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CLINICAL AND MEDICAL HISTORY FEATURES OF ACUTE MYOCARDIAL INFARCTION IN PATIENTS WITH DIABETES MELLITUS. EPIDEMIOLOGY STUDY

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ABSTRACT

The aim of the present study was to investigate clinical and medical history features of the onset, course, and short-term outcomes of acute myocardial infarction (AMI) in patients with type 2 diabetes mellitus (T2DM).

Original data were obtained from analytical information database of the World Health Organization epidemiology program "Acute Myocardial Infarction Register" for 2014 to 2015. A total of 1157 cases of AMI, registered in Tomsk in 2014–2015 except prehospital death episodes, were analyzed. Type 2 diabetes mellitus was present in medical history of 259 (22.4%) patients with AMI.

Age-gender structure of patients with diabetes mellitus showed that women (60.2% and 35.4%, respectively; p<0.001) and individuals older than 60 years (76.1% and 57.8%, respectively; p<0.001) prevailed. Obtained results demonstrated that AMI in the presence of T2DM was characterized with more severe cardiovascular medical history, severe AMI course with frequent atypical onset, a few electrocardiographic findings, and very high lethality. The vast majority of fatal AMI cases were registered when patients were in general hospitals.

The presence of significant number of women and older individuals among T2DM patients as well as high frequency of cases with atypical clinical onset of the disease and complicated medical history hampered AMI diagnosis. All above-said suggests the necessity of increase awareness of physicians working in general hospitals and emergency departments in regard to individuals with T2DM as potentially vulnerable to AMI development.

Key words: *acute myocardial infarction, diabetes mellitus*

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INTRODUCTION

Diabetes mellitus is one of the most serious medical, social and economic problems of healthcare in all countries of the world. This is due to the fact, that the greatest danger of this pathology is associated not only with a steady increase in the number of cases, but also with extremely high level of cardiovascular complications, particularly coronary artery disease [1, 2, 3]. According to the literature data, the number of people with diabetes mellitus increases every 10 years by about 50%, and coronary heart disease occurs in these patients 2-3 times more often than at the population level [2, 4]. Diabetes mellitus plays indisputable great role in increasing the risk of developing of acute myocardial infarction, therefore, according to the literature, every fourth patient with acute myocardial infarction suffers from diabetes [5, 6]. Besides, compared with the whole population, patients with diabetes have higher mortality rate in the acute phase of myocardial infarction, as well as in early and late post-infarction periods [7]. Certainly, a separate problem of AMI in DM should be considered the objective difficulties in diagnosing this disease, which is associated with frequent atypical, as well as painless clinical course of the disease and the lack (especially in the first hours of the disease) of appropriate changes on the electrocardiogram (ECG) [1]. All of the above indicates the relevance of studies analyzing peculiarities of AMI in patients with diabetes and studying outcomes of the acute period of the disease. It should be emphasized, that such works continue to maintain their importance and relevance, since they allow not only to confirm the already known features, but also reveal new peculiarities of manifestation of acute coronary disease in patients with diabetes. The most optimal source of information for this kind of analysis can be data from long-term epidemiological studies, since in this case there is a possibility to avoid a specific selectivity of the studied contingent and to analyze the problem at the population level.

The purpose of this study was to research the features of origin, course and immediate outcomes of AMI in patients with diabetes in anamnesis.

MATERIAL AND METHODS

The study is based on data from information-analytical database of the epidemiological program of the World Health Organization "Register of acute myocardial infarction", which operates in Tomsk since 1984. The epidemiology of AMI is studied among the population older than 20 years old according to the method recommended by the WHO (World Health Organization), using uniform diagnostic criteria (clinical, electrocardiographic,

biochemical and pathomorphological) [8]. In the course of the present study 1157 cases of AMI were analyzed (with the exception of episodes of death in patients in the prehospital phase), which were registered in the city in 2014-2015. In the anamnesis, diabetes was diagnosed in 259 patients with AMI (22.4%), the remaining 898 patients (77,6%) didn't have any DM.

To determine the statistical significance of differences in nominal attributes were used a nonparametric Pearson's test $\chi2$ for paired values, and Fisher's exact test for very small quantities (less than 5). The critical level of significance when testing statistical hypotheses in this study were taken equal to or less than 0,05 (p-level of significance).

