Original Article

Effectiveness of the application of the register of acute myocardial infarction in the pre-hospital stage of emergency medical care in the turkestan region of the republic of kazakhstan

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ABSTRACT

Background

Timeliness and sufficiency of the emergency medical services within the first hours of the disease are among the main factors defining prognosis of the patients with the acute myocardial infarction (AMI).

Aim

The purpose of this study is assessment of attendance and hospitalization timeliness by the emergency medical services (EMS) on fatality rate of the patients with the acute myocardial infarction.

Materials and methods.

The patients (n = 531) with the signs of the acute myocardial ischemia were included in the study with the various outcomes at prehospital phase of the emergency medical services. Statistical treatment of the material has been carried out using absolute and relative values. Outcomes. Untimely arrival of the emergency medical services physician to the patient from the moment of call receipt, AMI diagnosis and earlier hospital admission after the first examination of the EMS physician exert a great influence over probability of mortality due to acute myocardial infarction at prehospital phase.

Result

The specific weight of the patients attended by the EMS physicians within the range of 0-29 minutes has increased by 19.4% after implementation of the program of the AMI's register, the number of undiagnosed AMI cases by the EMS physicians has reduced by 16.4%, and the specific weight of the hospitalized after the first examination by the EMS physicians has increased by 7.2%.

Keywords

acute myocardial infarction; prehospital phase; timely attendance; correct diagnosis and hospital admission of the patients after the first examination by the EMS physician.

Abbreviations: AMI: Acute Myocardial Infarction, EMS: Emergency Medical Services, PHP: prehospital phase, ECG: Electrocardiography, MI: Myocardial Infarction,

INTRODUCTION

Turkestan region is one of the largest regions of the Republic of Kazakhstan, where more 77% of residents among2200000population live in rural districts. The incidence of the acute myocardial infarction (AMI) among the population of Turkestan region for 2020 was 196.53 cases per 100000 of population, that is higher than the incidence rate of the population of the Republic of Kazakhstan by 33.5 (147.24%), in addition to theincidence rate of the population of highly developed European countries and USA, and the average fatality rate is from 26.6% to 42.5% [1-3]. According to data of theAcute Myocardial Infarctionregistry program, mortality due to coronary vascular diseasesis increased due to rise in the number of the dead before arrival of anemergency physician. Undiagnosed AMI is detected in more than 40% of the dead at the prehospital phase (PHP) during postmortem examination[4-7]. In average, about the third cases

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of AMI are resulted in death before hospital admission, mainly within the first hour aftersymptoms onset.

Nevertheless, inadequate attention is paid to the emergency medical services system in many post-Soviet republics, and allocated funds for it were inappropriate. As the result, decrease in hospital mortality achieved following large-scale implementation of the modern treatmentmethodshasnotbeenaccompaniedbyreduction in mortalityon an outpatient basis. To affect pre-hospital mortality it is necessary to improve the current strategies for pre-hospital medical aid arrangement. In general, epidemiological evidencetestify that reallocation of funds in favor of pre-hospital aid can result in major reduction of mortality among the patients with AMI than further intensification of hospital treatment [8-14].

At the same time quality of the emergency medical services to the patients with ACS is slightly analyzed in the available literature, there is no information on pre-hospital mortality structure, immediate causes of death and factors defining early adverse outcome, as well as its impact on further disease progression of hospital patients[15-19].

Meanwhile, the level of pre-hospital mortality is stably high over the years. There is a need of as earlier risk assessment of a patient with AMI as possible resulting in differentiated approach to solution of tactical and medical issued at pre-hospital stage.

To achieve maximum reduction of pre-hospital mortality rate of patients with theacute myocardial infarction it is necessary to control the quality of medical diagnostics and urgency of delivery on hospital admission, as well as emergency antithrombolytic and antianginal aid to physicians of emergency cardiologic service.

MATERIALS AND STUDY METHODS.

A register of AMI has been arranged in Saryagash district in 2020, and it has been implemented in Sauran and Ordabasy districts of Turkestan region in 2021. Simultaneously Turkestan city AMI register started its operation. The staff is presented by 4 physicians – cardiologists and 4 nurses.

