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COMPARISON OF ROAD TRAFFIC ACCIDENT DEATH BETWEEN ALMATY CITY AND NUR-SULTAN

Deaths caused by road accidents are a big concern all over the world and every year near 1.3 million people die due to it.

This study aimed to find the mortality rate due to RTA (Road Traffic Accident) based on gender, city, year and comparing the rate of RTAD (Road traffic accident death) to total death and deaths due to external cause from 2010 to 2019 in two major cities of Kazakhstan, Almaty city and Nur Sultan. And also to find the cause of death in forensic medicine to what degree of the injury whether the head or other part of the body is more to be the cause of death.

The study design was quantitative cross-sectional. The data were obtained from the demographic yearbook of Kazakhstan for 10 years. For analyzing the data, the SPSS version 22 was used.

The total number of deaths due to RTA in two major cities of Kazakhstan, Almaty and Nur Sultan, from 2010 to 2019 was 2632. Among them 1732 (68.4%) were male, and 833 (31.6%) were female. In Almaty city, it was 1805 (68.6%) and in Nur Sultan city it was 827 (31.4%). The high rate among males was in between the age group of 30 – 39 while for the female it is 50 – 59 According to sex distribution males are more prone to have road traffic accident deaths comparing to females. The cause of death due to RTAD are around 65% in the head and 15% in the chest. The fracture of the femur bone is more prevalent among males and the fracture of humerus bone was more prevalent among females.

This rate study of road traffic accident deaths might contribute to reducing the numbers of deaths due to RTA in Kazakhstan.

Keywords: Road traffic accident death, Rate, Kazakhstan, Almaty city, Nur Sultan, Forensic medicine, comparative study.

Introduction

The problem of high rates of road traffic accidents is now one of the most challenging health and social policy problems affecting countries around the globe. Nearly 1.3 million people die every year on roads across the world, and 20–50 million suffer from serious injuries [1], the majority of which need long-term care. One of the most dangerous situations people face on a regular basis is being killed in a car accident. When a car/vehicle collides with another car, a pedestrian, an animal, road debris, or other things, it is known as a traffic accident. Road traffic accidents often result in injury, disability, death, property harm, and financial costs for both society and the people involved, but the numbers of people killed and injured in such accidents receive less media attention than other, less common forms of tragedies [2]. This issue has been studied since the beginning of automobile production. The first scientific study on an accident involving a vehicle and a motor vehicle was published in 1902 [3].

People will suffer not just from physical injury, but also from psychological trauma following a road traffic accident that requires special attention [4].

All over the world, annually 1.35 million people die due to road traffic accidents. RTAD is the 8th leading cause of death all over the world and is the first leading cause of death among people aged 5 – 29 [1]. Nearly half (49%) of people, dying due to road traffic accidents, are pedestrian [5]. The number of RTAD in 2010 in Kazakhstan is 3381 and to compare it with 2015, it shows a decrease to 2659 and again in 2019, there is a slight increase to 2726 [6] [7] [8]. The Frequency of RTAD is 11 times higher in Kazakhstan than in Europe [9]. The rate of RTAD in all Kazakhstan according to 100,000 population is 25,0 (± 2.1), while for males it is 38.2 (± 3.2) and for females, it is 12.6 (± 1.1). The age group of 30 – 39 had high rates in males and the age group of 50 – 59 years old had high rates in females [10].

Environmental factors play a significant role in RTAs, according to the data. To minimize and reduce RTA in a community, public awareness can

play an important role. [11]. The question always being asked is that who is the cause of the accident, which are drivers, about 95% involvement of them in having the accidents [12]. The RTAD rate increases as blood alcohol level increases [13]. Most users of alcohol while driving are among males aged 25 – 34 years [14].

