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Association of prevalence of metabolic syndrome and its components and family status changes in men of an open urban population

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Objective

To assess the association of prevalence of metabolic syndrome and its components with family status changes in men of an open population in a moderately-urbanized Siberian city.

Materials and methods

We conducted a cross-sectional epidemiological study of a representative sample formed from the electoral lists of Tyumen. The sample consisted of men aged 25–64 years, the response rate was 85.2%. We used IDF criteria (2005) to assess metabolic syndrome. We evaluated family stress including the stress from family status changes during the last 12 months using the WHO questionnaire "Knowledge and Attitude towards Health".

Results

Metabolic syndrome prevalence in Tyumen men aged 25–64 years was 15.0% (3 or more criteria per IDF). In an open Tyumen population 20% of men lacked stable family status, the same number of men were not able to rest at home, and in one third of men family conflicts were noted. In an open urban population of working age men with both a high prevalence of metabolic syndrome and high levels of family stress we identified certain groups with

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both metabolic syndrome and arterial hypertension (per IDF criteria) who on average had a more stable family status.

Conclusion

As such, when formulating regional preventive programs in the open population of the city of Tyumen and other moderately urbanized Siberian cities it is important to use standardized methodologies and accumulated data. This is necessary to achieve objective monitoring of the epidemiological situation in regards to cardiovascular disease and chronic stress factors such as availability of social care and family status.

Keywords: *Epidemiological study, male population, metabolic syndrome, family stress.*

Conflict of interest: none declared.

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Introduction

According to the Russian Society of Cardiology metabolic syndrome (MS) is characterized by visceral adipose tissue accumulation, peripheral insulin resistance, and hyperinsulinemia that lead to carbohydrate, lipid and purine metabolism disoreders as well as arterial hypertension (AH) [1]. A meta-analysis of major epidemiological studies found the frequency of MS in adult population to be 10 % in China and up to 24 % in the USA. The World Health Organization (WHO) consider MS to be the XXI century pandemic and predict that the rate of MS incidence will rise by 50 % in the following 25 years [2]. The European Botnia Study carried out in Finland in Sweden, showed the independent prognostic role of MS. Mortality in the MS group was 1 % compared with 2.2 % in the control group. The Botnia Study results showed that MS was a more significant risk factor than any of its components [3].

MS is characterized by polygenic predisposition that rarely causes any disease in the absence of specific risk factors associated with modern way of life. The specific risk factors that play the leading role in the development of MS are not clear at this time. The research is currently focused on psychosocial and dietary factors [4–6]. Stress affects the development of cardiovascular disease both in direct way and via irregular adaptation mechanisms (smoking, overeating, alcohol consumption) [7–9]. Many researchers consider the divorced, retired and unemployed individuals to be at the highest risk of stress [10, 11]. Long-standing excess stress and neuroendocrine trophic effects in MS also lead to structural adaptation of the cardiovascular system [2]. The effects of these risk factors are further aggravated by various maladaptive behaviors such as alcohol and drug abuse, smoking, overeating and lack of physical exercise [12, 13].

As such, the latest decade of the XXI century can be characterized by a strong interest in MS, as all its components are conventional risk factors of cardiovascular disease (CVD). The several-fold increase in total cardiovascular risk determines the medical and social significance of MS problem. At the same time, with an incredible material progress of the modern society comes the greater demand for the psychobiological knowledge. The lack of these knowledge may lead to loss of health and wellbeing.

Materials and methods

We conducted a simultaneous epidemiological study of a representative sample of the Central district of Tyumen population. The sample, formed using the random number generation method, included 1000 men aged 25–64 years (response rate 85.0 %), 250 people in each age group: 25–34; 35–44; 45–54; 55–64 (Figure 1).

We used IDF criteria (2005) to assess metabolic syndrome: waist circumference (WC)≥ 94 cm in Caucasian men plus 2 of the following criteria: triglycerides≥ 1.7 mmol/l, HDL–C< 1.0 mmol/l+ hypolipidemic therapy, blood pressure≥ 130/85 mmHg or previous antihypertensive therapy, blood glucose≥ 5.6 mmol/l or type 2 diabetes mellitus (T2DM).

We evaluated family stress including the stress form family status changes during the last 12 months using the WHO questionnaire "Knowledge and Attitude towards Health".

The study was carried out with the accordance with the principles laid down in the Declaration of Helsinki. Study protocol was approved by the Ethical Committees of all the involved clinical centers.

