



Keywords

Acute Myocardial Infarction,
Lethality, Acute Coronary
Syndrome,
A Pre-hospital Stage,
Chronobiological Factors

Received: October 27, 2015

Revised: November 6, 2015

Accepted: November 8, 2015

Biorhythmological Aspects of Acute Coronary Syndrome/Acute Myocardial Infarction (on Materials of the Register)

Urinov O. U.

Republican Specialized Center of Cardiology, Tashkent, Uzbekistan

Email address

oybek_use@mail.ru

Citation

Urinov O. U. Biorhythmological Aspects of Acute Coronary Syndrome/Acute Myocardial Infarction (on Materials of the Register). *AASCIT Journal of Medicine*. Vol. 1, No. 5, 2015, pp. 61-66.

Abstract

Purpose was the study influence of chronobiological factors (seasons, time of day, days of week) on the frequency of occurrence of ACS/AMI. Material and methods: Epidemiological features of AMI and ACS were studied among the constant population of one of districts of Tashkent. The research was carried during one year (from 1.07.2009 to 30.06.2010). For the collection of information there were used card of the emergency medical care, ambulatory cards, card of patients discharged from hospital, history of diseases, statistical coupons, journals of electrocardiogram (ECG) record and registration, journal of hospitalization registration and journals of registrations of the patient refusals from hospitalization. Results: The register were included 683 patients with AMI/ACS, of them men - 67,9% and women - 32,1%. According to our data January and December appeared to be the less favourable months, and May and June were the most favourable. The analysis of the incidence rate of ACS/AMI with regards to seasons of year showed, that the greatest quantity of patients as well as of lethal outcomes (23,0% and 33,9%, respectively) at the prehospital stage was noted on the autumn-winter period. Lethal outcomes at a pre-hospital stage on time of days were registered in night (0.00 till 5.59 o'clock) and morning (6.00 till 11.59 o'clock) hours (29,6% and 27,1% accordingly) is slightly more often. According to our data the highest incidence of ACS/AMI is defined at the beginning of week - Monday and Tuesday (18% and 16%, respectively) and at weekend - Saturday (15,5%). In the rest days of week the tendency preserved almost uniform. Thus, our researches have confirmed a universal tendency that episodes ACS/AMI on time of days meet in the morning is more often, and night time of days is interfaced to higher probability lethality at a pre-hospital stage.

1. Introduction

The development of effective methods of primary, secondary prevention and treatment of the patients with acute coronary syndrome / acute myocardial infarction (ACS/AMI) still remains to be a significant problem of cardiology. However its resolving is impossible without elucidation of the factors participating in formation and progressing of this pathological process. The results of multiple researches have shown that the prognosis in the patients with ischemic heart disease (IHD) depends on a degree of coronary insufficiency, character and intensity of the impairment of the coronary bed, dysfunction of the myocardium left ventricle, disturbance of the heart rhythm etc. [1,3,8]. Moreover, in the practice of cardiologist the use only of traditional factors of prognosis is far to be

always effective.

The interest to chronobiological aspects of health has increased presently, because the use of the basic laws of chronobiology allows to predict risk of occurrence and development of many diseases [2]. It has been proved, that practically all pathological processes in the body are accompanied by disorder of temporary organization of physiological functions and at the same time the mismatch of rhythms can be one of the causes of development of the marked pathological changes in the body. The seasonal fluctuations mortality rate due to cardiovascular diseases (CVD) have been studied rather well [4, 6, 7, 9, 10]. The information about existence of an individual year cycle not dependent on seasons of year and about its influence on adaptation of human organism has appeared over the last decades [5].

The climatic changes render essential pathological influence on formation of the epidemiological conditions and "final" points from the basic CVD [11]. The study of season and daily rhythm of the mentioned diseases occupies the special place in this problem [12].

Thus, the role and importance of biorhythmological aspects in occurrence, development and outcomes of IHD cannot be considered completely investigated, though some questions are well-known.