The correct use of a helmet can reduce mortality by 42% and head injuries by 69% [15]. An autopsy study in forensic medicine confirms this and shows that the cause of death due to RTAD are around 65% in the head and 15% in the chest [16]. The fracture of the femur bone is more prevalent among males and the fracture of humerus bone is more prevalent among females [17]. To get a reliable forensic report from a road traffic accident death, it's better to do both the analysis and computed tomography before the autopsy, so that a forensic specialist can be more specific [18]. The correct use of child restraints can reduce the fatality of children by up to 90% [19]. The use of mobile phones has a negative impact on road traffic accident deaths [20]. The study finds that the restriction on the use of a phone while driving can reduce the RTA by 22 % [21] and also a 5% reduction in average speed can reduce the number of fatalities by 30% [22].

However, the rate of RTAD is being mostly discussed as by 100,000 population in one year which exactly we can't understand by this rate that in a year from total death how many died due to RTAD which in this study I will find this rate that is more exact to find out the real proportion of RTAD to total death in two major cities of Kazakhstan, Almaty city and Nur-sultan and compare these two cities.

Materials and Methods

The study was designed as a retrospective cross-sectional study, with data on road traffic accident deaths collected from Kazakhstan's Demographic Year Book from 2010 to 2019; based on gender, population, and year. For statistical analysis, the statistical package for social science (SPSS) version 22 was used. Variables were compared between Almaty city and Nur-sultan using independent t-test and one-way ANOVA. Statistically, it was calculated by 95 % confidence interval, A p-value <0.05 was considered statistically significant. In this study, the two cities of Kazakhstan, Almaty city and Nur-Sultan were compared by the rates of RTAD by 100,000 population, and also it was calculated by 1000 total death and by 1000 deaths due to external causes.

The nominator for this study was considered the Road traffic accident death and the denominator was population, total death, and death due to external causes. To visualize the data more understandable; we multiply the calculation to the population by 100,000, meanwhile, the data for the calculation of the total deaths and deaths due to external causes were multiplied by 1000.\

Results and Discussion

From 2010 to 2019, 2632 people died as a result of RTA in Kazakhstan's two major cities, Almaty and Nur sultan. There are 1732 men (68.4 percent) and 833 women (31.6 percent) among them. It was 1805 (68.6%) in Almaty city and 827 (68.6%) in Nur Sultan city (31.4 percent). (Table 1, Figure1) shows the number of RTAD in two cities of Kazakhstan by each year. The total count and the difference between the male and female for each year are also shown. To visualize better, in the last row, the total number is calculated for each column related to male, female and total numbers, and also the data are presented in percentage.

Table 1 – RTAD from 2010 to 2019 with percentages

No	City	Year	Male	%	Female	%	Total	%
1	Almaty city	2010	131	7.28%	72	8.64%	203	7.71%
2	Almaty city	2011	123	6.84%	79	9.48%	202	7.67%
3	Almaty city	2012	142	7.89%	63	7.56%	205	7.79%
4	Almaty city	2013	120	6.67%	41	4.92%	161	6.12%
5	Almaty city	2014	137	7.62%	48	5.76%	185	7.03%
6	Almaty city	2015	106	5.89%	41	4.92%	147	5.59%
7	Almaty city	2016	100	5.56%	56	6.72%	156	5.93%
8	Almaty city	2017	98	5.45%	49	5.88%	147	5.59%
9	Almaty city	2018	111	6.17%	72	8.64%	183	6.95%

Comparison of road traffic accident death between Almaty city and Nur-Sultan

10	Almaty city	2019	143	7.95%	73	8.76%	216	8.21%
11	Nur-Sultan	2010	66	3.67%	31	3.72%	97	3.69%
12	Nur-Sultan	2011	54	3.00%	20	2.40%	74	2.81%
13	Nur-Sultan	2012	58	3.22%	26	3.12%	84	3.19%
14	Nur-Sultan	2013	69	3.84%	36	4.32%	105	3.99%
15	Nur-Sultan	2014	59	3.28%	15	1.80%	74	2.81%
16	Nur-Sultan	2015	52	2.89%	20	2.40%	72	2.74%
17	Nur-Sultan	2016	56	3.11%	24	2.88%	80	3.04%
18	Nur-Sultan	2017	58	3.22%	23	2.76%	81	3.08%
19	Nur-Sultan	2018	62	3.45%	24	2.88%	86	3.27%
20	Nur-Sultan	2019	54	3.00%	20	2.40%	74	2.81%
Total			1799	68.35%	833	31.65%	2632	100%

