



Evaluation of traffic accidents for which autopsies were conducted in an Eastern Turkish City: a five-year study

Türkiye'nin Doğu'sunda otopsi yapılan trafik kazalarının değerlendirilmesi: 5 yıllık çalışma

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Abstract

Objective: Traffic accidents are one of the leading causes of premature death worldwide. The current study aimed to present data on patients who died as a result of traffic accidents and offer suggestions on issues that affect traffic safety.

Materials and Methods: In our study, data pertaining to 422 road accident cases whose postmortem examinations and autopsies were conducted in Elazığ within a period of five years were evaluated with regard to age, gender, the day, and season on which the accident took place, the location of the accident, the role of the deceased in traffic (pedestrian, driver, or passenger), whether an autopsy was done, the state of safety measures, the presence of alcohol and opiates-stimulants, the place of death, duration of hospitalization, and cause of death.

Results: Three hundred twenty-two of the 422 subjects in our study (76.3%) were male and 100 (23.7%) female, with a mean age of 43.5 (23.9) years. One hundred seventy-seven of the cases (41.9%) were pedestrians, and accidents most frequently occurred during the summer season, with 161 (38.2%) cases. It was determined that an autopsy was performed on 388 (91.9%) of the cases, that 16.9% of the drivers had consumed alcohol, 260 (61.6%) of the cases died in the hospital, and head injuries were the most common cause of death.

Conclusion: It was concluded that in order to prevent traffic accidents, traffic control and checks should become more frequent during holiday periods, such as the summer season and necessary measures should be taken for pedestrian safety, and that encouraging the use of vehicle safety systems should largely reduce injuries and deaths from traffic accidents.

Keywords: Traffic Accidents; Autopsy; Forensic Medicine.

Öz

Amaç: Trafik kazaları dünya çapında erken ölümlerin en önde gelen nedenlerindedir. Çalışmamızda; trafik kazası sonucu ölen olgulara ait veriler ortaya konulup trafik güvenliğini etkileyen konularda önerilerde bulunulması amaçlanmıştır.

Gereç ve Yöntemler: Çalışmamızda; 5 yıllık sürede Elazığ'da ölü muayene ve otopsi yapılan 422 trafik kazası olgusu; yaş, cinsiyet, kazanın olduğu gün ve mevsim, kazanın gerçekleştiği olay yeri, ölen kişilerin trafikteki konumu, otopsi yapıp yapılmadığı, güvenlik tedbirlerinin durumu, alkol ve uyutucu-uyarıcı madde durumları, ölümün gerçekleştiği yer, hastanede yatış süreleri ve ölüm nedenleri ile ilgili veriler değerlendirilmiştir.

Bulgular: Çalışmamızdaki 422 olgunun 322'si (%76.3) erkek, 100'ü (%23.7) kadın olup, yaş ortalamaları 43.5±23.9 yıldır. Olguların 177'si (%41.9) yaya olduğu, kazaların 161 (%38.2) olgu ile en fazla yaz mevsiminde görüldüğü saptandı. Olguların 388'ine (%91.9) otopsi işlemi uygulanmış olup, sürücülerin %16.9'unun alkollü olduğu, olguların 260'ı (%61,6) hastanede öldüğü ve en sık kafa yaralanmalarının ölüme neden olduğu tespit edilmiştir.

Sonuç: Trafik kazalarının önlenmesi için, yaz mevsimi gibi tatil dönemlerinde trafik denetim ve kontrolleri sıklaştırılmalı, yaya güvenliği için gerekli önlemler alınmalı ve taşıt güvenlik sistemlerinin kullanımının teşvik edilmesinin trafik kazalarında ölüm ve yaralanmaları büyük oranda azaltacağı kanaatine varılmıştır.

Anahtar Kelimeler: Trafik Kazaları; Otopsi; Adli Tıp.

Received/Başvuru: 09.08.2016

Accepted/Kabul: 18.08.2016

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How to cite this article/Atıf için

Bork T, Tokdemir M, Turkoglu
Abdurrahim. Evaluation of traffic
accidents for which autopsies were
conducted in an Eastern Turkish
City: a five-year study. J Turgut
Ozal Med Cent 2016;23(4):375-83.

INTRODUCTION

Traffic accidents and accident-related deaths have become very common all over the world due to the increasing number of vehicles and vehicle speed in parallel to the economic development of countries (1). According to World Health Organization data for 2010, 1.24 million people died and 50 million were injured worldwide due to traffic accidents. While traffic accidents rank eighth among top causes of death, they are expected to take fifth place by 2030 if urgent measures are not taken (2).

The effect of road and motor vehicle born factors on traffic accidents is very low. For this reason, researchers turn more to explaining the human factors when trying to understand the reasons for traffic accidents (3).

