease development depending on psychosocial factors from the perspective of hostility research: gender aspect

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Abstract

The results literature data analysis showed multidirectional associations between the risk cardiovascular pathology and hostility. Prevalence of negative psycho-emotional states such as hostility was higher among females that may be explained by physiological characteristics of female body and ways of anger/hostility expression, which in turn affect the risk of cardiovascular disease (CVD) development. In this regard, in order to improve the CVD prevention among adult female population, it is necessary to create information resources and educational technologies as well as infrastructure that can provide appropriate and easily available counseling in order to identify and monitor psychosocial risk factors among all categories of female population.

Key words: psychosocial factors, hostility, gender aspect, females.

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Introduction

At the end of the 20th century and during the first decades of the 21st century many new scientific knowledge about the unconventional (psychosocial) risk factors of cardiovascular diseases (CVD) accumulated. At that time, the studies evaluated the effects of psychosocial CVD risk factors (PRF) on the epidemiologic situation in various countries and regions. The number of large epidemiologic scientific projects demonstrated the relevance of PRF as the most important part of the unconventional CVD RF due to the fact that PRF could explain up to 25–50 % of all coronary artery disease (CAD) cases. A large amount of data have shown that multiple professional, family and personal RF are associated with CVD. Overall, it has been shown that PRF play a leading role in the development of CVD.

Scientific concept of CVD

Concept of risk factors (RF) as a scientific basis of preventive cardiology became the foundation for many one- and multiple-factor primary CVD prevention programs on the populational level [1, 2]. According to this concept, RF are specific individual features, including biological, genetic, psychological, behavioral, and social ones that may influence the development of one or more noninfectious diseases during a certain period of time in the future. RF can be directly associated with CVD or influence its development via other determinants [1]. Fundamental epidemiologic studies that were carried out in the second half of the 20th century, in 1949, in Framingham, Massachusetts (Framingham Heart Study), showed the role of conventional RF in CVD [3]. It has been determined that such leading RF as tobacco smoking, arterial hypertension (AH), hypercholesterolemia, and obesity are associated with 67,2 % of all years of life loss in a healthy human [4, 5]. Isolated CVD RF are rare and the most part of the population has a combination of two or three factors [6]. According to the prospective JAMA study, 20 % of young women had no RF and around 60 % had two and more RF [7].

Psychosocial CVD RF

In the second part of the 20th century, PRF that met the strict mathematical significance criteria were included in the European guidelines on CVD prevention. They included: low socio-economic status, social isolation, low level of social support, personal characteristics (hostility, aggression, type D personality), anxiety and depression, home and work stress [8]. At the end of the 20th century and during the first decades of the 21st century many new scientific knowledge about PRF accumulated. These studies evaluated the effects of unconventional CVD risk factors on the development of epidemiologic situation in various countries and regions [9–15].

Hostility

The interest in the hostility phenomenon emerged at the last two decades of the 20th century, when it's associations with somatic health were identified [16]. Hostility is identified as a feature of cognitive character with an oppositional, negative attitude towards others. It demonstrates a wide range of behaviors, from aggression to becoming antisocial and having negative emotions [17]. Negative impact of hostility on the risk of non-infectious diseases and cardiovascular mortality as well as on quality of life in people with chronic illnesses has also been shown [18, 19].

Hostility, together with such similar parameters as anger, are important aspects of type A behavioral pattern, which was first described in 1950s [19]. At first, before concentrating mostly on hostility phenomenon, the studies have evaluated the types of personality. They showed that type A personality, associated with competitiveness, leadership, and hostility, is associated with a higher risk of CVD [18]. The first populational studies in the USA and Europe showed that type A personality was associated with a higher risk of CAD, but later studies have refuted this association [16, 18, 20, 21]. Further analysis of type A personality "toxic" components showed that only hostility and aggression are associated with increased risk of CAD. Metanalysis of cohort prospective studies carried out

at the end of the 20th century didn't show statistically significant tendencies of cardiovascular risk of type A personalities. On the contrary, a significant risk of CVD and CAD was identified in people with high level of hostility [22]. Therefore, further studies have focused not on the behavioral models but specifically on hostility — one of the unconventional CVD RF. They investigated the roles of the negative psychoemotional conditions in the development of CVD, and these roles are still debatable as new controversial data emerge. However, these findings confirm the fundamental role of preventive cardiology and multifactorial approach [23–28]. Initially, hostility and anger develop as a temporary psychological condition. Hostility has been associated with aggressive, violent or harmful actions towards the others. Adaptation to this condition leads to lasting changes that anchors in one's memory. Hostility is due to several factors that include both physiologic processes in the central nervous system and brain biochemistry and the psychologic factors such as motivation, imitation, learning, self-control and others. [16].

