

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Organization of Emergency Medical Care to Victims in Road Accidents in Northern Regions of the Republic of Kazakhstan.

Yernar Tursynbetov\*, Mazhit Shaidarov, and Andrey Dubitsky.

Astana Medical University, Kabanbai Batyr str. 29A – 3, Astana, 010000, Kazakhstan.

### ABSTRACT

Evaluation of the efficacy of the emergency medical care response system is necessary to make management decisions on how to improve the timely provision of medical assistance to the victims in road accidents. To evaluate the effectiveness of the current system of organization for prehospital emergency medical assistance to the victims of road accidents in regions of Kazakhstan. Cases of emergency medical care that occurred during 2012-2013 year were selected. Cases included road accidents that resulted in traumatic injuries of varying degrees of severity in three regions of Kazakhstan. The volume and type of medical diagnostic and transport activities were recorded. In 27.3% of studied regions, the extension of service area that provided access to the offices of emergency medical care exceeded 75 km. Six of the 11 districts had less than 80% of the staff dedicated to the ambulance service. In 49.2% of cases the reports about road accident came to the dispatcher service of ambulance were delayed by as much as 10 minutes after the accident. The research findings show the necessity to make management decisions to improve emergency ambulatory medical care to victims of road accidents.

**Keywords:** road accidents, emergency medical care, prehospital stage, Kazakhstan.

*\*Corresponding author*

## INTRODUCTION

Kazakhstan is the 9<sup>th</sup> largest country (2 724 902 sq. km), with the population of over 17 million people and population density of 6.4 people/m<sup>2</sup>. The length of roads is 148 thousand km. Between 2004-2013, there were more than 131 thousand road accidents, which killed more than 30 thousand and injured more than 161 thousand people. In 2013 alone, 23,359 automotive accidents were registered, 3,037 people died and 29,872 persons were injured (1).

In comparison with the European Union and North America indexes road traffic injuries are the highest in Kazakhstan, yet Kazakhstan has considerably less number of auto transport(2).

Some of the reasons for why there may be delayed emergency care and consequently worst outcomes for the victims of road accidents are low quality roads and low large territory with low population density. Such conditions often lead to the organization difficulty and delay of emergency medical care. Unfortunately, these conditions are prevalent in Kazakhstan and results in dangerous road conditions and a lack of prompt emergency care (3, 4).

The importance of timely emergency medical assistance to victims of road accidents is reflected in the scientific research by many authors. For example, Breen et al. (2000) noted the importance of time factor and the criteria used to assess road accidents such as the times for call receipt, activation, arrival at and departure from scene and arrival at hospital (5). Bigdeli et al. (2010) emphasized the importance of the "golden hour" which refers to the short window of time between the accident and the arrival of the medical care, on the effectiveness of medical care to victims of road accidents (6). Calland (2005) focuses on the "platinum 10 minutes", pointing to the need of consolidation and harmonization of the work of rescue services and ambulance teams in road traffic accident. When the term the "Golden Hour" was first introduced in 1961 by R. Adams Cowley, rescue services tended to believe that it referred to the period from arriving on the scene to putting the casualty in the ambulance, rather than "crash to knife" time. The concept of the "Platinum Ten Minutes" was then proposed as an ideal for the on scene time, as it was realized that time had to be allowed for transit and emergency department assessment. The "Platinum Ten Minutes" has placed considerable pressures upon the emergency services to reduce the time taken to extricate casualties from wrecked vehicles. (7).

The purpose of the present study was to evaluate the effectiveness of the current system of the emergency medical care to victims of road accidents in the pre-hospital stage in the regions, located on the north of the country. We specifically assessed the following characteristics of the available emergency care:

- Distance of responsibility area of stations and offices of the emergency medical care along the road;
- Provision of stations and offices by emergency medical care staff;
- Temporary parameters of ambulances' activities.

The distance of responsibility area shows the rational organization of emergency medical care and has a significant influence on the arrival periods of emergency medical care teams to the place of accident. Staff provision determines the quality of emergency medical care. Temporary parameters of ambulances' activities ultimately influence on the treatment outcome.