Information on AMI cases and suspected AMI as well as cases of sudden death is collected by the register's employees from the EMS call card (form 110-y), admission and refusals logs at hospitals, documents ofpolyclinics' physicians. Completeness of the obtained information is controlled by means of data verification on the patients leaving a hospital, monthly verification of professional medical expert commission data, weekly verification of MCB, registration details of local physicians. All ECG, registered in polyclinics and hospitals of districts, are verified. Documents in sanatory rehabilitation departments are reviewed. All death certificates are verified in district and municipal Civil Registry Offices on a weekly basis and in regional programm on a monthly basis to detect all death cases.

At suspicion on AMI a physician of the registry department interviews and examines a patient at hospital or at home, and ECG is registered. Moreover, a thorough analysis of all possible medical documentation is performed: case histories, outpatient cards, clinical records of ambulance stations, EMS cards of calls. Autopsy reports and medicolegal autopsy reports are analyzed in case of death during acute period. If the patient survives, it is repeatedly examined in 28 days to establish a diagnosis according to the WHO categories as at hospital and at home with the repeated ECG registration and study of the available documentation **(table 1)**.

Table 1. Breakdown (in %) of the patients with the acute myocardial infarction by time from call receipt to arrival of EMS physician

Years	Time interval			
	0-29 minutes	30-59 minutes	1 hour – 2 hours 59 minutes	3 hours and more
2013:				
I quarter	39.4	38.7	21.9	0.0
II quarter	51.3	33.1	15.6	0.0
III quarter	52.3	40.8	6.9	0.0
IV quarter	72.5	25.0	2.5	0.0
Total	53.9	34.4	11.7	0.0
2014	54.2	34.2	11.6	0.0
2015	54.3	34.3	11.4	0.0
2016	53.5	34.6	11.9	0.0
2017	54.1	35.7	10.2	0.0
2018	54.6	35.4	10.0	0.0
2019	54.7	35.0	10.3	0.0
2020	73.3	23.1	3.6	0.0
2021	76.7	20.0	3.3	0.0
2022	78.4	19.2	2.4	0.0

To assess and improve the aid to the patients with AMI it is divided into 3 time intervals. The first interval is time from the disease onset to visit or call of a physician; it reflects health literacy of the population. The second one is time from call receipt to arrival of a physician (mainly EMS), reflecting quality of the medical services arrangement. The third interval is time

from examination by a physician to hospital admission reflecting medical qualification. In total a diagnosis AMI has been established in 1869 patients within 10 years in Saryagash district, and in 3678 patients within 5 years in Sauran and Ordabasy districts. It turned out that 31.7% of patients visit a physician within the first hour of the disease, 87% - within twenty-four hours. Pain syndrome of common site was noted in most cases (97.1%) in patients with benign outcome of AMI. Specific weight of dyspnea and asphyxia (2.1%), loss of consciousness (0.5%), vegetative signs (0.2%) and pain of other localization (0.1%) are extremely rare. Chest pain was in 56.7% of cases in patients with adverse outcome. Dyspnea and asphyxia (22.3%), loss of consciousness (14.4%),autonomic disturbances (4.0%),as well as pain of other localization (2.6%) were more often in the group with benign outcome of AMI. So, typical clinical symptoms of the disease are rare in patients with adverse outcome, there are more cases of non-standard forms of AMI onset: asthmatic, gastralgic, syncopal, cerebral etc. A synergy betweenatypicality of clinical performance of the disease and mortality at pre-hospital stage among men and women ($p<0.001$) has been detected during the correlation analysis. An analysis of obtained data in time of EMS physician arrival to the patient from the call receipt demonstrated that 53.9% of the patients were serviced within 0-29 minutes before the register implementation, 35.0% of the patients were serviced from 30 to 59 minutes, 10.2% of the patients from 60 minutes to 2 hours 59 minutes. Servicing indicators on the abovementioned intervals were 73.3%,23.1% and 3.6% accordingly after implementation of the register (Table 1). Only 13.1% of the patients were admitted to hospital after the first examination by EMS physician before implementation of the register, and after implementation of the register a share of admitted to hospital within hours after examination has increased up to 20.3%. A share of the patients admitted to hospital has increased from 49.9% to 66.2% for the specified time interval (Table 2). Number of undiagnosed AMI cases by EMS physician during the first medical examination (Table 3) (from 8.0% to 14.7%) is indicative of relatively low quality of emergency medical services to the patients with AMI. Almost half of the patients with MI have been detected by the register's physicians after their examination by pre-hospital stage physicians (Table 4). It has to be said that 41.4% of the patients were examined by 3 physicians and more before their admission to hospital, and 27.6% of the patients were referred to hospital after 1 medical examination.