Hostility as a psychosocial factor of CVD in female population

High testosterone levels are traditionally thought to result in more aggressive behavior in males compared with females. However, it concerns not all types of hostility but primarily physical aggression. No significant differences have been found in levels of verbal aggression in males compared with females. Hostility in women is mostly irrational and more often associated with social ostracism and frustrations, and, therefore, carries a more destructive component [29]. It has been shown that the level of hostility is associated with the amount of adrenaline the has a direct effect on the sympathic nervous system, and specifically — on the posterior hypothalamus. Moreover, the level of adrenaline decreases with age and that leads to lower hostility [17]. The possible pathophysiological mechanisms that play a role in the development of CVD in the presence of negative psychoemotional conditions include increased neuroendocrine and CV reactivity and longer recovery from stress reactions [30]. Other studies also tried to explain which mechanisms lead from hostility and anger towards CVD. According to their results, anger and hostility in combination and separately were statistically significantly associated with increased levels of C-reactive protein — one of the factors of CAD [31]. Moreover, according to D. Shimbo et al., women with higher levels of hostility have changes in platelet activity [33]. Hostility together with a family history of CAD were associated with an increased level of vascular (carotid) disease [34]. Using a regression proportional risk model H.A. Tindle et al. showed a high 8-year risks of CAD and total mortality in women with higher hostility [35]. High risks of negative CAD outcomes were also shown in a metanalysis of cross-sectional populational studies and studies of high-risk groups. According to the data from 25 and 19 centers two parameters — anger and hostility — were significantly associated with the development of CV complications both in healthy people and individuals with CAD [36]. On the other hand, some studies have shown that myocardial infarction (MI) is associated not with the hostile behavioral pattern but with the emotional outbursts. Those individuals, who constantly demonstrate hostile behavior are possibly better adapted to negative outbursts and, therefore, are at the lower risk of CVD [37]. According to the latest results of several studies, there's an association between low-active MAOA-L gene alleles with a high level of hostility. That indicates a high tendency towards hostile response actions against provocations in the carriers of these alleles [38].

According to the results of a 10-year prospective observational study that investigated various types of anger expression, an attributable risk of CAD in individuals with high level of destructive anger (accusation of others in anger) was over 30 %, OR 1,31 (p=0,03) [39]. Based on these results and other findings it has been shown that the associations between anger and CAD outcomes are sex-dependent and also that anger variations influence the risks and outcomes of CAD. At the same time, some studies compared anger and hostility and showed that hostility is associated with a lower risk of CVD [39]. Earlier a two-component behavioral model with a higher risk of CAD has been developed. Two-component model cluster consists of hostility and anger potentioals. Hostility potential is a first component, a complex of reactions to special situations, such as irritation, indignation, disgust, distaste and disappointment. A second component is reluctance or inability to direct anger towards the object. According to this model, L. Musante et al. defined hostility and "anger/hostility". The first component carries the signs of indignation and rejection,

and the second component, on the contrary, is a combination of features that help restrain anger even if its absolutely appropriate [40]. Furthermore, several subsequent epidemiologic, experimental and clinical investigations defined the patterns that allowed to describe the associations between the level of anger/hostility and reactivity of platelets, levels of blood pressure, development and progression of hypertension and stroke, and various other CV complications [36]. Moreover, hostility was associated with worse prognosis of cardiovascular death and other cardiovascular complications in high-risk groups [32]. A Dutch study that included both men and women of the older age showed the stability and role of the hostility phenomenon in the general and cardiovascular mortality [41]. These results can prove that personalities with hostile (negative attitude towards others) behavior during life have more pronounced and frequent stress reactions [42]. This hypothesis was confirmed in the populational and comparative studies, where hostility in women was a significant predictor of CAD, including MI [43].

Although hostility is a determined CVD RF, suppression of anger and hostility can lead to a more serious exhaustion and CAD in women [44]. This fact can explain some negative results of the study of hostility and CAD risk [37]. Of note are the results of a 10-year observational Framingham Offspring Study that included more than 3 thousand women and men aged 18–77 years. According to the results of this study, hostility wasn't associated with any negative outcomes in women, including CAD and acute coronary death) [44]. Another populational study, the Nova Scotia Health Survey, 1995, also showed that in the CAD subgroup high level of hostility wasn't associated with a higher risk of repeated CAD events [45].