Deaths in traffic accidents can be caused by several traumatic reasons. These injuries must be examined separately according to the positions of persons in the traffic (pedestrian, driver, or passenger) (4).

It is necessary to conduct a detailed forensic medical examination of all traffic accidents in order to determine the losses incurred in injuries and deaths resulting from traffic accidents and to ensure that future legal and insurance claims are met without any errors (5). As in all deaths of a forensic nature, a postmortem examination or autopsy is also employed in deaths due to traffic accidents to determine the cause of death.

In the current study, the aim is to present data on cases that died as a result of traffic accidents and in light of the data obtained, to determine the factors influencing the occurrence of traffic accidents, and to make recommendations for traffic safety.

MATERIAL and METHODS

In the current study, data pertaining to cases whose postmortem examinations and autopsies were performed at the Firat University Hospital Department of Forensic Medicine between the dates of 01.01.2008-01.01.2013 and who died as a result of in- and out-of-vehicle traffic accidents were gathered from autopsy reports in the Department archive and accident reports at the Regional Traffic Registration Branch Office of the persons who had died. The resulting data were transcribed to the forms prepared for this study.

Of the total 1439 cases who received a postmortem examination and autopsy, the 422 (29.3%) who died due to traffic accidents and were taken for evaluation. Data pertaining to cases were identified regarding age, gender, the day and season on which the accident took place, the location of the accident, the position of the deceased in traffic (driver, passenger, or pedestrian), and whether an autopsy was performed, the state of safety measures inside the vehicle involved in the

accident (seat belts, airbags, etc.), the presence of alcohol or opiates/stimulants in the systems of cases involved in the accident, the place of death, duration of hospitalization, the areas of injury detected in the deceased and the causes of death. The data obtained were transferred to the SPSS 17.0 (Statistical Package for Social Science) program. The chi-square test was used for the statistical analysis of data and the results were evaluated within a 95% confidence interval. P values smaller than 0.05 were considered statistically significant. The indicated average values have been given as mean \pm standard deviation.

RESULTS

A total of 1439 postmortem examination and autopsy procedures were performed at the Firat University Hospital Department of Forensic Medicine during the five-year period between January 2008 and January 2013 in Elazig. Four hundred twenty-two (29.3%) deaths occurred after traffic accidents.

The distribution of the ratio of forensic deaths occurring within five years to deaths occurring after traffic accidents based on years is given in Table 1.

A statistically significant difference was identified in the ratio of all forensic deaths to deaths resulting from traffic accidents based on years ($p < 0.05$).

Of the total 422 cases, 322 (76.3%) were male and 100 (23.7%) were female. One hundred seventy-seven (41.9%) of the cases were pedestrians, 71 (16.8%) drivers, and 174 (41.2%) passengers, with 177 (41.9%) of the accidents resulting in deaths due to out-of-vehicle, and 245 (58.1%) due to in-vehicle traffic accidents. A statistically significant difference was observed in terms of deaths related to in- or out-of-vehicle traffic accidents by gender ($p < 0.05$). It was determined that males suffered deaths due to both in-vehicle (75.9%) and out-of-vehicle (76.8%) traffic accidents at a higher rate (Table 2).

The mean age of cases was 43.5 (23.9). When examining the distribution of the deceased persons' positions in traffic based on age groups, pedestrians were found most frequently (44.0%) among those over 60 years of age, drivers were most frequent among the 20-39 age group (45.0%), and passengers were most frequent among the 20-49 age group (45.9%) (Table 3).

Deaths from traffic accidents occurred most frequently during summer season with 161 (38.2%) cases and the least frequently during the winter season with 43 (10.1%) cases (Figure 1). When examining the distribution of cases by months, August is ranked first with 65 (15.4%) cases (Figure 2). Traffic accident deaths were the most common on Fridays (18.5%), Mondays (16.4%), and Tuesdays (10.9%) (Figure 3).

Table 1. Distribution of the ratio of forensic deaths to deaths resulting from traffic accidents based on years

Year	Number of Forensic Cases	Resulting From Traffic Accidents			Ratio of Deaths Resulting From Traffic Accidents to Forensic Deaths (%)
		Number of Persons Who Received Post Mortem Examination	Number of People Autopsied	Total	
2008	279	7	74	81	29.0
2009	322	7	63	70	21.7
2010	282	5	75	80	28.4
2011	292	8	76	84	28.9
2012	264	8	99	107	40.5
Total	1439	35	387	422	29.3

X²: 25.113, p< 0.001

Table 2. Distribution of the traffic positions of the cases by gender

Gender	Position in Traffic						Total	
	Pedestrian		Driver		Passenger		Numbers	%
Male	136	42.2	66	20.5	120	37.3	322	76.3
Female	41	41.0	5	5.0	54	54.0	100	23.7
Total	177	41.9	71	16.8	174	41.2	422	100