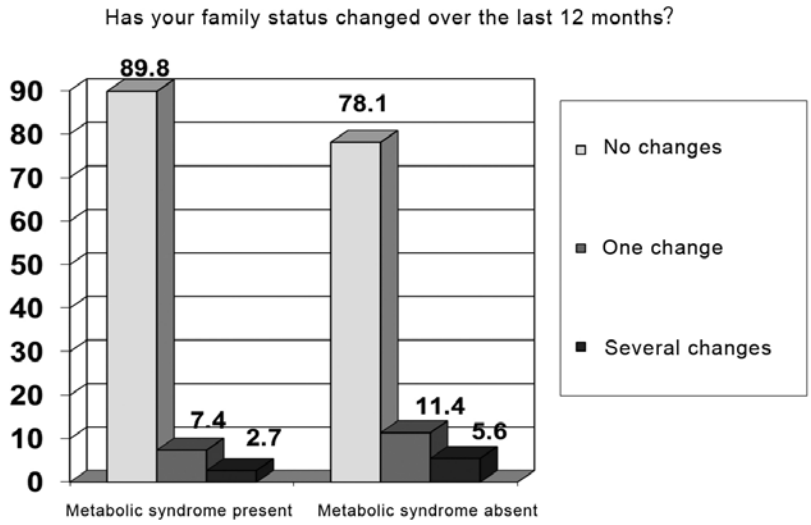

Figure 1. The association between metabolic syndrome prevalence and family status changes in the population of men aged 25–64 years, %.

Written informed consent was obtained from all participants prior to being enrolled.

Statistical analysis was completed using the IBM SPSS Statistics 21.0 software. The results are presented as proportions (in percent) for categorical variables in the four age groups that were analyzed. To correctly compare our data with the data form other epidemiological studies we performed age adjustment by direct standardization based on the age structure of Russian Federation urban population aged 25–64 years. In order to assess statistical significance of the differences we used Pearson's chi- squared test (χ^2) with Bonferroni correction. A p-value less than 0.05 was considered statistically significant.

The aim of this study was to assess the association of prevalence of metabolic syndrome and its components and family status changes in men of an open population in a moderately-urbanized Siberian city.

Results

Metabolic syndrome prevalence in Tyumen men aged 25–64 years was 15.0% (3 or more criteria per IDF) — age adjusted value. Prevalence of MS was significantly higher in the 45–54 age group (10.0–19.8%, p<0.001) and in the 55–64 age group (19.8–31.2%, p<0.01). Statistically significant differences in MS prevalence were found in the following age groups: 25–34 years — 6.8–17.3%, p<0.001; 35–44 years — 10.0–17.3%, p<0.001; 55–64 years — 31.2–17.3%, p<0.001 (Table 1).

At the same time, around 20% of men in the open Tyumen population lacked stable family status, the same amount of men were not able to rest at home, and 1/3 of men family had frequent family conflicts.

Individuals with MS were found to have more stable family status compared with those without MS. Of all participants, 89.8% individuals with MS and 78.1% individuals without MS didn't have any family status changes during the last 12 months (p<0.05) (Figure 1).

Table 2 shows the association of MS components and family-related stress in the male population aged 25–64 years. Both individuals with and without MS answered questions from the "family-related stress" category (severe disease in close relatives, death of a relative, family conflicts during the last 12 months and the ability to rest at home) in a similar way.

At the same time, we identified a more stable family status in individuals with AH compared with the individuals without AH. Of all participants, 88.0% of

Table 1. **The prevalence of metabolic syndrome (according to IDF criteria) in Tyumen men aged 25–64 years**

Age, years	n	MS	
		Absolute number	%
25–34	177	12	6.8***
35–44	228	23	10.0***
45–54	231	46	***19.8
55–64	214	67	**31.2***
25–64	850	148	17.3
Age adjusted value			15.0

Comment: (*) on the left marks statistically significant differences in two age groups, (*) on the right marks statistically significant differences in the age group compared with the general population: * — * — p<0.05; **– p<0.01; *** — p<0.001; n –number of people examined, MS — metabolic syndrome.