At the same time we shall note, that study of features of formation and development of the IHD main forms in the various regions of Central Asia, including Uzbekistan, and developed on this basis methods of meteo-prevention, chronobiology, chronopharmacology and chronoepidemiology represent certainly not only scientific, but also practical interest [13].

The development of the present direction concerning study of the mechanisms of individual year changes will allow to develop effectual measures of preventive maintenance and, probably, to optimize the prognosis of the patients with IHD.

As early as 2300 years ago the great and famous doctor of the antiquity Hippocrat said: "The one who wants to deserve the valid and complete recognition in art of treatment should, first of all, take into account features of seasons of year not only because they differ from each other, but also because each of them can have the most different consequences" [19].

The purpose of the present research was the study influence of chronobiological factors (seasons, time of day, days of week) on the frequency of occurrence of ACS/AMI according to the data of the register in one of the districts of Tashkent.

2. Material and Methods

Epidemiological features of AMI and ACS were studied among the constant population of one of districts of Tashkent. The research was carried during one year (from 1.07.2009 to 30.06.2010). The population at the age of 20-69 years in studied participants was only 159 778 persons with the ratio between men and women in the structure of studied population 78719 and 81059 persons, respectively.

For the collection of information there were used card of the emergency medical care, ambulatory cards, card of patients discharged from hospital, history of diseases, statistical coupons, journals of electrocardiogram (ECG) record and registration, journal of hospitalization registration and journals of registrations of the patient refusals from hospitalization. Completeness of the evidences obtained was controlled with use of check of the polyclinic data, bureau of forensic-medical examination and registry office.

For everyone patient AMI and ACS, the special card of the primary registration was filled, where all accessible information was brought (interview, examination, data of out-patient cards, results of additional methods of investigation and so on). Besides, in case of death the card of lethal outcome was filled.

The population-prophylactic, statistical, mathematic methods of investigation were used. The verification of the reasons of death was carried out under the medical certificates according to ICD-10. The statistical accounts were performed with calculation of the arithmetical mean, standard error, medians, coefficient of variation, the mean quadratic deviation, minimum and maximum parameters, coefficients of correlation. There were used criteria χ^2 and Mac-Nimara for determination of reliable differences of quantitative parameters.

3. The Results

The register were included 683 patients with AMI/ACS, of them men - 464 (67,9%) and women - 219 (32,1%). The average age in group was $57,15 \pm 9,08$ years; average age of the men - $56,06 \pm 9,55$ years, women - $59,48 \pm 7,51$ years ($p = 0,001$).

It is known, that cold, unstable weather, the sharp fluctuations of temperature and atmospheric pressure with winds contribute to occurrence of cardiovascular accidents.

In this connection the study of influence of the seasonal factor on the frequency of occurrence ACS/AMI in our studied contingent both on months and on seasons is of special interest.

January and December appeared to be the less favourable months (12,3% and 10,2%, respectively), and May and June were the most favourable; the morbidity rate in these months seemed to be 6,3% and 6,9%, respectively. (Fig.1).

According to our data the analysis of the incidence rate of ACS/AMI with regards to seasons of year showed, that the greatest quantity of patients (27% and 29,3%, respectively) (Fig.2), as well as of lethal outcomes (23,0% and 33,9%, respectively) (Fig. 3) at the prehospital stage was noted on the autumn-winter period, which under climatic conditions of Tashkent was characterized by the most unstable weather and consequently possible delay of the emergency medical care. The least quantity of cases of disease, as well as lethal outcomes, on the prehospital period was noted at the summer months, for which steadily hot weather is characteristic. It is interesting that the general survival of the patients with ACS/AMI was also maximal in the summer-autumn period. (Fig. 4)