Epidemiologic data show that healthy individuals with hostile character are at a higher risk of CAD. As such, the study of association between hostility and thrombocyte aggregation showed that hostility, especially as a subtype of aggression, leads to platelet reactivity — a key pathophysiologic mechanism in the beginning of CVD [32]. In women with suspicion of MI, higher scores on The Cook-Medley Hostility Scale (indicated cynicism, hostile effect and aggressive response) were associated with lower survival, but after the groups were normalized for RF and CAD, associations with CVD increased [46]. At the same time, the role of hostility in the CAD development in women is still debatable among the epidemiologists [32, 33]. As such, the results of populational study by D.C. Haas et al. showed that hostility is an independent risk factor of repeated CAD events in men, but not in women [45]. According to other studies, people who constantly demonstrate hostile behavior, are, possibly, better adapted to negative outbursts. In such people, anger may be associated with lower risks of CVD [37]. Studies carried out on Novosibirsk female population also didn't show an increased risk of CVD. According to the authors, hostility (as a key component of type A personality), possibly, mostly has trigger effects as a provoking factor (spasm, thrombosis, plaque rupture), causing higher risk of MI in men [14]. This effect is less prominent in women [14]. CVD development phenomenon in women with hostility may be explained by the fact that, initially, submissive, formally subordinate personalitis, who are also introverted and suppress their anger, are more helpless in any negative episodes that cause anger [37]. That leads to CAD and high mortality in women with other PRF, compared with women with high level of hostility, who can tolerate these emotional changes more calmly [44].

Conclusion

The analysis of literature demonstrated that the tendencies of cardiovascular disease risk factors, associated with hostility, have different directions. Negative psychoemotional conditions, specifically, hostility, are highly prevalent in female populations. That is possibly due to physiologic features of female organisms and variations in anger/hostility expression that affect the risks of CVD. Therefore, the development of informational and educational technologies and infrastructure that is able to provide all women population access to consultations and monitoring of PRF is required for better CVD prevention in adult female population.

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References

1. Heinemann L., Enderlein L, Stark H. The Risk Factor Concept in Cardiovascular Disease. Stellman J.M. Encyclopaedia of Occupational Health and Safety. International Labour Office, 1998. pp. 34–39.

