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THE INCIDENCE OF CORONARY HEART DISEASE IN THE PRESENCE AND VARIOUS COMBINATIONS OF INDIVIDUAL COMPONENTS OF THE METABOLIC SYNDROME

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ABSTRACT

The aim was to study the significance of individual components of metabolic syndrome and their various combinations as risk factors for coronary heart disease.

Material and methods. The study included 1335 males representing a representative sample of the unorganized population of the city of Tashkent (Uzbekistan). Some risk factors of coronary heart disease (including the main components of metabolic syndrome) were studied. Mathematical processing was determinedcorrelation indicators, average and relative values of the studied risk factors.

Results. The differences in correlations between different risk factors of coronary heart disease were revealed. Coronary heart disease has been shown to be associated with all major components of metabolic syndrome. However, the severity of these relationships varies. As the number of risk factors in the structure of coronary heart disease increases, the proportion of typical angina pectoris decreases, and the proportion of pain-free and atypical manifestations of coronary heart disease increases. Among individuals with MS, the frequency of pain-free and atypical manifestations of coronary heart disease is 3.63 times higher than typical angina pectoris.

Summary. The connection between coronary heart disease and the main components of metabolic syndrome has been established. It is shown that with impaired glucose tolerance, pain-free and atypical variants of the course of this disease are more common.

Keywords: coronary heart disease, metabolic syndrome, impaired glucose tolerance, obesity, diabetes, hypertension, dyslipidemia.

INTRODUCTION

To date, quite a large number of scientific facts have accumulated indicating that in the development and progression of cardiovascular diseases (CVD), including coronary heart disease (CHD), a large number of different risk factors (RF) [1, 2, 3, 4]. One of the most important CHD IS hypertension (AH). According to the literature data, CHD in AH develops more often and is more complicated by myocardial infarction than in normal blood pressure [3]. According to a number of authors, overweight (BMI) is one of the main RFof CHD [3, 5].

Along with the important role of hypercholesterolemia (GC) in the development of CHD, in particular, the importance of the lipid triad: the combination of hypertriglyceridemia (HTG), hyper β-lipoproteinemia (HBLIP) and low level of a-cholesterol [6]. The important role of diabetes mellitus (DM) in the development of CHD has been convincingly proved [7, 8]. DM often develops among individuals with previously impaired glucose tolerance (IGT). However, the presence of IGT is closely linked to insulin resistance [9]. Therefore, IGT, to a certain extent, can be considered as a state of pre-disease in relation to DM [10]. It follows that the study of early manifestations of hyperglycemia can provide interesting data in the field of pathogenesis and prevention of coronary heart disease.

Population studies have shown that the prevalence of individual components of MS, as well as their importance in the development of coronary heart disease in different populations, may differ significantly [11]. To a certain extent, this is due to socio-demographic, climate and geography, and other factors [12, 13, 14]. Therefore, it seems appropriate to study the role of the MS and its individual components in the formation of CHD, taking into account their regional characteristics.

MATERIALS AND METHODS

The analysis includes data from a survey of a representative sample of the unorganized male population of the city of Tashkent in the amount of 1335 people. Among the examined persons,

166 patients with coronary heart disease were identified.The examination included the following methods: questionnaire, biochemical instrumental.

Survey methods:

- WHO standard questionnaire for angina pectoris (presence of pain or other unpleasant sensations localized behind the sternum and / or / in the left half of the chest and left arm, appearing during exercise and ceasing after reducing the intensity or cessation of exercise);
- WHO standard questionnaire for the detection of possible myocardial infarction (history of severe pain penetrating the front of the chest and lasting 30 minutes or more, in the absence of scarring on the ECG).

RESULTS

Diagnosis of metabolic syndrome and its main components was carried out on the basis of IDF criteria [15]. However, in assessing carbohydrate metabolism, along with the study of fasting glycemic levels and 2 hours after glucose loading, glycemic levels were also studied 1 hour after glucose loading. Definition of glucose 1 hour after load glucose was motivated by a desire to explore the significance of the sympathadrenal phase glycemic curve (blood glucose 1 hour after load glucose) compared to vago-insular a phase of the glycemic curve (blood glucose 2 hours after glucose load).