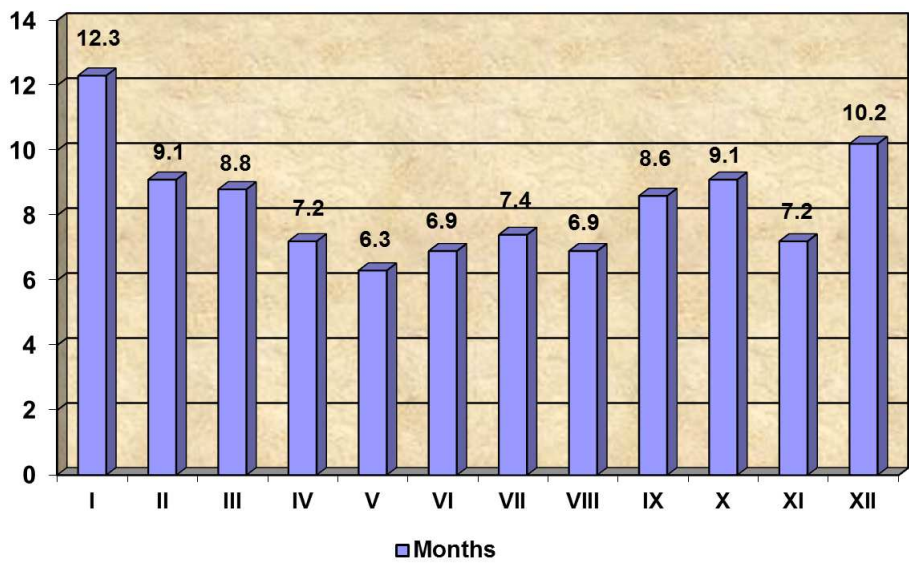


Fig. 1. Frequency of the cases ACS/AMY in relation to month%.

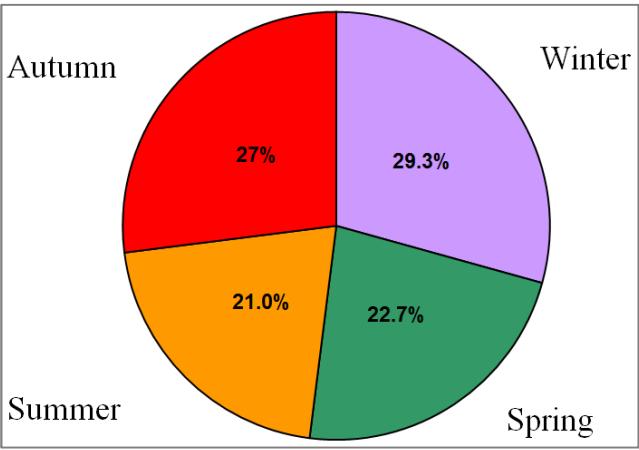


Fig. 2. Relative parameters of the frequency ACS/AMI in patients hospitalized in relation to season of year.

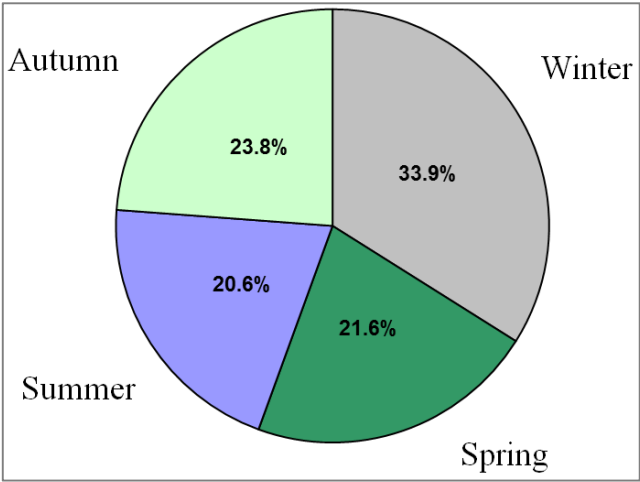


Fig. 3. Lethality at the prehospital stage in the myocardial infarction in relation to season of year.