## METHODS

The study utilized a descriptive design. Three northern regions of Kazakhstan were selected: Akmola, Karaganda and North Kazakhstan region (Table 1). These regions are the large territories, located along the two largest transport corridors in the country.

**Table 1: The population and the territory of the northern regions of Kazakhstan**

	Regions	Population	Territory
1	Akmola region	731 526	146 219 км <sup>2</sup>
2	Karaganda region	1 363 264	427 982 км <sup>2</sup>
3	North-Kazakhstan region	571 600	97 993 км <sup>2</sup>

Eleven districts were selected for this project, as these regions were identified as having the heaviest highway traffic. These are also the most densely populated areas (see for more detail Table 2).

**Table 2: The population in districts of the northern regions of Kazakhstan**

	Regions	Districts	Population
1	Akmola region	Arshaly	24 330
		Tselinograd	43 063
		Burabay	73 545
		Shortandy	30 055
2	Karaganda region	Osakarov	34 397
		Abay	53 079
		Aktogay	18 779
		Zhanaarka	31 287
3	North-Kazakhstan region	Tayinshy	48 816
		Kyzylzhar	49 393
		Akkain	21 968

All cases of emergency medical care provision to the patients, who were involved in road traffic accidents and sustained traumatic injuries of varying degrees for 2012-2013 were selected.

Information about each emergency case was obtained from the original records that were filled out by the responding ambulance team. Each record contained information regarding the victim, the arrival time of medical professionals' teams to the place of accident, the time of medical care provision, the amount of provided assistance, the condition of the injured in a road accident and the expert's conclusion about the care received by the injured party. A total of N=2877 records were examined.

Information was coded specifically for the time parameters of ambulance activities.

**RESULTS**

Statistical analysis of the data was carried out using descriptive statistics, using standard statistical software package Statistica 6.0. Indicators of road traffic injuries are calculated in absolute and relative terms (the number of victims per 10,000 population, the number of deaths per 100,000 population, provision of medical organizations by personnel per 100,000 population).

Results revealed that with respect to road accidents with particularly serious consequences, these occurred mainly in areas of national highways and roads, passing outside the settlements and situated in zone of central regional hospitals.

From 2011-2013, a persistent increase, from 8.9 to 19.5 per 10,000 population in number of road traffic accidents with victims was observed in all studied regions. This finding is also consistent with national averages that report an increase in traffic accidents from 9.4 to 13.3 (8).

With respect to the number of victims, we found that there was a small decrease from 9.9 to 8.6 per 10,000 population in the north region of Kazakhstan. However, national report indicates a country-wide increase from 9.7 – 17. The decrease in number of fatalities in road accidents was observed in all 3 regions (Table 3).

**Table 3: Road traffic injuries in Kazakhstan and its northern regions in 2011-2013.**

Index	Years	Kazakhstan		Akmola region		Karaganda region		North-Kazakhstan region	
		Abs. number	Index	Abs. number	Index	Abs. number	Index	Abs. number	Index
Number of road traffic accidents (per 10,000 population)	2011	16524	9.4	1116	15.2	1225	8.9	1048	18.3
	2012	14168	8.1	1431	19.5	1491	10.9	1153	20.1
	2013	23359	13.3	1245	17.0	1596	11.7	1061	18.5
The number of victims (per 10,000 population)	2011	16978	9.7	863	11.7	1265	9.7	566	9.9
	2012	17488	10.0	974	13.3	1391	10.2	621	10.8
	2013	29872	17.0	897	12.2	1489	10.9	497	8.6
The number of dead (per 100,000 population)	2011	2897	16.5	168	22.9	84	20.8	161	28.1
	2012	3032	17.3	151	20.6	303	22.2	155	27.1
	2013	3037	17.3	155	21.1	250	18.3	147	25.7

In the studied districts the highest indexes of road accidents was found in Arshaly and Tselinograd districts of Akmola, as well as Osakarov and Abai districts of Karaganda region (Table 4).