Electrocardiography (ECG): ECG was shot in 12 common leads and analyzed the data about coronary artery disease according to the Minnesota code [16] according to the following criteria: definite myocardial infarction - the presence on the ECG cicatricial changes (category 1-1,2 μm); angina – a pain syndrome that meets the criteria of the questionnaire who, in the absence of category 1-1,2 MK; painless ischemic heart disease – in the presence of ECG ischemic changes (categories 4-1,5-1 and 2,2 MK) in the absence of left ventricular hypertrophy, angina, and categories 1-1,2 MK; possible myocardial infarction in anamnesis (according to the questionnaire who) - in the absence of scar and ischemic ECG changes, and angina; possible coronary artery disease, including possible scarring of the myocardium by ECG (categories 1-3 1-2-8 and MK), for possible myocardial ischemia (category 4-3, 5-3 MK), arrhythmic form (category 6-1,2; 7-1 and 8-3 MK), the myocardial ischemia in the presence of left ventricular hypertrophy (categories 4-1,5-1 and 2,2 in the presence of 3-1,3 MK).

The study of correlations between the studied RF showed (table. 1) that there is an ambiguous correlation between individual RF.

Table 1 Correlation coefficients between indicators blood pressure, Ketle's index, lipids and glycemia

Indicators	SBP	DBP	KI	TH	TG	β-lip	Glycemia	
							Fasting	In 1 hour
SBP	-							
DBP	0,75*	-						
KI (Ketle'sindex)	0,36 **	0,45*						
Totalcholesterol (TH)	0,1*	0,03	0,01					
Triglyceride (TG)	0,2*	0,09	0,11*	0,45*				
β- lipoproteins (β-lip)	0,12*	0,06	0,08	0,63*	0,34*			
Fastingglucose	0,13 *	0,12*	0,21*	0,2*	0,35*	0,18*		
Glycemiain 1 hour	0,18*	0,14*	0,22*	0,05	0,22*	0,1*	0,41*	
Glycemiain 2 hour	0,25*	0,21*	0,29*	0,16*	0,52*	0,11*	0,43*	0,42 *

Note: * - significance of differences in indicators

It turned out that in general, the levels of almost all correlation coefficients are reliable (except for the coefficients between the Ketle's index with cholesterol and β-lipoproteins). It should be noted that the most pronounced correlation was established between systolic blood pressure (SAD) and diastolic blood pressure (dad) with Ketle's index and glycemia 2 hours after glucose loading. Between the Ketle's index and glycemic parameters, a significant correlation was also found, more pronounced in relation to glycemia 2 hours after glucose loading.

One of the methods used in population studies to assess the importance of certain RF in the development of the disease is the percentile distribution of the variation series of indicators of the studied parameter. Therefore, to assess the relationship between the mean levels of the studied RF and the prevalence of CHD, the analysis of the frequency of CHD in the quintiles of the distribution of blood PRESSURE, lipid levels, Ketle's index (KI) and glycemia was carried out (table.2).

Table 2 Prevalence of coronary heart disease in quintiles of level distribution Blood pressure, Ketle's, lipids, and glycemia

Indicators	Quintiles of the studied indicators				
	1	2	3	4	5
SBP	6,33	8,31	10,73	14,65	**27,41 ***
DBP	6,01	10,00	11,18	15,75	**23,96 ***
Ketle's index (KI)	6,07	10,08	11,56	14,34	**23,43 ***
Totalcholesterol(TH)	9,41	13,49	10,68	13,26	**13,09**
Triglyceride (TG)	9,87	9,58	11,44	14,48	**13,87**
β- lipoproteins (β-lip)	7,02	8,21	14,58	18,01	**21,56 ***
Fastingglucose	12,64	10,98	13,62	11,28	**20,77 ***
Glycemiain 1 hour	9,66	11,52	14,65	12,54	**19,62 ***
Glycemiain 2 hour	10,24	10,41	9,72	11,82	**26,40 ***

