

*Full Length Research Paper*

# Trait anxiety, awareness, health attitudes and 16-year hazard ratio of acute cardiovascular disease in open female population in Russia

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**Anxiety is an independent risk factor for cardiovascular diseases (CVD). Objective of the study was to elucidate impact of trait anxiety on hazard ratios (HRs) of acute myocardial infarction (AMI) and stroke in open population of 25-64year old women in Russia. Representative sample of female residents (n=870) of Novosibirsk was examined according to WHO MONICA-Psychosocial program. First-time AMI and stroke events were studied in the cohort from 1994 to 2010. Trait anxiety was evaluated by Spielberger's test. Cox proportional hazards regression model was used to determine HRs for CVD. Prevalence of high level of trait anxiety (HLA) was 60%. Poor self-rated health was associated with HLA. HLA group had higher levels of stress at workplace and in family. Increased trait anxiety was associated with worse behavioral risk profile related to smoking, diet and physical activity. Women with HLA had 4.2-fold ( $p=0.05$ ) and 3.5-fold ( $p<0.05$ ) increases in AMI and stroke HRs, respectively. Among women with HLA, increased MI and stroke rates were associated with married marital status, lower education levels and physically demanding jobs. Integrated analysis of epidemiological traits in CVD psychosocial risk factors allowed to identify pathogenetic mechanisms providing background for prevention.**

**Key words:** Trait anxiety, hazard ratio, myocardial infarction, stroke, awareness, health-rated health.

## INTRODUCTION

Recent studies have suggested that anxiety, one of the equivalents of psychological stress, is an independent risk factor for ischemic heart disease (IHD) (Roest AM et al., 2010). The increasing demand for studying the impact of anxiety on cardiovascular risk in working-age women in Russia provided rationale for our work. Indeed, national prospective studies elucidating the effects of anxiety on cardiovascular health are absent whereas the prevalence of anxiety disorders in women remains alarming (Lépine JP et al., 2005; Kadri N et al., 2007). The objective of our study was to investigate an influence of trait anxiety on hazard ratios for developing myocardial

infarction and stroke in an open population of 25-64year old women during 16 year-long study.

## METHODS

A representative sample of 25-64year old women (n = 870), all residents of one of Novosibirsk districts, was studied in the 3rd screening of the World Health Organization (WHO) Multinational Monitoring of Trends and Determinants in Cardiovascular Disease program (MONICA) and MONICA-psychosocial subprogram (MOPSY) (MONICA, 1988) in 1994. The sample was formed based on the electoral lists of Novosibirsk residents by using the random numbers table. The response rate was 72.5%. The examination procedure complied with MONICA protocol. The program of psychosocial screening examination included the registration of

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sociodemographic data such as marital status, educational level and profession and testing by psychosocial methods. Trait anxiety levels were evaluated by using Spielberger's test (subscale of anxiety as personality trait) (Spielberger CD, 1972). Interpretation of data was based on the following criteria: the trait anxiety score less than 30 corresponded to the low level of anxiety (LLA); the score from 31 to 44 corresponded to the moderate level of anxiety (MLA); and the score more than 45 suggested about the high level of anxiety (HLA). Self-rated health and attitudes to smoke cessation, diet and physical activity were studied by using the awareness and health attitude questionnaire proposed by MOPSY protocol and adapted for the given population. During the study period from 1994 to 2010, a total of 35 cases (6.3%) of first-time stroke were detected according to data of medical checkups, medical documentation analysis and death certificates. A total of 15 cases (2.7%) of first-time myocardial infarction (MI) were documented in the study cohort according to WHO program, The Register of Acute Myocardial Infarction (RAMI) (Gafarov VV, 1992). Individuals who had past history of MI, stroke, IHD and diabetes mellitus were excluded from the study.

Statistical analysis of data was performed by using the SPSS (Statistical Package for the Social Sciences) software package version 11.5. Cox proportional hazards regression model was used for determination of the hazard ratio (HR) taking into account different time intervals. Chi square ( $\chi^2$ ) statistic was used to investigate whether distributions of categorical variables differed from one another in between the groups. A value of  $p < 0.05$  was considered statistically significant.