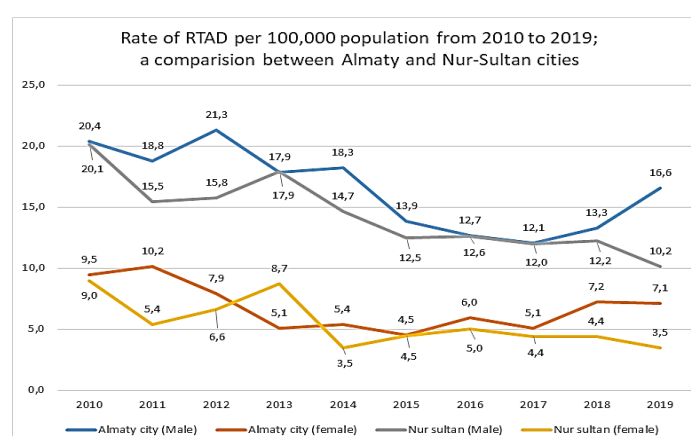


Figure 1 – Rate of RTAD per 100,000 population from 2010 to 2019; a comparison between Almaty and Nur-Sultan cities

Shows the rate of RTAD per 1000 deaths due to external causes for each year between the Almaty

city and Nur-Sultan. To differentiate between the sexes, for each sex separate variables by combining city names are used (Table 2, Figure2).

Table 2 – The rate of RTAD per 1000 deaths due to external causes of deaths

No	Year	Almaty city (Male)	Almaty city (Female)	Nur sultan (Male)	Nur sultan (Female)
1	2010	122.9	240.8	163.8	236.6
2	2011	124.5	261.6	145.6	192.3
3	2012	162.8	254.0	156.3	250.0
4	2013	126.3	138.5	174.7	262.8
5	2014	169.3	202.5	157.3	153.1
6	2015	144.4	191.6	140.9	168.1
7	2016	155.8	213.7	152.2	233.0
8	2017	168.4	247.5	177.9	219.0
9	2018	182.9	293.9	179.7	237.6
10	2019	208.5	323.0	166.2	208.3

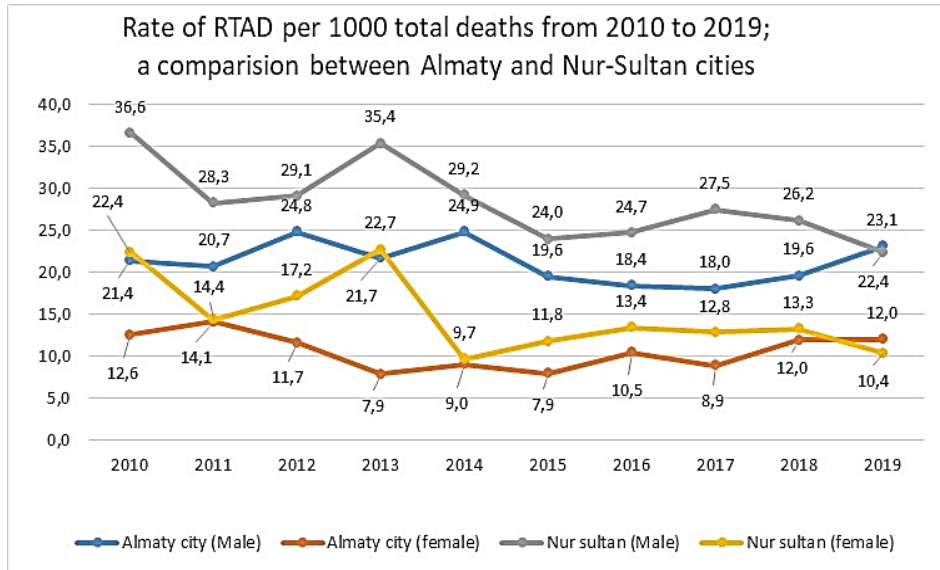


Figure 2 – Rate of RTAD per 1000 total deaths from 2010 - 2019; a comparison between Almaty and Nur-Sultan cities