2. Mamedov M.N. 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.
3. Stamler J. Epidemiology of coronary heart disease. Clin M Amer. 1973;57:46–59. doi: 10.1016/s0025-7125(16)32300-8
4. Tomasik T., Krzysztoń J., Dubas-Jakóbczyk K. The Systematic Coronary Risk Evaluation (SCORE) for the prevention of cardiovascular diseases. Protocol of a systematic review. Probl. Med. Rodz. 2015;2:72–87. doi:10.1080/00015385.2017.1335052
5. Visseren F.L.J., Mach F., Smulders Y.M. et al. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice: Developed by the Task Force for Cardiovascular Disease Prevention in Clinical Practice with representatives of the European Society of Cardiology and 12 medical societies with the special contribution of the European Association of Preventive Cardiology (EAPC). Eur. Heart J. 2021;42:3227–3337. doi:10.1093/eurheartj/ehab484
6. Baena Díez J.M., del Val García J.L., Pelegrina T.J. et al. Cardiovascular disease epidemiology and risk factors in primary care. Rev Esp Cardiol. 2005;58:367–373. doi:10.1016/S1885-5857(06)60667-1
7. Daviglus M.L., Stamler J., Pirzada A. Favorable cardiovascular risk profile in young women and long-term risk of cardiovascular and all-cause mortality. JAMA. 2004;292:1588–1592. doi: 10.1001/jama.292.13.1588
8. 2016 European guidelines on cardiovascular disease prevention in clinical practice. Russian Journal of Cardiology. 2017;146(6):7–85. Russian. doi:10.15829/1560-4071-2017-6-7-85
9. Rosengren A., Hawken S., Ounpuu S. et al. INTERHEART investigators. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the INTERHEART study): case-control. Lancet. 2004;364:953–962. doi:10.1016/S0140-6736(04)17019-0
10. Brugnera A., Zarbo C., Tarvainen M.P. Higher levels of Depressive Symptoms are Associated with Increased Resting-State Heart Rate Variability and Blunted Reactivity to a Laboratory Stress Task among Healthy Adults. Appl. Psychophysiol. Biofeedback. 2019;44(3):221–234. Russian. doi: 10.1007/s10484-019-09437-z
11. Rosenblit P. Extreme Atherosclerotic Cardiovascular Disease (ASCVD) Risk Recognition. Curr Diab Rep. 2019;19(11):123–131. doi:10.1007/s11892-019-1178-6
12. Cho Y., Lim T.H., Kang H., et al. Socioeconomic status and depression as combined risk factors for acute myocardial infarction and stroke: A population-based study of 2.7 million Korean adults. J Psychosom Res. 2019;121:14–23. doi:10.1016/j.jpsychires.2019.01.016
13. 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:10.1016/j.atherosclerosis.2015.07.025
14. Gafarov V.V., Gagulin I.V., Gafarova A.V. et al. Psychosocial risk factors for cardiovascular disease: gender differences and 22-year dynamics among the population of Siberia (WHO MONICA-Psychosocial Program, HAPIEE). Therapeutic archive. 2020;1(92):15–24. Russian. doi:10.26442/00403660.2020.01.000249
15. Akimov A.M. Parameters of stressful events at a young age (data of cross-sectional epidemiological studies). 2020;25(6):3660). doi:10.15829/1560-4071-2020-3660
16. Dembroski T.M., MacDougall J.M., Williams R.B. et al. Components of Type A, hostility, and anger-in: relationship to angiographic findings. Psychosom. Med. 1985;47:219–233. doi: 10.1097/00006842-198505000-00001
17. Lin T.K., You K.X., Hsu C.T. et al. Negative affectivity and social inhibition are associated with increased cardiac readmission in patients with heart failure: A preliminary observation study. PLoS One. 2019;14(4): e0215726. doi:10.1371/journal.pone.0215726
18. Friedman M. Type A behavior pattern: some of its pathophysiological components. Bull. N Y Acad. Med. 1977;53:593–604.
19. Gafarov V.V., Panov D.O., Gromova E.A. et al. An association of hostility with awareness of health and other psychosocial factors in an open female population aged 25–64 years in Novosibirsk. Neurology, neuropsychiatry, psychosomatics. 2016;8(1):16–21. Russian. doi: 10.14412/2074-2711-2016-1-16-21
20. Chinnaiyan K. Role of stress management for cardiovascular disease prevention. Curr Opin Cardiol. 2019;34(5):531–535. doi: 10.1097/HCO.0000000000000649
21. Lanberg E.M. Development of the concept of patient-centredness – A systematic review. Patient Educ Couns. 2019;102(7):1228–1236. doi:10.1016/j.pec.2019.02.023
22. Myrtek M. Meta-analyses of prospective studies on coronary heart disease, type A personality, and hostility. Int. J. Cardiol. 2001;79;245–251. doi:10.1016/s0167-5273(01)00441-7
23. Curry S.J., Krist A.H., Owens D.K. et al. US Preventive Services Task Force. Risk Assessment for Cardiovascular Disease with Nontraditional Risk Factors: US Preventive Services Task Force Recommendation Statement. JAMA. 2018;320(3):272–280. doi:10.1001/jama.2018.8359
24. Pogosova N.V., Boytsov S.A., Oganov R.G. 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