THE RESULTS OF THE STUDY

In age and gender structure of patients with diabetes women (60,2% and 35,4%, respectively; p<0,001) and people older than 60 years (76.1 per cent and 57.8 per cent respectively; p<0,001) prevailed. In General, patients with DM were older and the average age of patients in this group was 71,1±11,2, whereas individuals without diabetes were 67,3±13,4 years old (p<0,001). The main clinical and anamnestic indicators of compared groups of patients are presented in table 1. The data in the table indicate that in patients with diabetes the infarction developed against the background of more severe (in terms of cardiovascular disease), medical history and more often accompanied by atypical clinical picture.

Table 1. Clinical and anamnestic features of acute myocardial infarction in patients with and without diabetes

Directly in the structure of atypical clinical forms of myocardial infarction in patients with diabetes and without diabetes we can see the domination of people with asthma (31,3% and 27,1%, respectively) and collaptoid (18,8% and 23,5%, respectively) versions. Almost equally often in patients of the analyzed group was recorded cerebral (13,5% and 17,6%) and peripheral (8.3% and 7,2%) and painless (5,2% and 6,3%, respectively) clinical variants of AMI. Abdominal form of AMI were more often registered in patients without diabetes (16,3 per cent and 7,3%, respectively; p<0,05). Among patients with diabetes and without diabetes (in those cases where it was possible to establish), angina pectoris was II-III grade of functional class, arterial hypertension only II and III and cerebral stroke was ischemic. Not to mention that patients of the compared groups were equally often subjected to high-tech methods of CHD treatment. It's worth to mention an important fact that in the group of patients with diabetes significantly more often AMI developed in individuals undergoing treatments in non-core hospitals (therapeutic, surgical, etc.), regarding gastroenterological, endocrine and other pathologies.

Table 1. Clinical and anamnestic features of acute myocardial infarction in patients with and without diabetes

Anamnesis /history	Acute myocardial infarction+ Diabetes mellitus (n=259)		Acute myocardial infarction without Diabetes mellitus(n=898)		P
	Abs.	%	Abs.	%	
An atypical clinic	96	39,0	221	27,1	<0,05
AMI developed in non-core hospital	41	15,8	98	10,9	<0,05
AMI in anamnesis	114	44,0	305	34,0	<0,001
Angina pectoris	229	88,5	693	77,2	<0,001
Arterial hypertension	240	92,7	721	80,3	<0,001
AVCC	65	25,1	148	16,5	<0,05
Stenting of CA in anamnesis	15	5,4	48	5,3	>0,05

Note: AMI – acute myocardial infarction, AVCC – acute violation of cerebral circulation, CA – coronary artery disease, DM – diabetes mellitus

Table 2. The frequency and structure of complications of acute myocardial infarction in patients with and without diabetes

Complications of AMI	AMI+DM (n=259)		AMI without DM (n=865)		P
	abs.	%	abs.	%	
Cardiogenic shock	68	26,3	149	17,2	<0,05
Acute left ventricular failure	110	42,5	256	29,6	<0,001
Chronic heart failure	182	70,3	476	55,0	<0,001
Heart rhythm and conduction disorders	144	55,6	412	47,6	<0,05
Pulmonary thromboembolism	14	5,4	30	3,5	>0,05
Rupture of myocardium	11	4,3	31	3,6	>0,05
Acute aneurysm	11	4,3	43	5,0	>0,05
Palindromia	20	7,7	50	5,8	>0,05
Other complications	21	8,1	55	6,4	>0,05

Notes: AMI – acute myocardial infarction, ALVF – acute left ventricular failure, CHF – Chronic heart failure, HRCD – Heart rhythm and conduction disorders, pulmonary thromboembolism, DM – Diabetes mellitus

In patients of compared groups, AMI with a Q-wave was found equally often (78,2% and 74,3%, respectively; p>0,05), however, almost every fourth patient with DM (25,5 percent) had no changes on the ECG (and not only in the first hours of the disease), that characterize the acute coronary pathology. In the group of patients without diabetes the amount of such cases was significantly lower (16,3 percent, p<0,001). All patients with diabetes had AMI with complications, but patients without DM (865 patients or 96,3%) (p>0,05) also experienced complications. Structure of complications is presented in table 2.