The task of pre-hospital stage in case of the disease is delivery of care to the patientsto the full extent **(table 2,3**).

Table 2. Breakdown (in %) of the patients with the acute myocardial infarction by time the first examination by an EMS physician to hospital admission

Years	Time interval				
	0-59 minutes	1 hour -5 hours 59 minutes	6 hours -23 hours 59 minutes	1 - 10 days	10 -30 days
2012:					
I quarter	10.0	38.1	27.7	17.9	6.3
II quarter	9.2	45.0	25.0	16.6	4.2
III quarter	15.8	36.9	26.3	15.7	5.3
IV quarter	8.7	39.1	21.7	21.8	8.7
Total	10.9	39.8	25.2	18.0	6.1
2013:					
I quarter	11.8	45.7	26.0	16.7	0.0
II quarter	9.9	45.2	27.2	17.7	0.0
III quarter	7.5	47.3	26.1	19.1	0.0
IV quarter	9.4	52.0	24.4	14.2	0.0
Total	9.6	47.5	26.0	16.9	0.0
2014	10.1	52.2	24.6	13.1	0.0
2015	12.2	48.1	25.5	14.2	0.0
2016	14.5	48.3	24.6	12.6	0.3
2017	14.1	49.2	26.0	12.5	0.0
2018	13.4	51.3	23.5	11.8	0.0
2019	14.3	50.5	24.0	11.2	0.0
2020	19.8	62.7	15.2	2.3	0.0
2021	20.5	62.5	14.6	2.4	0.0
2022	20.8	73.5	4.1	1.6	0.0

Table 3. Incidence rate (in %) of the acute myocardial infarction which has not been detected during the first medical examination by the EMS physicians

Years	Physician of the Emergency medical services
2013	26.7
2014	25.3
2015	24.7
2016	24.3
2017	24.4
2018	23.3
2019	22.6
2020	9.2
2021	8.0
2022	6.8

Residential treatment is also one of the treatment components. According to our records, there were 35.9% of the patients in intensive follow-up wards in 1977; there was a possibility of rehabilitation during

28 days after onset of the disease within 1 year of the register operation in 86.3% of the patients, also it was performed for 16.8% of the patients by nurses. There were no physicians of intensive follow-up wards and therapeutic exercises physician.

Consequently, operation of MI register allowed objective assessment of care delivery to the patients, as well as plan and implementation of the measures focused on its improvement (2). All abovementioned indicators were improved during the 2nd year of operation (1978): 72% of the patients were referred to hospital within 24 hours from the disease onset by EMS and polyclinic physicians. Deficient positions of physicians of intensive follow-up wards and therapeutic exercises physicians not stipulated by the staff schedule were introduced in infarcted department. 89.4% of the patients with MI attended intensive follow-up ward in 1978. Residential treatment has been carried out for 78.5% of the patients among 84.2%, to whom it was permitted with 28-day period after the disease onset.

Succession in delivery of care to the patients with MI by stages (AMS – polyclinics – hospital) and feedback were worked out. All these resulted in reduction of hospital mortality by 2 times during the 2nd year of operation (p-0.001) (Table 5). It has to be said that a downward trend of mortality of men (from 167 cases to 123 cases per 100 000 of residents) and women (from 62 to 50 per 100 000 of residents) has been noted during the 2nd year. Subsequently, relative stabilization of this indicator has been noted.