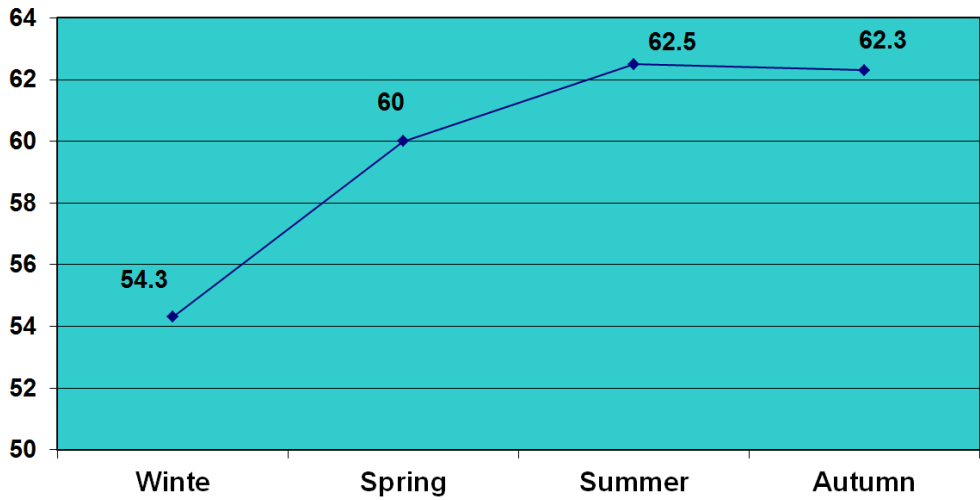


Fig. 4. Survival of the patients in the cohort with regards to season of the year.

The data about the time of onset of attack finishing by formation of myocardial infarction are important for elucidation of the dependence of development of diseases on a number of factors, as well as for resolving some problem of organization of help for the patients.

From the literary data it is known, that ACS/AMI arises most often at night and morning hours. We have also carried out the analysis of time of occurrence of an attack in the

studied patients. The results have shown, that (fig. 5) occurrence of ACS/AMI was registered mostly often in the period from 09.00 to 12.00 (with the maximal peak of registration during 10.00-11.59), then some wavy recession was noted till 19.00 hours, with the subsequent increase of number of cases of disease - second peak of smaller amplitude in the period from 19.00 to 21.00 - and preservation of the level archived down to early morning hours.

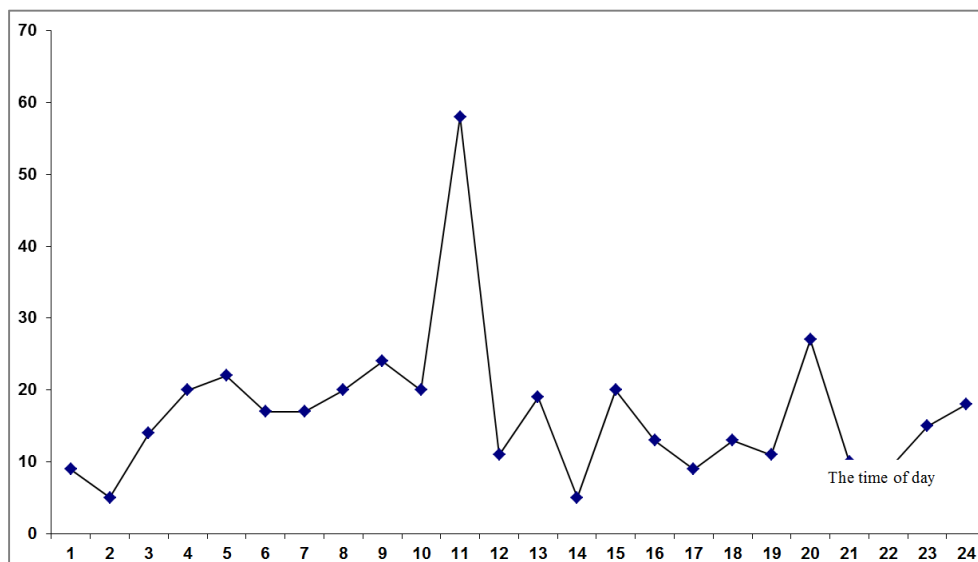


Fig. 5. Relative parameters of the frequency of occurrence of ACS/AMI in relation to the time of day.