**Table 4. Road traffic injuries in the northern region of Kazakhstan in 2012-2013.**

Regions	The number of road accidents				The number of injured				The number of dead			
	2012		2013		2012		2013		2012		2013	
	Abs. number	Index	Abs. number	Index	Abs. number	Index	Abs. number	Index	Abs. number	Index	Abs. number	Index
<b>Akmola region</b>												
Arshaly	91	37.4	86	35.3	124	50.9	136	55.8	39	160	22	90.4
Tselinograd	72	16.7	61	4.1	98	22.7	116	26.9	16	37.1	24	55.7
Burabay	44	5.9	43	5.8	73	9.9	84	11.4	24	32.6	22	29.9
Shortandy	46	15.3	39	12.9	92	30.6	109	36.2	22	73.1	26	86.5
<b>Karaganda region</b>												
Osakarov	94	27.3	118	34.7	74	21.5	86	25.0	14	40.7	21	61
Abay	73	13.7	87	16.3	62	11.6	98	18.4	16	30.1	19	35.7
Aktogay	56	29.8	61	32.4	37	19.7	41	21.8	18	95.8	22	117
Zhanaarka	40	12.7	44	14.0	51	16.3	42	13.4	12	38.3	9	28.7
<b>North-Kazakhstan region</b>												
Tayinshinsy	28	5.7	26	5.3	61	12.4	55	11.2	22	45.0	19	38.9
Kyzylzhar	31	6.2	29	5.8	43	8.7	47	9.5	19	38.4	14	28.3
Akkain	19	8.6	16	7.2	36	16.3	28	12.7	19	86.4	10	45.5

Among the districts of the Karaganda region the longest length of national road in the response zone of Zhanaarka district was - 197 km, the lowest was in Osakarov (68 km). The length of national road in Abay and Osakarov districts is 58 km and 68 km respectively and allows for the timely arrival of ambulances' teams

to the place of road accident in the most distant parts of districts. The length of national road in Aktogay district is 115 km (9).

Responsibilities' zones studying of stations and emergency departments in North Kazakhstan region has shown that in all districts the length of the national highway does not exceed 75 km, which corresponds to average norm parameters (10).

At the level of selected regions, a provision of medical assistance by personnel was found to be different (Table 5).

**Table 5: Provision of population by medical staff of the northern regions of Kazakhstan per 100 000 population in 2010-2013.**

Region	Provision by the physicians				Provision by the nurses			
	2010	2011	2012	2013	2010	2011	2012	2013
Akmola	45.7	45.7	45.1	45.8	66.3	71.2	69.9	71.4
Karaganda	33.0	32.8	33.6	37.4	62.5	66.7	65.3	69.1
North Kazakhstan	38.6	38.0	37.5	36.7	60.5	64.1	66.2	65.8

Doctors staffing of ambulance services was varied from 78.4 to 100%, depending on the region.

It was also revealed, that in Akmola region physician teams went to the place of an accident only in 24.7% of the cases and in 19.8% of the cases in Karaganda region. In the North Kazakhstan region this index was lower (18.5%). In the rest of the cases, emergency medical care was provided by the nurse/paramedic teams and not the physician team.

Analysis of the information about the time of the accident occurred and the time it took the ambulance team to respond revealed, that on average 49% of the cases were received by the central service of the emergency ambulance within the first 5 minutes and in 26.6% of cases within 10 minutes from the time of accident.

### DISCUSSION

Providing emergency medical care to victims of road accidents in the northern regions of Kazakhstan, mainly assigned to the ambulance service. Responsibility areas on the roads in the territory of studied regions are distributed among 18 medical organizations - 11 regional hospitals, 3 ambulance stations, 4 road medical points of the center of disaster medicine. They are state organizations.

In all investigated regions, securing districts are carried out by the administrative-territorial principle for the stations and ambulance offices to provide emergency medical assistance to victims of road accidents on the highways (11).

Staff of stations and offices of emergency medical assistance are formed in accordance with the number of resident population. At the same time, the functional possibilities of zone-responsible organizations of emergency medical assistance on the service of fixed responsibility areas do not take into account the length of roads, including national.

The main charge on organization of emergency medical care to injured in road accident at the district level lies on the central regional hospitals, in the responsibility area of which is the bulk of the automobile roads.

The current staffing level of medical personnel often defines inappropriate level possibilities to provide various kinds of emergency medical assistance to victims of road accidents.