Indicators of average values for the cities of Almaty and Nur-Sultan in the context of men and women with the calculation of the

significance of the statistical difference are presented below (Table 3, Figure 3)

Table 3 – Comparison of mean values for both sexes in Almaty and Nur sultan cities and the result of statistical difference signification

	Variable		Nur-Sultan	Almaty	Test of difference	
					Results	P-value
Road traffic accident death (RTAD)	Sexes	Male	58	121	11.074	<0.0001
		Female	24	59	7.258	<0.0001
	Years	2010-2014	87	191	44.923	<0.0001
		2015-2019	79	170		
RTAD rate per 100,000 population	Sexes	Male	14	16.5	1.51	0.148
		Female	5.5	6.8	1.482	0.156
	Years	2010-2014	11.6	13	9.572	0.001
		2015-2019	8	9.5		
RTAD rate per 1000 Total deaths	Sexes	Male	28.3	21.2	-4.306	<0.0001
		Female	14.8	10.7	-2.596	0.018
	Years	2010-2014	25.5	17	15.702	<0.0001
		2015-2019	19.4	15		
RTAD rate per 1000 external causes of deaths	Sexes	Male	161.5	156.6	-0.5	0.623
		Female	216.1	236.7	1.024	0.32
	Years	2010-2014	173.6	158.9	1.859	0.177
		2015-2019	174.8	193.5		

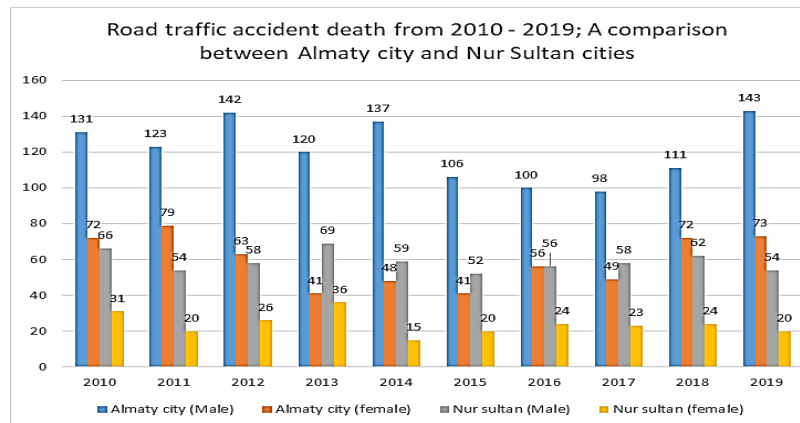


Figure 3 – Road traffic accident deaths from 2010 to 2019; A comparison between Almaty city and Nur-Sultan city

This comparative study between Almaty city and Nur-sultan city shows that the number of RTAD is quite different and the number between both genders was higher in Almaty city than in Nur Sultan city with annual males means of 121 ± 16.9 and 58 ± 5.5 RTAD in Almaty and Nur Sultan cities, respectively. Comparison of these two values by the statistical test of an independent sample (t-test) confirms the significant difference among them with the p-value of < 0.0001 . The same procedure was applied to the female group. The results showed means of 59 ± 14.2 in Almaty city and 24 ± 6 in Nur Sultan city. T-test showed a significant difference between these values with a p-value of < 0.0001 . A similar comparison was also done to the first five years and second five years which confirms a decrease of numbers for the years 2015 – 2019. The mean of RTAD for each year in 2010 – 2014 in Almaty was 191 ± 18.7 and for the year 2015 – 2019 it was 170 ± 29.7 , in the Nur Sultan for the first five years it was 87 ± 13.9 and for the second five years, it was 79 ± 5.6 . the result of one-way ANOVA confirms the difference between these means with the p-value of >0.0001 .