Table 1. Frequency of the occurrence of ACS/AMI and lethal outcomes in the various time of day.

Hour	Number of hospitalized patients		Number of dead persons (at the prehospital stage)		Survival	
	n	% (out of all hospitalized)	n	% (out of all dead)	n	%
0.00-5.59	87	21,4	82	29,6	87	51,5
6.00-11.59	150	36,9	75	27,1	150	66,7
12.00-17.59	79	19,5	56	20,2	79	58,5
18.00-23.59	90	22,1	64	23,1	90	58,4
0.00-23.59	406	100	277	100	406	59,4

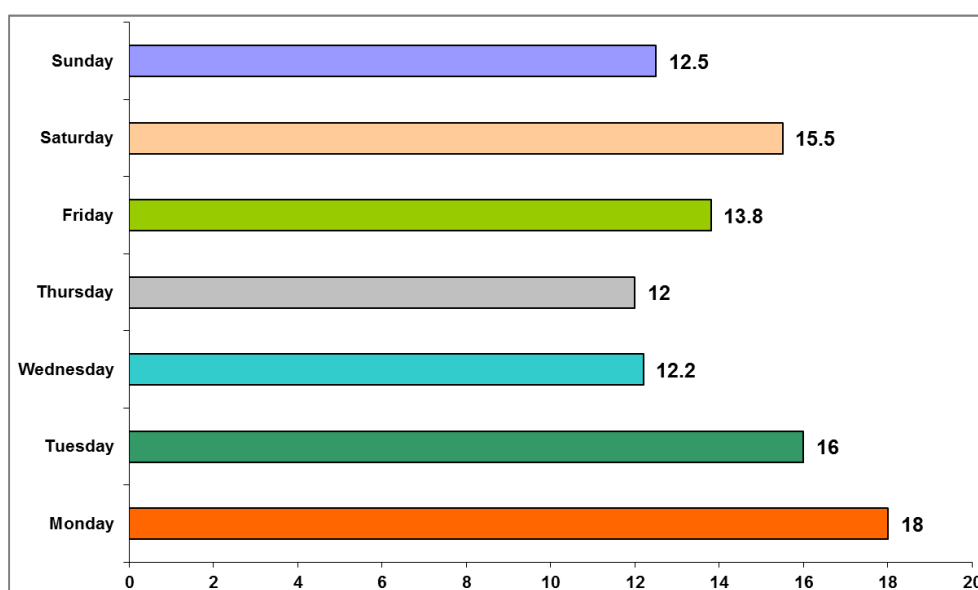


Fig. 6. Frequency of the development of ACS/AMI (%).

The analysis of daily distribution of frequency of cases ACS/AMI in the studied contingent showed an opportunity of occurrence of disease at any time of day. However, the periods of increased occurrence of cases of diseases observed in the first half of a working day and after finishing work.

The lethal outcomes (from number of all died patients) on the prehospital stage were registered often at night (from 0.00 till 5.59 o'clock) and morning (6.00 till 11.59 o'clock) (29,6% and 27,1%, respectively) a little bit more often. However, analysis of survival in relation to day time showed that minimal survival was registered at night hours from 0.00 to 5.59 o'clock (51,5%), maximal - in morning from 6.00 to 11.59 o'clock (66,7%), in the other time of day the survival preserved at the level 58,4-59,4% (Table 1).

Thus, the existing opinion on more often occurrence and lethality in ACS/AMI at night time in our studied cohort was

confirmed.