## RESULTS

Prevalence of trait anxiety in an open population of 25-64-year old women was 38.9% and 60.4% for MLA and HLA, respectively. Associations of trait anxiety and attitudes to one's own health, prophylactic check ups, medical assistance and disease prevention were studied (Table 1). An increase in the levels of trait anxiety was associated with a decrease in the rates of good self-rated health (MLA: 41.6%; HLA: 12.5%) and with an increase in the rates of fair and poor self-rated health (MLA: 53.2% and 5.2%; HLA: 72.3% and 15.2%, respectively;  $\chi^2 = 37.70$ ;  $df = 4$ ,  $p < 0.001$ ). More than 92% of women with HLA presented with health complaints ( $\chi^2 = 38.33$ ,  $df = 3$ ,  $p < 0.001$ ) but, nevertheless, they stated that they did not pay enough attention to their health (56.4% and 70.8%;  $\chi^2 = 7.22$ ,  $df = 2$ ,  $p < 0.05$ ). Individuals with HLA stated more often that the development of a serious illness in a healthy person within 5 to 10 years was "very high".

Participants of the study were asked a question: "What will you do if you start feeling unwell at work?" Analysis of the answers showed that women with HLA had less

tendency to continue work and consult a doctor in comparison with women in MLA group (55.3%, and 57.9%, respectively); more women with HLA continued work when they were down with the flu or fever (43.3% and 41.3% for HLA and MLA, respectively); they tended to decrease amount of extra work (13.3% and 6.7% for HLA and MLA, respectively;  $\chi^2 = 7.83$ ,  $df = 3$ ,  $p < 0.05$ ) and reported more often that they did not like their job too much in comparison with women in MLA group (14.9% and 5.6% for HLA and MLA, respectively;  $\chi^2 = 9.57$ ,  $df = 4$ ,  $p < 0.05$ ). Increase in the level of trait anxiety was associated with decrease in workplace responsibility from high to low ( $\chi^2 = 13.15$ ,  $df = 4$ ,  $p < 0.05$ ); it was also associated with the downward trend in workplace responsibility during the last year. Significantly lower percentage of women in HLA group reported about their opportunity to get rest and relax after workday (17.2% and 31% for HLA and MLA, respectively;  $\chi^2 = 13.72$ ,  $df = 4$ ,  $p < 0.05$ ). Work capacity in women with HLA decreased significantly in comparison with MLA group (33.8% and 13% for HLA and MLA, respectively;  $\chi^2 = 13.72$ ,  $df = 4$ ,  $p < 0.01$ ). Increase in the level of trait anxiety was associated with an increase in the number of family conflicts (46.7% for MLA and 58.9% for HLA;  $\chi^2 = 13.36$ ,  $df = 3$ ,  $p < 0.01$ ). In comparison with MLA group, women in HLA group tended to change marital status (5.2% and 2.6% for HLA and MLA, respectively). Women with HLA reported twice more often about something which prevented them from having rest at home (51.2% and 25.6% for HLA and MLA, respectively;  $\chi^2 = 16.57$ ,  $p < 0.001$ ). Data showed no difference in the attitudes of women to illnesses or deaths of relatives between the groups.

The study determined the relationships between the levels of trait anxiety and attitudes to smoking, diet and physical activity. Group of HLA had a higher proportion of women who failed to quit smoking in comparison with MLA group (10.7% and 3.9% for HLA and MLA, respectively;  $\chi^2 = 11.25$ ,  $df = 5$ ,  $p < 0.05$ ). The upward trend in smoking intensity for the past year was found in HLA group (18% and 14.3% for HLA and MLA, respectively).

Data showed a downward trend in a number of women who adhered to a diet when the level of trait anxiety increased (3.7% and 8.1% for HLA and MLA, respectively). Women in HLA group were aware of benefits of sticking to a diet; they tried to follow a diet plan more often than women with MLA (62% and 33.1%, for HLA and MLA, respectively;  $\chi^2 = 20.87$ ,  $df = 4$ ,  $p < 0.001$ ).