Further dynamics (within 7 years) demonstrate that effect achieved due to operation of the register is preserved at the achieved level and even became better. Time of EMS physician arrival to the patient within 30 minutes from the call receipt is from 53.9% to 78.4% as number of health professionals and number of sanitary vehicle of EMS station were increased. Due to the fact that prompt analysis of the efficiency of care delivery to the patients with MI and its correction were performed during the register operation, period of admission to hospital of the patients with MI from the first medical examination by EMS and polyclinic physicians is mainly within the range 0-6 hours; number of the patients admitted to hospital within 1 hours has been increasing. A number of patients who were not diagnosed by EMS and polyclinic physicians has been decreased considerably **(table4,5**).

Table 4. Incidence rate (in %) of the acute myocardial infarction which has not been diagnosed at prehospital phase, but detected by the physicians of the Cardiology department

Years	MI incidence rate
2018:	
I quarter	42.2
II quarter	40.6
III quarter	39.5
IV quarter	41.7
2019:	
I quarter	38.6
II quarter	34.9
III quarter	32.4
IV quarter	31.4
2020	12.8
2021	8.9
2022	2.7

Table 5. Mortality (in %) of theacute myocardial infarction depending on the place of death

Years	Mortality	
	Hospital	Pre-hospital
2018	4.6	29.4
2019	4.5	28.1
2020	4.2	19.2
2021	4.1	18.2
2022	3.7	16.3

Within the last year hospital admission within 6 hours after the first examination by EMS physicians was 92.5%, by polyclinic physicians– 88.4%; number of MI cases not diagnosed by EMS and polyclinic physicians was 8.8 and 12.6%, accordingly. 93.5% of the patients with MI attended intensive follow-up ward. Residential treatment has been carries out for 82.6% of the patients among 86.9% to whom it was permitted within 28-day period after the disease onset. Number of the patients detected by the register's physicians has decreased to 0.8%. The presented data are confirmed by the absence of growth of hospital mortality since 1979. In spite of the fact that all detected deficiencies in delivery of health care to the patients with MI and possibilities and methods of their correction were set out in instructive letters and sent to all municipal and district health authorities of the region, commencement of operation

delivery for the patients with AMI, apparently, can be very successful, but there is a reason for late hospital admission that cannot be adjusted. These areterms of the patients seeking medical care. This indicator has not been changed over 9 years.

In view of the foregoing, a questionnaire on study of causes of late uptake has been developed, and 300 patients were examined.

An analysis of the obtained results demonstrated that 54% of the patients with exertional angina sought medical aid later than 6 hours after the disease onset. Late uptake was more typical for women, 56% of them sought medical attention later than 24 hours after the disease onset.

58% of the patients who suffered from exertional angina within a month before the onset of MI, knew about their disease, 35% were subject to regular medical check-up, and 30% were treated regularly. 69% of the patients who

Table 6. Time from EMS call to the patient with the acute myocardial infarction before arrival of a physician (in %)

Year	District	Time intervals			
		0-29 minutes	30-59 minutes	1 h – 2 h 59 minutes	3 h and more
2018: I quarter	Turkestan city	31.72	25.09	42.68	0.51
	Sauran district	28.54	21.46	46.90	2.30
	Saryagash district	29.35	22.82	46.58	1.25
	Ordabasy district	22.64	36.63	38.91	1.82
II quarter	Turkestan city	45.19	44.76	10.05	0
	Sauran district	36.86	41.92	21.22	0
	Saryagash district	38.01	39.83	22.16	0
	Ordabasy district	37.69	38.73	23.58	0
III quarter	Turkestan city	86.67	12.32	1.01	0
	Sauran district	83.34	13.28	3.38	0
	Saryagash district	84.17	14.08	1.75	0
	Ordabasy district	81.54	15.35	3.11	0
IV quarter	Turkestan city	91.6	8.36	0.04	0
	Sauran district	89.62	8.73	1.65	0
	Saryagash district	89.36	9.12	1.28	0
	Ordabasy district	87.49	10.83	1.68	0
2019	Turkestan city	93.35	6.65	0.00	0
	Sauran district	91.89	8.06	0.05	0
	Saryagash district	92.07	7.74	0.19	0
	Ordabasy district	90.58	8.86	0.56	0
2020	Turkestan city	97.50	2.50	0.00	0
	Sauran district	96.68	3.32	0.00	0
	Saryagash district	95.91	4.09	0.00	0
	Ordabasy district	93.38	6.62	0.00	0
2021	Turkestan city	98.56	1.44	0.00	0
	Sauran district	98.02	1.98	0.00	0
	Saryagash district	97.97	2.03	0.00	0
	Ordabasy district	96.86	3.14	0.00	0
2022	Turkestan city	99.01	0.99	0.00	0
	Sauran district	98.72	1.28	0.00	0
	Saryagash district	98.51	1.49	0.00	0
	Ordabasy district	97.39	2.61	0.00	0