The definition of conditions, at which ACS/AMI occurred most often in patients, is also important for resolving of a number of questions of organization of the help for patients. In these cases there is observed significant connection with days of week. According to our data the highest incidence of ACS/AMI is defined at the beginning of week - Monday and Tuesday (18% and 16%, respectively) and at weekend - Saturday (15,5%). In the rest days of week the tendency preserved almost uniform (Fig. 6).

It is interesting that lethal outcomes due to ACS/AMI most often are observed in the next days of week: - on Monday and on Saturday (19,8% and 19,1%, respectively, a little bit less on Thursday and on Sunday (18% and 15,9%, respectively). The lowest parameters are characteristic for Tuesday and Friday (9,4% and 6,8%, respectively) (Fig. 7).

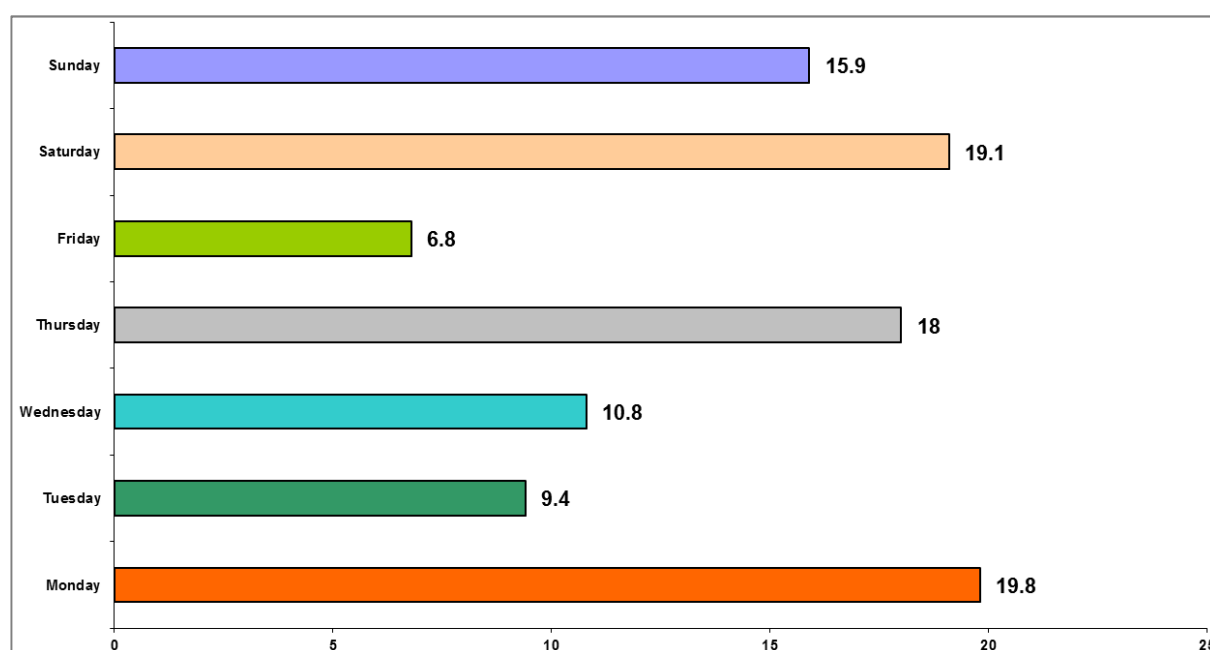


Fig. 7. Frequency of the lethal outcomes due to ACS/AMI by days of week (%).

4. Discussion

The analysis of the literature with regards to chronobiological parameters has also shown the unidirectional tendencies on studied parameters. The data of the American researchers indicated about decrease in referrals to doctor concerning diseases of blood system in summer time. In USA there were noted cases of myocardial infarction 2 times less in than winter [14]. It is known, that in a cold season the activity of renin-angiotensin-aldosterone and sympathoadrenal system increased; it promotes increase of arterial pressure (AP), increase in the consumption of oxygen by myocardium; there are changes in hemostasis system in relation to increase of aggregability and blood coagulation, growth of cholesterol and triglyceride concentration in the blood [14,15,16].