More individuals with HLA assessed their age-adjusted physical activity as "low" in comparison with MLA group (21% and 11.6% for HLA and MLA, respectively;  $\chi^2 = 18.13$ ,  $df = 4$ ,  $p < 0.01$ ). Women with HLA spent their free time doing physical activities less often than those with LLA (22.1% and 29.9% for HLA and LLA, respectively); Proportion of women who exercised regularly was equally

**Table 1.** Trait anxiety, awareness and health attitudes in 25-64year old women.

Question/attitude	Trait anxiety (%)	
	MLA	HLA
How do you rate your health?		
Perfectly healthy	1.3	0.3
Good health	7.8	2.7
Healthy	32.5	9.5
Not fully healthy	53.2	72.3
Sick	5.2	15.2
$\chi^2 = 37.70, n = 4, p = 0.00000013$		
Do you have health-related complaints?		
Yes	66.7	92.2
No	33.3	7.8
$\chi^2 = 38.33, n = 3, p = 0.00000002$		
In your opinion, do you believe that you pay enough attention to your health?		
Yes		
I could do better	7.7	3.3
Obviously not enough	35.9	25.9
$\chi^2 = 7.22, n = 2, p = 0.0269$	56.4	70.8

HLA: high level of anxiety; MLA: moderate level of anxiety.

low in MLA and HLA group (7.7% and 7.9%, respectively).

Marital status pattern in the cohort of women with MI and HLA was as follows: married (64.3%); divorced (21.4%) and widowed (14.3%). The incidence rate of MI was higher among the married women with HLA compared with divorced women in MLA group ( $\chi^2 = 5.66, df = 1, p < 0.05$ ). Marital status pattern in the cohort of women with stroke and HLA was as follows: never married (9.1%); married (72.2%); divorced (15.1%) and widowed (3.0%). Data showed an increasing tendency in percentage of strokes in married women with HLA.

Educational level pattern among participants with stroke and HLA was as follows: higher education (12.1%); incomplete higher education/vocational secondary education (36.4%); high school diploma (33.3%) and high school partially completed/preparatory school (18.2%). The study revealed tendency to higher incidence of stroke in highly educated (complete and incomplete higher education) women with HLA in comparison with women of the same educational level in MLA group.

Professional status of women with trait anxiety and stroke was as follows: middle managers (9.1%); senior managers (9.1%); white-collar workers (12.1%); highly physically demanding jobs (12.1%); moderately physically demanding jobs (21.2%); not physically demanding jobs (12.1%); retired persons (18.2%) and military personnel (6.1%). Frequency of stroke in HLA group was higher in women who held highly physically demanding jobs in comparison with white-collar workers

with MLA ( $\chi^2 = 3.99, df = 1, p < 0.05$ ) and HLA ( $\chi^2 = 7.325, df = 1, p < 0.01$ ) and women with HLA whose work was not physically demanding ( $\chi^2 = 6.35, df = 1, p < 0.05$ ). Data showed tendency to higher frequency of stroke among the middle and senior managers with HLA when compared to MLA group.

The entire period of 16-year study (from 1994 to 2010) showed that hazard ratio (HR) for MI was 4.2 times higher (95% CI = 1.946–18.583;  $p = 0.05$ ) in 25-64year old women with HLA than in women with the lower levels of trait anxiety. The study did not show statistically significant differences between the frequency of AMI in dependence on educational and professional status of women.

## DISCUSSION

Data of our study demonstrated extremely high (60%) prevalence of HLA in a population of 25-64year old women; this prevalence was significantly higher than in European countries and the USA (Lépine JP et al., 2005; Kessler RC et al., 2005; Alonso J et al., 2004). It has been well documented that 1994 in Russia was the year of social order breakdown, parliamentarism crisis and transition of the country from one social structure to another. These processes were accompanied by the highest peak of social stress and as a repercussion, by the high level of trait anxiety (Gafarova AV et al., 2009; Gafarov VV et al., 2010). The study showed that 1.5-3 fold increase in the level of trait anxiety was associated with the significant worsening of self-rated health defined

as “not fully healthy” and “sick”. Women with HLA presented more often with health-related complaints and believed that they did not pay enough attention to their health. Our data are consistent with the results of the Women's Health Initiative Observational Study and WOBASZ study where the adverse psychological determinants were associated with negative self-rated health in women (Wassertheil-Smoller S et al., 2004; Piwonski J et al., 2009). Recent studies in Denmark (Fink P et al., 2010) and China (Xu Z et al., 2011) confirmed the presence of association between the anxiety and negative self-rated health. Apprehension of a serious illness in the upcoming 5 to 10 years as well as the statements about not enough care for one's own health suggested about the insufficient awareness regarding prevention of cardiac diseases in women. According to data of foreign scientists, women with emotional disorders have poor concepts about the prevention techniques (Piwonski J et al., 2009).