25. Crawshaw J., Auyeung V., Norton S., Weinman J. Identifying psychosocial predictors of medication non-adherence following acute coronary syndrome: a systematic review and meta-analysis. J. Psychosom. Res. 2016;90:10–32. doi:10.1016/j.jpsychores.2016.09.003
26. Akimov A.M., Kayumova M.M., Akimov M.Yu., Kuznetsov V.A. Stress in the family in the open urban population. Siberian scientific medical journal. 2018; 4(18): 127-129. 2018; 4 (18): 127-129). Russian. doi: 10.15372/SSMJ20180417
27. Beutel M.E., Brähler E., Wiltink J. et al. New onset of depression in aging women and men: contributions of social, psychological, behavioral, and somatic predictors in the community. Psychol. Med. 2019;49(7):1148–1155. doi:10.1017/S0033291718002787
28. Vaccarino V., Sullivan S., Hammadah M. et al. Mental stress-induced-myocardial ischemia in young patients with recent myocardial infarction: sex differences and mechanisms. Circulation. 2018;137(8):794–805. doi: 10.1161/CIRCULATI0NAHA. 117.030849.
29. 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
30. Compare A., Brugnera A., Spada M.M. et al. The role of emotional competence in Takotsubo cardiomyopathy. Psychosom. Med. 2018;80:377–384. doi: 10.1097/PSY.0000000000000564
31. Surtees P., Wainwright J., Luben R. Psychological distress, major depressive disorder, and risk of stroke. Neurology. 2008;70:788–794. doi: 10.1212/01.wnl.0000304109.18563.81
32. Shimbo D., Chaplin W., Kuruvilla S. Hostility and Platelet Reactivity in Individuals Without a History of Cardiovascular Disease Events. Psychosom. Med. 2009;71(7):741–747. doi:10.1097/PSY.0b013e3181ad18b6
33. Vogele C. Serum lipid concentrations, hostility and cardiovascular reactions to mental stress. Int. J. Psychophysiol. 1998;28:167–179. doi:10.1016/s0167-8760(97)00094-9
34. Knox S.S., Adelman A., Ellison R.C. Hostility, social support, and carotid artery atherosclerosis in the National Heart, Lung, and Blood Institute Family Heart Study. Am J Cardiol. 2000;86(10):1086–1089. doi:10.1016/s0002-9149(00)01164-4
35. Tindle H.A., Chang Y.F., Kuller L.H. et al. Optimism, cynical hostility, and incident coronary heart disease and mortality in the Women's Health Initiative. Circulation. 2009;120:656–662. doi: 10.1161/CIRCULATIONAHA.108.827642
36. Chida Y., Steptoe A. The association of anger and hostility with future coronary heart disease: a meta-analytic review of prospective evidence. J. Am. Coll. Cardiol. 2009;53:936–946. doi:10.1016/j.jacc.2008.11.044
37. Ravaja N., Kauppinen T., Keltikangas-Järvinen L. Relationships between hostility and physiological coronary heart disease risk factors in young adults: the moderating influence of depressive tendencies. Psychol Med. 2000;30(2):381–393. doi:10.1017/s0033291700001720
38. Gafarov V.V., Gromova E.A., Panov D.O. et al. Association of MAOA-uVNTR gene polymorphism with hostility in an open population of males aged 45-64 in Russia, Siberia (international program: WHO «MONICA-psychosocial», «HAPIEE») Review of Psychiatry and Medical Psychology. 2020;(1):39-44. Russian. doi:10.31363/2313-7053-2020-1-39-44
39. Compare J., Mommersteeg P.M., Faletra F., et al. Personality traits, cardiac risk factors, and their association with presence and severity of coronary artery plaque in people with no history of cardiovascular disease. J. Cardiovasc. Medicine. 2014;15(5):423–430. doi:10.2459/JCM.0b013e328365cd8c
40. Musante L., Mac Dougall J.M., Dembroski T.M., Costa P.T. Potential for hostility and dimensions of anger. Health Psychol. 1989;8:343–354. doi: 10.1037//0278-6133.8.3.343
41. Barefoot J., Larsen S., von der Lieth L. Hostility, incidence of acute myocardial infarction, and mortality in a sample of older Danish men and women. Am. J. Epidemiol. 1995;142:477-484. doi:10.1093/oxfordjournals.aje.a117663
42. Sumin A.N., Shcheglova A.V. Is the concept of type D personality a component of personalized medicine or a prognostic factor in the treatment of cardiovascular diseases? Russian Journal of Cardiology. 2020;25(9):3996. Russian. doi:10.15829/1560-4071-2020-3996
43. Newman J., Davidson K., Shaffer J. Observed Hostility and the Risk of Incident Ischemic Heart Disease. A Prospective Population Study From the 1995 Canadian Nova Scotia Health Survey. J Am Coll Cardiol. 2011;58:1222–1228. doi:10.1016/j.jacc.2011.04.044
44. Eaker E.D., Sullivan L.M., Kelly-Hayes M. Anger and hostility predict the development of atrial fibrillation in men in the Framingham Offspring Study. Circulation. 2004;109(10):1267–1271. doi: 10.1161/01.CIR.0000118535.15205.8F
45. Haas D., Chaplin W., Shimbo D. Hostility is an independent predictor of recurrent coronary heart disease events in men but not women: results from a population based study. Heart. 2005;91(12):1609–1610. doi: 10.1136/hrt.2004.056994
46. Olson M.B., Krantz D.S., Kelsey S.F. et al. WISE Study Group. Hostility scores are associated with increased risk of cardiovascular events in women undergoing coronary angiography: a report from the NHLBI-Sponsored WISE Study. Psychosom. Med. 2005;67:546–552. doi:10.1097/01.psy.0000170830.99263.4e