Note: * - significance of differences in 1 and 5 quintiles

According to the quintile distribution, there is a direct relationship between the levels of SAD, dad and Ketle's index and the prevalence of CHD. As the level of these indicators increases, there is an increase in the frequency of coronary heart disease. This relationship is more pronounced in relation to SAD. It should be noted that the differences in the frequency of coronary heart disease in 1 and 5 quintiles of blood PRESSURE and Ketle'sindex are statistically significant. There were no significant differences between the frequency of coronary heart disease in the corresponding quintiles of the distribution of levels of CS and TG. At the same time, sufficiently large and statistically significant differences were found in the frequency of coronary heart disease in 1 and 5 quintiles of the distribution of β-lipoproteins. A sufficiently pronounced relationship between the levels of glycemia and the frequency of coronary heart disease was established. This relationship was more typical for glycemia 2 hours after glucose loading. It should be noted that the frequency of coronary heart disease in 5 quintile distribution of SAD and glycemia 2 hours after glucose load was greater than in the corresponding quintiles of other indicators. These data indicate that in the development of coronary heart disease the most important is the increase in blood pressure (primarily SAD), Ketle'sindex, the level of β-lipoproteins and glycemia (primarily glycemia 2 hours after glucose loading).

From the data presented, it appears that as the level of RF in quintiles increases, the prevalence of CHD increases. However, this analysis does not allow us to determine the significance of each of the studied RF in the prevalence of coronary heart disease. Therefore, an attempt was made to study the frequency of

coronary heart disease in different combinations of the considered RF. It was found that the prevalence of coronary heart disease to some extent associated with different combinations of RF (table.3).

Table 3 The prevalence of coronary heart disease in different combinations of RF (in%)

The combination of FR	CHD (n=166)		NoCHD (n=1169)		Total	
	n	%	n	%	n	%
No RF	**33**	**5,76**	**540**	**94,24**	**573**	**100,00**
GH	5	4,59	104	95,41	109	100,00
GIT + GH	3	6,25	45	93,75	48	100,00
AG + GH	2	12,50	14	87,50	16	100,00
GIT	34	13,88 ***	211	86,12	245	100,00
overweight + GH	3	17,65	14	82,35	17	100,00
AG+overweight	5	17,86	23	82,14	28	100,00
overweight	10	17,86 **	46	82,14	56	100,00
GIT+overweight	8	19,51 *	33	80,49	41	100,00
AG	14	22,22 **	49	77,78	63	100,00
GIT+overweight+GH	3	25,00 *	9	75,00	12	100,00
AG+GIT	14	26,92 ***	38	73,08	52	100,00
AG+GIT+overweight	15	37,50 ***	25	62,50	40	100,00
AG+GIT+GH	8	38,10 *	13	61,90	21	100,00
MS (metabolic syndrome)	**7**	**63,64 *****	**4**	**36,36**	**11**	**100,00**
AG+overweight+GH	2	66,67 *	1	33,33	3	100,00

Note: * - The table shows the significance of differences in the studied indicator relative to the group without RF.

The highest incidence of CHD occurs among individuals who have a combination of AH, BMI, and GC (66.67%). The incidence of coronary heart disease was slightly lower among people with AH, nth, BMI, and GC (63.64%). These 4 RF form the basis of the metabolic syndrome and, logically, it was expected that the highest prevalence of coronary artery disease is among this category of persons. However, analysis of the data suggests that CHD risk increases not only with the increasing amount of RF. Having only one AH is associated with a greater risk of CHD than combining IGT with GC, BMI with GC, IGT with BMI. From these data, it could be concluded that AH has a greater significance in the development of coronary heart disease than even a combination of other (the above combinations). However, it was found that in the combination of AH with GC, as well as in the combination of AH with BMI, the frequency of CHD was lower than among those with only AH. Apparently, the results were influenced by the insufficient number of individuals in certain groups: 3 people in the group with a combination of AG, BMI, and GC, three people in the group with a combination of

IGT and GC, two people in the group of AG and GC.