The data indicate that in the structure of complications of AMI in patients with DM we can see the domination of cardiogenic shock, acute left ventricular failure, congestive heart failure of severe functional class (II-IV NYHA), as well as various violations of cardiac rhythm and conduction. In the structure of cardiac arrhythmias in patients of the analyzed group we can see the domination of supraventricular and ventricular premature beats (various gradations in Lown) (68,1% and 63,8%, respectively). Patients with DM more often had atrioventricular blockade of various degrees (21,5% and 15,5%, respectively; p<0,05). The density of other types of heart rhythm and conduction disorders in the structure of cardiac arrhythmias in the analyzed groups was almost identical.

It's worth to mention the fact that the mortality of patients, registered with a specialist unit was quite low and practically identical in patients with diabetes and without diabetes (10,5% and 10,2%, respectively). Very high mortality was observed in patients in the non-core (therapeutic, surgical, etc.) hospitals (86,7% and 76,6% in patients with diabetes and without diabetes, respectively; p<0,05).

Every third patient with diabetes had a fatal outcome developed in the first 6 hours of the disease (31%) and without diabetes – every fourth patient – in 25,8% of cases (p>0,05). In the analyzed groups, there were no significant differences in the frequency of occurrence of the causes of the death.

DISCUSSION

Thus, the study made it possible to obtain results, that indicate that AMI in patients with DM is characterized by high frequency of atypical clinical manifestations and the absence of specific changes on ECG, that characterize acute coronary pathology, making it difficult to diagnose AMI, especially at the prehospital stage. The obtained results are consistent with literature data [1, 4]. Most authors believe that DM not only increases the risk of AMI, but also has a negative effect on the course of disease, increasing the likelihood of such extreme complications, as cardiogenic shock, pulmonary edema, chronic heart failure, etc. [9, 10]. It's important to note that there are significant number of cases of atypical clinical beginning and the complicated course of AMI not only in patients with diabetes, but in the group without diabetes. This is due to the fact, that in the age structure of the patients of analyzed groups elderly and senile individuals predominate. In turn, atypical clinical forms of AMI, as well as complicated course of disease are most often registered among people of this specified age category [11]. In addition, diabetes is also associated with an adverse course of hospital period of AMI, being an independent predictor of death in hospital that is associated with high in-hospital mortality of patients. Such statements were also confirmed during the present study [12, 13, 14]. It's also worth mentioning that we find a significant number of deaths registered in the non-core hospitals. This situation was noted in the city of Tomsk for the last 5-6 years and was the subject of a special study, the results of which have been published in the medical literature more than once [15, 16, 17]. Briefly summarizing its results, we can say that significant and sustained growth among patients with AMI, not only with diabetes, women and the elderly, as well as high frequency of atypical clinical onset of the disease, which is burdened by anamnestic background and by absence of ECG changes, create objective difficulties in diagnosing AMI on prehospital stage. These circumstances contribute to the fact that the number of people with AMI in combination with DM under the mask of associated or comorbid pathology falls not to specialized cardiology department but to non-core hospitals. In addition, AMI developed directly in the hospital for a significant part of patients, often against the background of severe concomitant, often surgical pathology. Objective difficulties in the diagnosis of AMI affect the timely recognition of this disease that largely contributes to the poor prognosis of patients and a large number of fatal outcomes. It's important to mention that the time factor in the case of a combination of AMI and diabetes is particularly important, since, as shown by the present study, a significant number of deaths occurs in the first six hours of the disease. This fact indicates the need for increased alertness of doctors of therapeutic, surgical and other hospitals, particularly on duty at the ambulance, in respect of people with diabetes as potentially threatened in terms of development of AMI, especially that any acute non-cardiac pathology may serve as an additional provoking factor of acute coronary catastrophe [15]. In this regard, it is necessary that all patients with diabetes coming in therapeutic or other profile hospitals, regardless of the

reason for hospitalization, were examined by a cardiologist with mandatory registration of ECG and analysis of enzyme activity of blood serum and other biochemical markers of myocardial necrosis, primarily troponin. ECG registration and monitoring of the activity of enzymes should be repeated in the first three days (the most important for the diagnosis of AMI) of hospitalization. In cases of suspected AMI in patients, already located in non-core hospital, also it's required a prompt and regular ECG registration and control of activity of enzymes of blood serum. In such cases, results of these studies will allow to verify the diagnosis in time, take appropriate steps to correct the treatment and transfer the patient to a specialized hospital.

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