The study of anxiety and stress at workplace showed that individuals with HLA more often stated that they reduced amount of additional work and that they did not like their job too much; women in HLA group reported about a pronounced decrease in the work capacity and responsibility for the past 12 months. The study of occupational stress in Great Britain demonstrated that the higher levels of anxiety and depression are associated with an increase in the workplace demands, intrinsic and extrinsic effort and negative coping (Mark G and Smith AP, 2012). Moreover, it has been known that the high levels of anxiety together with the low self-rated health are associated with the reduced work capacity in the employed women (Peterson U et al., 2011).

The study of trait anxiety and stress in family showed that an increase in anxiety is associated with the higher number of family conflicts, more frequent changes in marital status and less often opportunities for rest at home. Social traditions where the female gender role is limited by that of a wife with the correspondent responsibilities can have an impact on the development of stress in family and the work-family conflict aggravates this pathological pattern in individuals with HLA.

The associations between trait anxiety and behavioral risk factors, including smoking, eating habits and physical activity, are identified. More and more studies demonstrate an impact of emotional disorders and stress on the health attitudes. Such women have more adverse risk profile and behavioral lifestyle: they smoke more often and do not get enough physical activity (Whang W et al., 2009; Piwonski J et al., 2009; Rodjer L et al., 2008).

For the first time, the present study showed a significant impact of trait anxiety on the risk of AMI and stroke in the population of working-age women in Russia. Our data are consistent with the results of foreign authors who studied AMI risk in women with anxiety (Albert CM et al., 2005; Smoller JW et al., 2007).

Pathogenetic pathways of AMI involve the prolonged psychoemotional stress associated with the evident increase in trait and state anxiety leading to disturbed sympathetic tone with hemodynamic changes, increase in hypothalamic-pituitary-adrenal axis activity and lipoprotein profile shift toward the atherogenic fraction (Paul SM, 1988; Alboni P and Alboni M, 2006; Vögele C, 1998).

The study showed that married women with HLA have higher frequency of AMI. It is consistent with the foreign studies where single and divorced women have lower AMI risk in comparison with the married ones (Thompson SG et al., 1989). In HLA group, women with the higher level of education demonstrated tendency to high risk of stroke in comparison with that in MLA group of the same educational level. Similar results were found in the previous works (Gafarov VV et al., 2011; Panov DO et al., 2011).

The observed upward trend in frequency of stroke in female managers is caused by high job strain and in the presence of a combination of high demand with low job control, is associated with high cardiovascular risk (Kivimäki M et al., 2008).

The study demonstrated that female workers with HLA holding highly physically demanding jobs had higher frequency of stroke. Women with this kind of labor are the most prone to occupational stress and psychological problems associated with anxiety and loss of behavioral and emotional control leading to increased risk of stroke (McFadden E et al., 2009). Low social class affiliation is the stronger risk factor for women than for men since the double pressure of career and family increases the risk of coronary heart disease in women (Brezinka V and Padmos I, 1994).

## CONCLUSIONS

1. Prevalence of HLA in an open population of 25-64year old women in Russia was as high as 60%.
2. Increased levels of trait anxiety in the study population were associated with 1.5-3 fold increase in prevalence of poor self-rated health; more frequent health-related complaints; significant increase in prevalence of negative behavioral habits; and higher levels of stress at workplace and in family.
3. Development of AMI and stroke is significantly associated with HLA and marital status “married” among 25-64year old women with low educational and both high and low professional levels.
4. Hazard ratios for AMI and stroke in 25-64year old women with HLA were 4.2 fold and 3.5 fold higher, respectively, than in women without HLA.
5. There is a high demand in psychological testing and social gradient determination via the interdisciplinary examination of female population. Monitoring of the psychosocial cardiovascular diseases (CVD) risk factors

and attitudes to health, diet, smoking and prophylactic check-ups contributes to the direct assessment of prophylactic program efficacy and prediction of population response to preventive measures.

6. Detection of the high levels of psychosocial factors among the economically active women allows timely psychotherapeutic intervention aimed at correction of the personality nucleus (biological and cultural) providing an opportunity to change attitudes to self, disease, overall life and CVD prophylactics.

7. Integrated analysis of the epidemiological traits in psychosocial risk factors for CVD allows to elucidate mechanisms of their development which is necessary for planning of prophylactic measures aimed at decrease in CVD mortality and morbidity.

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