X²: 16.101, p< 0.001

Table 3. Distribution of position in traffic by age group

Age Group	Position in Traffic						Total	
	Pedestrian		Driver		Passenger		Numbers	%
0-9	24	13.6	-	-	18	10.3	42	10.0
10-19	21	11.9	2	2.8	17	9.8	40	9.5
20-29	12	6.8	16	22.5	26	14.9	54	12.8
30-39	11	6.2	16	22.5	27	15.5	54	12.8
40-49	14	7.9	13	18.3	27	15.5	54	12.8
50-59	17	9.6	16	22.5	18	10.3	51	12.1
60-69	27	15.3	5	7.1	21	12.1	53	12.5
70-79	29	16.4	3	4.3	11	6.3	43	10.2
80 üstü	22	12.3	-	-	9	5.3	31	7.3
Total	177	100.0	71	100.0	174	100.0	422	100.0

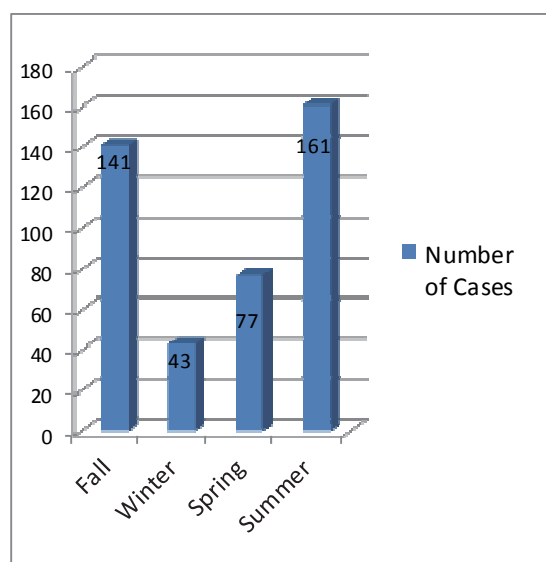


Figure 1. Distribution of deaths by season.

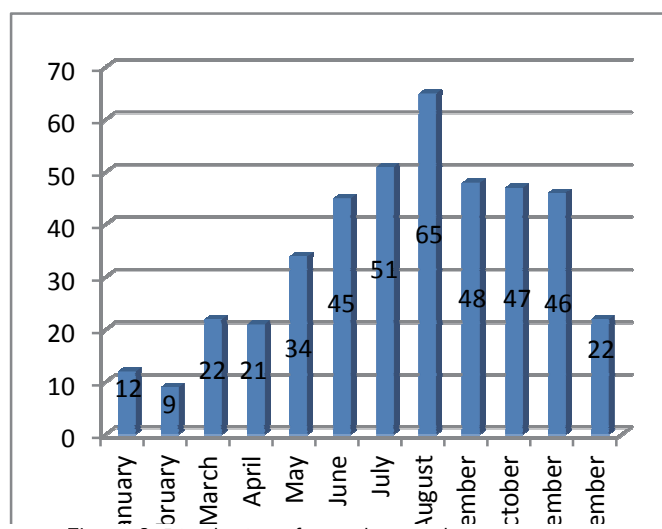


Figure 2. Distribution of cases by month.

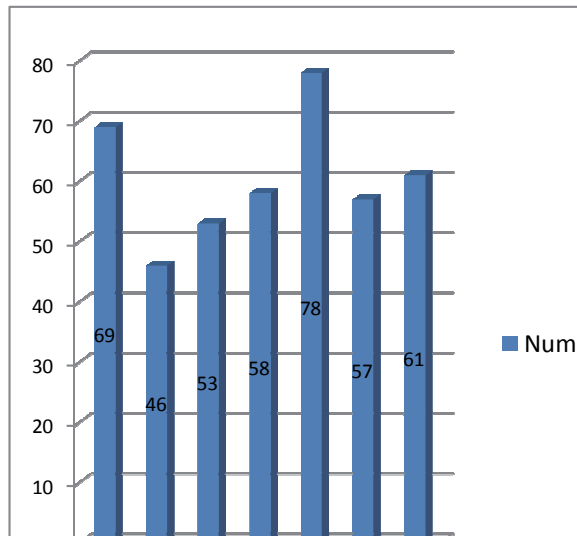


Figure 3. Distribution of cases by day of the week.