Table 2. **Family-related stress and metabolic syndrome components in the population of men aged 25–64 years**

Question/attitude	Metabolic syndrome components									
	Abdominal obesity n=390		Arterial hypertension n=581		Hyperglycemia n=162		Hypertriglyceridemia n=97		Low HDL–C n=42	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
1. Severe disease or death of a close relative during the last 12 months?										
1.1. Yes	96/108	24.7/23.5	136/68	23.4/25.5	37/167	22.8/24.3	22/182	22.7/24.2	11/193	26.2/23.9
1.2. No	293/351	75.3/76.5	445/199	77.1/74.5	125/519	77.1/75.7	75/569	77.4/75.8	31/613	73.8/76.1
2. Has your family status changed over the last 12 months (married, divorced, left family, widowed, child born, other)?										
2.1. No changes	337/378	86.682.2	512/203	88.1/75.7***	137/578	84.6/84.1	86/629	88.7/83.6	35/680	83.3/84.3
2.2. One change	34/57	8.7/12.4	44/47	7.6/17.5***	14/77	8.6/11.2	7/84	7.2/11.2	6/85	14.3/10.5
2.3. Several changes	18/25	4.6/5.4	25/18	4.3/6.7	11/32	6.8/4.7	4/39	4.1/5.2	1/42	2.4/5.2
3. Were there any serious conflicts in your family during the last 12 months?										
3.1. No conflicts	271/312	69.7/67.8	401/182	69.0/67.9	112/471	69.3/68.2	74/509	76.3/67.4	27/556	64.3/68.9
3.2. One conflict	34/36	8.7/7.8	51/19	8.8/7.1	15/55	10.4/8.0	7/63	7.2/8.6	4/66	9.5/8.2
3.3. Several conflicts	70/94	18.0/20.4	107/57	18.4/21.3	31/133	17.8/19.8	14/150	14.4/20.1	10/154	23.8/19.1
3.4. Frequent conflicts	14/18	3.6/3.9	22/10	3.8/3.7	4/28	2.5/3.9	2/30	2.1/3.9	1/31	2.4/3.8
4. Is there anything that prevents you from getting good rest at home?										
4.1. Yes	68/110	17.4/24.0*	120/58	20.7/21.7	32/146	19.8/21.3	17/162	17.5/21.6	10/168	23.8/20.8
4.2. Нет	322/348	82.6/76.0*	461/209	79.3/78.3	130/540	80.2/78.7	80/589	82.5/78.4	32/638	76.2/79.2

Comment. (*) marks statistically significant differences in the presence and absence of metabolic syndrome components:
* — p<0.05; ** — p<0.01; *** — p<0.001; Abs. — absolute number

men with AH and 75.9% of men without AH didn't have any family status changes during the last 12 months (p<0.001); 7.5% of men with AH had one change compared with 17.3% of men without AH (p<0.001). Concerning other components of MS, we identified no significant differences related to family status changes in the last 12 months.

Discussion

Over the last two decades the psychosocial component of population health and its effects on CVD development have been a very important topic in contemporary research. It's gradually becoming one of the most important and complicated problems in modern medical science. Modern Russian society is currently undergoing major transformations that is inevitably leading to the formation of a new social structure and to the development of even stronger stratification [7, 10]. Chronic social stress results in the development of multiple adaptational diseases, and, undoubtfully, MS is one of them [1,4].

Chronic psychosocial stress increases the risk of MS development in a great number of ways. The formation of a specific behavioral pattern leads to activation of the sympathetic nervous system (SNS), secretion of catecholamines and, eventually, blood pressure elevation. Many studies have assessed the connection between stress and blood pressure changes [6, 8, 12]. Some traditional behavioral risk factors such as smoking, lack of physical activity and alcohol abuse as well as socioeconomic status in general are also associated with increased CVD risk in the presence of chronic psychosocial stress [9, 13].

In an open Tyumen population 20% men lacked stable family status, the same number of men were not able to rest at home, and in one third of men family conflicts were noted. At the same time, men aged 25–64 years with MS and AH (a component of MS according to the IDF criteria) were found to have a more stable family status compared with individuals without MS and AH. At the first sight, the identified pattern contradicts the majority of epidemiologic studies that found the CVD risk to be higher in single men [10]. However, according to the results of our previous studies in the Tyumen population, married men were better informed about CVD risk factors and showed more responsibility for their health and readiness to participate in preventive activities [11]. Therefore, more stable family status in men with MS seems reasonable enough. Marriage is considered to be one of the strongest types of social support. Widowhood and divorce, on the contrary, are difficult and stressful life situations. CVD mortality in divorced, widowed and single men who never married was significantly higher compared with married men [3]. As such, married men are considered to be the most protected social group and individuals with MS are in great need of social protection [9].

Conclusions

In conclusion, in working-age men with high prevalence of MS and its components and high levels of

family-related stress we identified a more stable family status. As such, when formulating regional preventive programs in the open population of the city of Tyumen and other moderately urbanized Siberian cities it is important to use standardized methodologies and accumulated data. This is necessary to achieve objective monitoring of the epidemiological situation in regards to cardiovascular disease and chronic stress factors such as availability of social care and family status.

Conflict of interests: None declared.

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