On the other hand, by comparing the RTAD by 100'000 population, we find out no significant difference in the rate of RTAD between the two sexes. For the first five years, The mean rate for males in Almaty city is 16.5 ± 3.3 and in Nur Sultan city it is 14 ± 3.1 , which shows no significant difference. For the female in Almaty city, it is 6.8 ± 1.9 , while for in Nur Sultan, it is 5.5 ± 2 , which again shows no significant difference among them. The comparison among first and second five years for Almaty and Nur Sultan is 13.0 and 11.6 for the

first five years, respectively, and 9.5 and 8.0 for the second five years, respectively. One-way Anova test results confirmed the difference between pairs of data and showed a decrease in the rate of RTAD per 100'000 population in the second five years.

The outcome of calculating and comparison of RTAD to total deaths is a key to know about the exact dangers of RTAD; which among male in Almaty is 21.2 and in Nur Sultan is 28.3 deaths per 1000 total death with the p-value of <0.0001 , which shows higher value in Nur Sultan. For the female, this value is 10.7 in Almaty city and 14.8 in Nur Sultan with the p-value of 0.018, which similarly is higher in Nur Sultan city. The rate of the first five years in Almaty city is 17.0 and in Nur Sultan is 25.5 deaths due to RTAD per 1000 deaths; and for the second five years, the rate is 15.0 in Almaty city and 19.4 in Nur Sultan with a p-value of <0.0001 , we can confirm that there is a difference among these values and the RTAD has declined in the second five years.

The comparison of RTAD to external causes of death shows that for the males of Almaty city, it is 156.6 and for Nur Sultan, it is 161.5 per 1000 external causes of death. For females in Almaty city, it is 158.9 and in Nur Sultan city, it is 216.1 per 1000 external causes of death. Comparison of the result of the two sexes shows no difference among males and females in this regard. The number of deaths due to RTAD per 1000 total deaths due to external causes of death are 158.9 and 173.6 in the first five years in Almaty and Nur Sultan cities, respectively. In the second five years, these values are 174.8 and 193.5 in Almaty and Nur Sultan cities, respectively. One-way Anova results show no significant difference between these two cities regarding this rate.

Conclusion

According to the number of the RTAD, the Almaty city has a higher number comparing to Nur-Sultan city. By comparing both sexes, it can be concluded that the number of RTAD in both sexes in Almaty city is higher. The timely comparison shows that there is a total decrease in RTAD in both cities. The rate of 100,000 population didn't show any significant difference among these two cities, but for the rate which was calculated by 1000 total deaths, the Nur-Sultan RTAD rate is higher than Almaty city among both males and females. And for the rate of RTAD compared to 1000 deaths due to external causes there was no significant difference between Almaty city and Nur-sultan. The most common cause of death due to RTAD are around 65% in the head and 15% in the chest. The fracture of the femur bone is more prevalent among males and the fracture of humerus bone is more prevalent among females. Also, there is alcohol in the blood of the corpse that was more male aged 25 – 34. The high rate for males is for the age group of 30 – 39 and females it is 50 –

59. That the correct usage of a helmet and observing drivers for alcohol can reduce the fatality rate. There are some points to be considered to reduce RTAD:

1. Public awareness is the key to reduce the rate of RTAD. The media and social networks can play a significant role in this regard.

2. The leading cause of the RTAD is the speed of the driver, therefore, speed limits should be decreased and selected with more caution.

3. Alcohol and other drug consumption adversely affect RTAD rates. More and random control of drivers, especially male drivers, can reduce this rate significantly.

4. The correct use of helmets and child restraints can reduce the rate and should be considered.

5. Around 95% of the time, the cause of RTAD is related to the driver. Even we can no longer call this RTAD, but just an accident, maybe we could call it a careless and reckless act of the driver, which consequently affects adversely not only the driver but also pedestrians.

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