We did not detect any connection between early uptake and awareness of the patients about CHD and at the same time noted that the vast majority of the patients with AMI do not understand the whole danger of the first hours of the disease, and half of them do not know the signs of MI. Therefore, only an increase in health literacy of the population can improve this indicator, but this task is not only medical, but also social one **(Table 7).**

Table 7. Time from EMS call to the patient with the acute myocardial infarction before arrival of a physician (in %)

Years	Districts	Time interval				
		0-59 minutes	1 hour -5 hours 59 minutes	6 hours -23 hours 59 minutes	From 1 day – to 10 days	From 10 – to 30 days
2018: I quarter	Turkestan city	0	15.33	21.76	43.46	19.45
	Sauran district	0	12.47	30.62	39.83	17.08
	Saryagash district	0	13.62	29.87	40.03	16.48
	Ordabasy district	0	12.34	28.92	38.23	20.51
II quarter	Turkestan city	6.92	38.61	36.28	14.46	3.73
	Sauran district	6.82	39.75	36.05	13.29	4.09
	Saryagash district	6.41	39.92	36.11	14.21	3.35
	Ordabasy district	5.11	37.41	37.53	15.62	4.33
III quarter	Turkestan city	12.37	65.42	16.76	4.43	1.02
	Sauran district	11.62	65.36	16.74	4.16	2.12
	Saryagash district	11.48	64.29	17.76	4.63	1.84
	Ordabasy district	10.24	59.13	18.51	10.18	1.94
IV quarter	Turkestan city	21.49	71.58	7.36	1.57	0
	Sauran district	19.54	71.26	8.43	2.77	0
	Saryagash district	18.92	70.42	5.41	1.52	0
	Ordabasy district	17.04	69.18	6.04	3.16	0
2019	Turkestan city	20.14	70.83	5.26	3.77	0
	Sauran district	20.93	69.74	5.68	3.65	0
	Saryagash district	19.84	70.02	7.12	3.02	0
	Ordabasy district	18.92	69.86	8.22	3.00	0
2020	Turkestan city	22.44	71.39	4.64	1.53	0
	Sauran district	**28.06**	65.62	5.32	2.00	0
	Saryagash district	26.23	66.48	5.40	1.89	0
	Ordabasy district	27.21	67.13	5.18	1.14	0
2021	Turkestan city	29.26	63.72	5.84	1.45	0
	Sauran district	30.83	64.49	4.41	1.25	0
	Saryagash district	30.19	63.91	5.46	1.62	0
	Ordabasy district	**30.17**	64.41	3.97	0.71	0
2022	Turkestan city	31.56	63.84	5.12	0.78	0
	Sauran district	31.33	64.39	4.74	0.68	0
	Saryagash district	31.65	62.78	3.99	0.61	0
	Ordabasy district	31.71	64.37	3.92	0.36	0

Practical MI register, created in Turkestan region, is one of the variants of the management system, which explains its high efficiency, which has been detected in a short time. Health authorities can perform this work using its own resources at the cost of internal reserves.

of MI register in Ordabasy and Sauran districts in 2021 demonstrated that there was the same situation as in Saryagash district in 2020 (Tables 6 and 7). The number of patients detected by the physicians of MI register after their examination by EMS physicians was about 40% in both districts. But due to a certain working experience within 1 year, it has been able to improve both the arrangement of care for the patients with MI and improve medical qualifications. The number of the patients detected by the register's physicians after their examination by physicians at outpatient stage was 7.3% in IV quarter of 1981. Further dynamics in these districts does not differ from the such in Saryagash district.