The work of control departments of emergency medical services in the studied regions is based on the territorial principle. However, in any of the regions examined in the present study, these departments do not have an organized and unified organization that would provide service to all the regions.

Studying of timing parameters of ambulances' activities such as time of call registration to the place of an accident to the control station or emergency department is the most accurate way to assess the effectiveness of the emergency medical care to victims of road accidents in the pre-hospital stage (12).

That's why in our research it is important to pay attention on work time of ambulance teams from the moment of call receiving and registration by the dispatcher of the station or emergency department until carriage of the injured to the medical organization, including all intermediate timing parameters.

### CONCLUSIONS

During the 2011-2013 in the northern regions of Kazakhstan the increase in the number of road accidents with victims is marked.

Essential insufficiencies of the organization system of emergency medical care to victims in road accidents were revealed. In 27.3% of studied regions the extent of service area of the stations and offices of the emergency medical care on the national road exceeds 75 km. Six districts out of eleven have an incomplete staffing of emergency medical care by doctors, less than 80%. In every second case the reports about road traffic accident come to the control service of emergency medical care in the later stages - within 10 minutes from the moment of road traffic accident.

Thus, the results of the research indicate the need for further improvement of the emergency medical care to victims of road accidents in the pre-hospital stage at the regional level.

### REFERENCES

- [1] Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. Available at: [http://www.stat.gov.kz/faces/wcnav\\_externalId/publicationsPage?\\_afLoop=7598401406548406#%40%3F\\_afLoop%3D7598401406548406%26\\_adf.ctrl-state%3D5tl13e3fl\\_79](http://www.stat.gov.kz/faces/wcnav_externalId/publicationsPage?_afLoop=7598401406548406#%40%3F_afLoop%3D7598401406548406%26_adf.ctrl-state%3D5tl13e3fl_79). Accessed December 2, 2014.
- [2] Transport safety performance in the EU: a statistical overview. European Transport Safety Council. Brussels; 2003.
- [3] Peden, M., Scurfield, R., Sleet, D. et al. World report on road traffic injury prevention. World Health Organization. Geneva; 2004.
- [4] Global status report on road safety: time for action. World Health Organization. Geneva; 2009.
- [5] Breen, N., Woods, J., Bury, G. et al. A national census of ambulance response times to emergency calls in Ireland. *J AccidEmerg Med.* 2000; 6:392-395.
- [6] Bigdeli, M., Khorasani-Zavareh, D., Mohammadi, R. Pre-hospital care time intervals among victims of road traffic injuries in Iran. A cross-sectional study. *BMC Public Health.* 2010;10:406.
- [7] Calland, V. Extrication of the seriously injured road crash victim. *Emerg Med J.* 2005;11:817-821.8. The report of the National Coordinator of the Republic of Kazakhstan Decade of Actions for Road Safety. Available at: <http://niito.kz/main-trauma-orthopedist/national-coordinator-of-the-decade-2011-2020>. Accessed September 23, 2014.
- [8] Roads committee of Ministry for investment and development of the Republic of Kazakhstan. Available at: <http://roads.mid.gov.kz/en/node/929>. Accessed October 3, 2014.
- [9] Government Resolution of the Republic of Kazakhstan. On approval of Rules of providing emergency medical care and medical aid in the form of sanitary aviation. Government of the Republic of Kazakhstan, Astana; 2011. Available at: <http://www.government.kz/en/postanovleniya.html>. Accessed October 15, 2014.
- [10] Government Resolution of the Republic of Kazakhstan. On approval of the state standard network of health care organizations of the Republic of Kazakhstan. Government of the Republic of Kazakhstan, Astana; 2014. Available at: <http://www.government.kz/en/postanovleniya.html>. Accessed October 15, 2014.
- [11] Borisenko, L.V., Koldin, A.V., Akin'shin, A.V. Elaboration and Adoption of Statistical Documentation Is One of Directions of Perfection of First Aid to Road Traffic Accident Casualties. *Disaster Medicine.* 2010;69:47-49.
- [12] Bandara, D., Mayorga, M., McLay L. Priority dispatching strategies for EMS systems. *Journal of the Operational Research Society.* 2014;65: 572-587.