The Russian research showed that the maximal number of exacerbations of CVD was observed in the winter - 30 (44,1%)

in comparison with the minimal parameters in autumn and summer - 10 (14,7%) and 11 (16,2%), respectively ($p < 0,01$). The greatest quantity of hospitalizations due to cardio-vascular events was annually noted in winter and spring time. On the contrary, the summer and autumn seasons were more favorable; the reliable results have been obtained for all 3 years of observation. The reliable less quantity of the "end points" was registered in autumn and summer during 3-year-period. At the same time the winter and spring periods were least favorable [17]. The season of year, in which the myocardial infarction was developed, appeared also to be important factor concerning the prognosis of disease. At the patients with myocardial infarction, developed in summer and winter time, the least parameter of survivability and the greatest risk of development of coronary events during 3-year summer periods of observation is registered. The greatest parameters of survivability are revealed in the patients with

myocardial infarction, developed in the spring and autumn [17]. The analysis of frequency of development of lethal outcomes in relation to years revealed that higher frequency of fatal outcomes was registered in the I trimester.

According to the data of F. R. Kadirova the greatest quantity of patients was found in winter-spring period, which in climatic conditions of Tashkent-city is characterized by the most unstable weather. The least quantity of cases of disease also is noted in summer that coordinates with our results obtained. Dependences between frequency of occurrence of the diagnosed and possible myocardial infarction in relation to the season of year is not revealed. Kadirova F.R. performed also analysis of the daily distribution of the frequency of the lethal cases: there was established that lethality due to AMI was more frequently registered in the morning (from 6 till 12 o'clock) and in the evening (from 18 till 24 o'clock) hours (40% and 27,4%, respectively) [18]. For comparison - in our cohort 33,3% and 41,6%.

5. Conclusions

Thus, our researches have confirmed the world tendency that the episodes ACS/AMI in relation to time of day occurred more often in the morning time, and the night time of day is connected to higher probability of lethality at the prehospital stage. Our data presented are unequivocally indicate also that the winter period of year is unfavorable with regards to probability of development of cardio-vascular attacks, frequency of hospitalization and lethal outcome, the most favorable season of year seemed to be summer. The daily hourly analysis on our studied cohort has confirmed existing opinion about more often occurrence and lethal outcomes of ACS/AMI at night time of day. Concerning days of week the most unfavourable days appeared to be days at the eve and immediately after weekends (Saturday, Monday, Tuesday).