Improvement of the efficiency of medical care

suffered from unstable angina pectoris within 2 weeks before MI development, knew about their disease, 38% were subject to regular medical check-up, and 31% were treated regularly. Later, patients whose disease has developed at home, sought medical assistance (this indicator is 72.8% according to the register). It emerged that patients of elder age classes seek medical assistance with a major delay: 50-59 years old - 82%, 60 years old and more - 83%. There was no difference in uptake of the patients depending on the position held and educational qualification. One of the main reasons of late uptake was the opinion that an attack can be stabilized through its own effort (85%), 51% did not associate an attack with a heart disease, 48% of the patients did not know the clinical performance of MI. All other causes - family circumstances, alcohol intoxication preceding the disease, earlier refusal to hospital admission, difficulties related to call of a physician, etc. - accounted for 6-12% of cases of late uptake. Evidently, gender and age of patients impact the time of medical care seeking for the patients with AMI. Women and patients of elder age classes attend medical institutions with a major delay, which is related to the features of MI clinical performance at elderly age, and according to some authors, with greater patience of women (14). Late uptake in case of the disease at home is based on the fact that patients try to stabilize the attack through their own efforts using available medicines **(Table 6).**

DISCUSSION

Turkestan region is large region of the Republic of Kazakhstan, where 77% of 2200000 population lives in rural districts. About 13000 of people die annually on the coronary heart disease here. 1789 cases of acute myocardial infarction were diagnosed in 2021, 679 among them were with the fatal outcome.

Actual level of hospital mortality in case of AMI in Turkestan region is in 2.4 times higher than in European countries (16.08% vs 6.7%) [20,21,22,23,24,25,26,27,28]. A lot of budgetary funds has been spent for development of high-tech cardiological care over the last 5 years and such care has been obtained by more than 600 patients for 2021. Mortality rate due to diseases of blood circulation organs has reduced by 4.8%.

Meanwhilein average about 32% of AMI in Turkestan region result in mortality before hospital admission within the first hour from the moment of the disease signs onset [29,30]. This suggests the necessity to pay special attention to improvement of the arrangement of specialized emergency medical services for population of the district. According to statistical data, an emergency medical services (EMS) for cardiologic patients are rendered by the specialized heart teams. Main indicator of accessibility and efficiency of operation of EMS teams is time of the patients with ACS delivery to the specialized cardiological and otherin-patient clinics after pain episode commencement. Our research data for 2013-2019 indicated that specific weight of the patients serviced by EMS physicians from the call receipt within 0-29 minutes was 53.9% of the patients, from 30 to 59 minutes – 35.0% of the patients, from 60 minutes to 2 hours 59 minutes – 10.2% of the patients**.**13.1% of the patients were admitted to hospital after the first examination by EMS physician. Almost half of the patients with AMI have been detected by the register's physicians after examination by the physicians of the pre-hospital stage.

However, patients are rarely delivered within the first 3 hours from the pain syndrome onset; within 4-6 hours - necessary treatment has not been performed for main part of the patients; moreover, the majority of the patients are not admitted to hospital during 24 hours. Nevertheless, even that small part of the patients delivered to hospital during the first three hours does not immediately arrive at the catheterization laboratories, which results in a delay in specialized cardiac care in case of ACS. One of the main factors defining the outcome of the patients with ACS is adequacy of medical care within the first hours of the disease. The earlier will be performed the necessary treatment, the higherthe higher the chances for favorable outcome of the disease. Development and implementation of logistics schemes for transportation of patients with MI from a primary hospital to PCI center for invasive treatment is one of the most difficult tasks in arrangement of modern medical care. Time "door-balloon"/"time door-needle" should not exceed 60-120 minutes, as this time interval allows for advantage of initial PCI over thrombolysis. An ambulance transporting patients with ACS should be able to transport patients directly