Attention should be drawn to the fact that in different combinations of RF among persons with the highest prevalence of coronary heart disease in the last five groups (not counting the small group of a combination of AH, BMI and GC) a permanent participant is IGT, GC and BMI occur in three cases out of five. However, the lowest incidence of coronary heart disease is observed in "isolated" GC, i.e., among persons with only this RF.

DISCUSSION

One of the objectives of this study was to clarify the relationship between different RF and CHD. In order to study this issue, the prevalence of coronary heart disease in different quintiles of the distribution of the studied indicators was studied. As evidenced by the quintile distribution data for SAD, dad and Ketle's index, there is a direct relationship between their levels and the prevalence of coronary heart disease. As the level of these indicators increases, an increase in coronary heart disease is observed. This relationship is strongly expressed in relation to SAD. In this part, our data are consistent with the results of other authors [1, 2, 3, 13, 18]. It should be noted that the differences in the frequency of coronary heart disease and five quintiles of blood PRESSURE and Ketle's index are statistically significant. However, there were no statistically significant differences in the frequency of coronary heart disease in the quintiles of the distribution of cholesterol and triglycerides. At the same time, sufficiently large and statistically significant differences in the frequency of coronary heart disease were observed between 1 and 5 quintiles of β-lipoprotein distribution. At the same time, a pronounced and reliable relationship between glycemic levels and the frequency of coronary heart disease was revealed. This Association is highly characteristic of glycemia 2 hours after glucose loading. It should be noted that the frequency of CHD in the five quintiles of the distribution of SAD and glycemia 2 hours after glucose loading was the highest relative to other indicators.

These data indicate that the development of coronary heart disease is the most significant increase in blood PRESSURE. This is also indicated by a study conducted in Kyrgyzstan [17]. Our study also showed that coronary heart disease is more common with increased predominantly systolic blood PRESSURE, body weight, β-lipoprotein levels, and glycemia (primarily hyperglycemia glycemia 2 hours after glucose loading).

On the basis of the presented data, it is possible to judge the significance of individual RF in the development of coronary heart disease. However, the importance of combining different RFS is of some interest. In order to study this issue, the prevalence of coronary heart disease in different combinations of the studied RF was studied.

It turned out that among those without studied RF CHD occurs least, and most often CHD occurs in metabolic syndrome, i.e., among those who have a combination of AH, BMI, GC and IGT (66.7%). It should be noted that in the three groups with the highest incidence of coronary heart disease, "permanent participants" are AH and IGT, and in the last two AH, IGT and BMI.

Thus, our data are consistent with the literature data on the high importance of metabolic syndrome in the development of coronary heart disease [19, 20, 21]. Of particular interest was the prevalence of various forms of coronary heart disease among people with metabolic syndrome. Almost all forms of CHD among people with MS were more common than without MS. The greatest differences were noted with respect to pain-free forms of coronary heart disease. However, the frequency of "possible" MI in the groups under consideration did not differ. It should be noted that the frequency of such forms of CHD as MI, angina and "possible" CHD in MS was 3.3 times more common than without MS, and painless myocardial ischemia was seven times more common.

CONCLUSION

Thus, the most important among the studied RF CHD are AH, BMI, and IGT. "Isolated" GC has a relatively lower significance in the development of coronary heart disease. However, when GC is combined with other RFS, the risk of CHD formation increases significantly. In the presence of the main components of the metabolic syndrome, CHD occurs 2-3 times more often than without them, and with a combination of AH, BMI, IGT, and GC, CHD occurs in 66.7%.

As the number of RF increases in the structure of CHD, the proportion of typical angina pectoris decreases, and the proportion of pain-free and atypical manifestations of CHD increases. Among individuals with MS, the

frequency of pain-free and atypical manifestations of coronary heart disease is 3.63 times higher than typical angina pectoris.

Modern trends in the prevalence of RF in the studied populations provide an opportunity to predict a significant increase in the frequency of CHD and hypertension, and IGT is associated with a violation vago-insular phase glycemic curve.

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