References

- [1] Aronov D.M., Lupanov V.P. Diagnostics and treatment of the ischemic heart disease. Quality of life. *Medicine* 2003; 2: 16-24. (Diagnostika i lechenie ishemicheskoy bolezni serdtsa. Kachestvo jizni).
- [2] Komarov F.P., Chotgaev Kh.Kh., Naumov V.G. Chronobiology and chronomedicine. Moscow, 200; 488 p. (Chronobiologiya i chronomedicina).
- [3] Lupanov V.P., Chotgaev Kh.Kh., Naumov V.G. The results of the long observation and prognosis in patients with IHD with the stable stenocardia in relation to dependence on the various methods of treatment of disease. *Rossiyskiy Kardiologicheskiy Jurnal (RCJ)* 2000; 4:67-77. (Rezultati dlitelnih nabludeniy n prognoz bolnih so stabilnoy stenokardiey v zavisimosti ot razlichnih sposopov lecheniya zabolevaniya).
- [4] Fomina N.V., Barabash O.L., Mineeva E.V. Biorhythmologic risk factors of the ischemic heart disease progressing. *Klin.med.* 2003; 10:41-43. (Bioritmologicheskie faktori riska progressirovaniya ishemicheskoy bolezni serdtsa).
- [5] Shaposhnikova V.I. Waves of life. Biorhythms and health. St.-Petersburg 1996; 198 p. (Volni jizni. Bioritmi i zdorovie).
- [6] Arntz H.R. Willich S.N., Diurnal, weekly and seasonal variation of sudden death. *Eur Heart J* 2000; 21: 315-20.
- [7] Douglas A.S., Dunnigan M.G., Allan T.M., Rawles J.M. Seasonal variation in coronary heart disease in Scotland. *J Epidemiol Comm Health* 1998; 49: 275-82.
- [8] Dudler P. Stability and instability: two faces of coronary atherosclerosis. *Circulation.* 1996; 94: 2013-20.
- [9] Sheth T, Nair C, Muller J, Yusuf S. Increased winter mortality from acute myocardial infarction and stroke: the effect of age. *JACC* 1999; 33: 1916 - 9.
- [10] Williams E.S., Douglas P.Z. The winters tale - and toll. *Am Heart J* 2003; 146: 1061 -3.
- [11] Briginiski M. Ya., Eskov V.M. et al. Effect of chaotic dynamics of meteorofactors on the parameters of cardiorespiratory human system under conditions of the North. *Vestnik novih med. tehnologiy.* Moscow 2006; Vol.13, N1:168. (Vliyaniye haoticheskoy dinamiki meteofaktorov na pokazateli cardiorespiratornoy sustemi cheloveka v usloviyah Severa).
- [12] Barbarsh O. L. The relation of the season of year of birth and trimesters of individual year of the patients with ischemic heart disease with risk of the development of myocardial infarction and its complications *Terapevticheskiy archive.* Moscow 2002; 9:30-33 (Cvaz sezona goda rojdeniya I trimestrov individuaalnogo goda bolnih ishemicheskoy bolezniyu serts a riskom razvitiya infarkta miokarda I ego oslojneniy).
- [13] Akbarova M., Mamsoliev N.S. Epidemiological, clinical-biorhythmologic and prophylactic aspects of chronic cardiac insufficiency under the conditions of the sharp continental climate of Fergana valley. V-Congress of cardiologists of the CIS countries in journal *Kardiologiya CIS.* Moscow 2005; Vol.3, N2: 17.
- [14] Spencer F. A., Goldberg R.J., Becker R.C. Seasonal distribution of acute myocardial infarction and stroke: the effect of age. *JACC* 1998; 31: 1226 – 33.
- [15] Kanabrocki E. L., Sothorn R.B, Bremmer F., et al. Weekly and yearly rhythms in plasma fibrinogen in hospitalized male military veterans. *Am J Cardiol* 1995; 76: 628 -31.
- [16] Maes M, Scharpe S, Cooreman W, et al. Components of biological including seasonal, variation in hematological measurements and plasma fibrinogen concentration in normal humans. *Q Rev Biol* 1995; 70 (2); 141-64.
- [17] Barbarsh O. L., Formina N.V., Mineeva E.V. et al. Biorhythmological approach to the prognosis of the development of ischemic heart disease. Journal "Kardiovaskularnaya terapiya i profilaktika" Moscow 2008; 7(8):4-11. (Bioritmologicheskiy podhod k prognozirovaniyu techeniya ishemicheskoy bolezni serdtsa).
- [18] Kadirova F.R."Clinical-epidemiologic study of acute myocardial infarction by the data of register of Tashkent". The auto abstract. Tashkent 1988:14-15. (Kliniko-epidemiological izuchenie ostrogo infarkta miokarda po dannim registra g.Tashkenta).
- [19] Yuldashev K.Yu., Khamitov L.Ya. Seasonal and daily rhythms of the exacerbations of the ischemic heart disease and their prognosis under the conditions of Tashkent region. *Terapevticheskiy arkchiv* 1986; n1:43-45. (Sezonnie i sutochnie ritmi obostreniy ishemicheskoy bolezni serdtsa i ih prognozirovanie v usloviyah regiona Tashkenta).