to the catheterization laboratory, not entering the emergency department or critical care unit in the PCI center. All ambulance teams should be provided with the necessary intensive care equipment, 12-channel device for ECG recording. Active dissemination of knowledge about the symptoms of ACS, about the key role of the time factor in these conditions ("every minute counts"), about ACS treatment (including primary PCI) and about the basics of resuscitation is an extremely important part of the whole process and can significantly improve the final outcome.Introduction of modern treatment patterns into practice, training of highly qualified personnel, and provision of patients with modern medicines are necessary, but not enough. The lack of the population awareness about the first aid methods, primarily among patients with risk of an emergency condition and their relatives, is one of the main reasons of impossibility to solve this problem. The time factor plays a decisive role. Unfortunately, a significant part of patients with ACS seeks medical assistance with a delay up to 8-10 hours. Management of a patient with ACS is provided by a number of institutions of various types of incorporation which prevents formation of a single ideology for delivery of health care. It is necessary to create a single continuous system of care delivery for patients with ACS. There are several directions for solution of this problem: 1) Formation of a regional network for the availability of primary PCI; 2) Provision of access to patients to the PCI center within 24/7; 3) Provision of the quickest transportation to the PCI center; 4) Creation of adequate CHI tariffs covering the cost of high-tech treatment of ACS; 5) Training of specialists; 6) Education of the population. In spite of the organizational and remedial measures aimed at improvement of the emergency care for patients with ACS, this problem is still far from its practical solution. According to hospital registers, the frequency of coronary angioplasty procedures, coronary bypass surgery and thrombolysis is still significantly lower than in economically developed countries. For example, 1.3 mln. of PCI are performed per year in the USA. Our indicator is 15 times less.MI is caused by rupture and ulceration of atheromatous plaque resulting in occlusive coronary thrombosis. Restoration of anterograde blood flow in infarct-related artery (IRA) preserves myocardium and reduces mortality. In humans, reperfusion can be achieved by means of primary angioplasty or assignment of thrombolytic therapy (TBT). Nowadays valid evidences that PCI is the best method of reperfusion at STEMI were obtained. First of all, this is stipulated by truly lower level of mortality in patients with STEMI after primary PCI than after TBT. Primary angioplasty not only restores blood flow, but also removes stenosis in IRA. Successful angioplasty of hemodynamically relevant stenosis also reduces the risk of recurrent ischemia and recurrent MI. The outcome of PCI is directly proportional to time since the onset of STEMI symptoms: the longer the time, the higher the mortality. Consequently, it is necessary in practice to strain after reduction of time from the onset of the disease to PCI. If the patient is successful in obtaining of appropriate treatment during the so-called "golden hour" (first 60-90 minutes after the episode onset), its chances for recovery rise exponentially. But we are catastrophically behind the developed countries in the arrangement of the emergency medical service. Untimely arrival of ambulance workers to patients or improper actions - for example, of patients who suffered ST segment elevation myocardial infarction are transported to the nearest ICU, even if there is no catheterization laboratory in it. Insufficient infrastructure of the ambulance service - for example, not all ambulance cars are equipped with electrocardiographs, or the staff is not well trained from a professional point of view. Ignorance of AMI symptoms by the patients and/or their relatives, therefore, an ambulance is called too late in some cases. One of the reasons of heavy mortality due to ACS in the Russian Federation is minimum number of PCI operations performed within the first 2 hours after the patient seeks medical assistance, and a few number of TBT cases at prehospital and early hospital stage.

CONCLUSIONS

The highest level of mortality of the patients with the acute myocardial infarction is noted at pre-hospital stage of the emergency medical services rendering (19.4%vs 6.7% at hospital stage).

Organizational, medical and social, chronobiological risk factors affect probability of mortality of the acute myocardial infarction during the emergency medical services rendering.

Mortality probability is higher in individuals waiting for arrival of EMS cardiologist more than 30 minutes, with incorrect diagnosis, with late delivery to the specialized departmentand untimely urgentthrombolytic therapy and high-technology surgical measures.

To reduce mortality rate of the patients with AMI at pre-hospital stage it is necessary to review the arrangement procedures having reduced the time from call to EMS physician arrival, coverage level increase and improvement of cardiologists'knowledge, delivery and hospital admission in the specialized department and immediate commencement ofthrombolytic therapyand high-technology surgical measures.

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Conflict of interest

The author declares no conflict of interest.

Ethical approval

The study was approved by the Committee of Ethical Considerations belonging to Khoja Akhmet Yassawi International Kazakh-Turkish University, No 3/2022.

Consent to participate

Written informed consent was obtained from the participants.

Authorship

IMA contributed to conceptualizing, methodology, writing the original draft, editing the manuscript, data collection, data curation, and data analysis

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