Blood alcohol levels were requested in all of the cases, with alcohol levels being discovered as over 20 md/dl in 7.3% (31) of all the cases. Looking at the traffic position of cases based on blood alcohol levels, 5.1% of pedestrians, 16.9% of drivers, and 5.7% of passengers had a blood alcohol level over 20 mg/dl. A statistically significant difference was found in terms of traffic positions of cases based on presence of alcohol in their blood ($p<0.05$). This difference stems from those present as drivers in traffic (Table 4).

An opiate/stimulant and systematic toxicological report was requested for 370 (87.6%) of the cases, with 312 mg/dl of amphetamine detected in one case. Among the in-vehicle traffic accidents, the seat belt was in use in 5.9% of men and 11.9% of women. A statistically significant difference was not detected in terms of distribution of gender based on seat belt usage ($p>0.05$)

Table 4. Distribution of traffic position according to blood alcohol levels of cases

Alcohol Level	Position in Traffic						Total	
	Pedestrian		Driver		Passenger		Numbers	%
	Numbers	%	Numbers	%	Numbers	%	Numbers	%
Alcohol free*	168	94.9	59	83.1	164	94.3	391	92.7
20-100mg	5	2.8	4	5.6	6	3.4	15	3.6
100-200mg	3	1.7	7	9.9	2	1.1	12	2.8
200-300mg	1	0.6	1	1.4	2	1.1	4	0.9
Total	177	100.0	71	100.0	174	100.0	422	100.0

χ^2 : 7.676, p : 0.006

* Blood-alcohol level below 20 mg /dl.

Table 5. Distribution of gender based on use of seat belt in in-vehicle traffic accidents

Safety Measure	Gender				Total	
	Male		Female		Numbers	%
	Numbers	%	Numbers	%	Numbers	%
Seat Belt Attached	11	5.9	7	11.9	18	7.3
Seat Belt Not Attached	161	86.6	51	86.4	212	86.5
Unknown	14	7.5	1	1.7	15	6.2
Total	186	100.0	59	100.0	245	100.0

χ^2 : 1.936, p : 0.164

(Table 5). Data pertaining to protective measures such as airbags and head cushion within vehicles in in-vehicle traffic accidents could not be collected due to the fact that this information is not included in accident reports. Two hundred (47.4%) of the accidents occurred in residential areas and 222 (52.6%) had taken place outside of residential areas. While 140 (70.0%) accidents in residential areas were out-of-vehicle accidents, 185 (83.3%) of the accidents occurring outside of residential areas were in-vehicle accidents. A statistically significant difference was observed between types of accidents compared to location of accidents ($p<0.05$) (Table 6).

Two hundred sixty (61.6%) deaths occurred in the hospital, 121 (28.7%) occurred at the location of the accident, and 41 (9.7%) occurred while being transferred to the hospital. While 78 (64.5%) of on-site deaths occurred outside of residential areas, 143 (55.0%) of hospital deaths occurred in a residential area. A statistically significant difference was detected between whether the deaths took place at the site of accident or at the hospital and the location where the accident took place ($p<0.05$) (Table 7).

Three hundred eighty-eight (91.9%) of the cases were autopsied and 34 (8.1%) were examined postmortem and issued a death certificate. One hundred sixty-seven (94.4%) of the pedestrians, 68 (95.8%) of the drivers, and 153 (87.9%) of the passengers were autopsied. The performance of autopsy based on the traffic position of the cases was statistically significant ($p<0.05$). This difference is due to those present as passengers in traffic (Table 8).

Seventy-eight point four percent of the cases, 86.4% of the pedestrians, 73.2% of the drivers, and 72.4% of the passengers died most frequently as a result of injuries to the head area. No statistically significant difference was observed in terms of areas of fatal injuries of the cases with relation to their traffic positions ($p>0.05$) (Table 9).

Table 6. Distribution of accident location of cases according to accident type

Accident Types	Accident Site				Total	
	Residential Area		Rural Area		Numbers	%
	Numbers	%	Numbers	%		
In-Vehicle Accidents	60	30.0	185	83.3	245	58.1
Out of Vehicle Accidents	140	70.0	37	16.7	177	41.9
Total	200	100.0	222	100.0	422	100.0

χ^2 : 122.900, $p < 0.001$

Table 7. Distribution of accident sites of cases according to the place of death

The Place of Death	Accident Site				Total	
	Residential Area		Rural Area		Sayı	%
	Sayı	%	Sayı	%		
Scene of Accident	43	35.5	78	64.5	121	28.7
Hospital Transfer	14	34.1	27	65.9	41	9.7
Hospital	143	55.0	117	45.0	260	61.6
Total	200	47.4	222	52.6	422	100.0

χ^2 : 15.742, $p < 0.001$

Table 8. The relationship between the traffic positions of cases who received autopsy and postmortem examination

Forensic Procedure	Position in Traffic						Total	
	Pedestrian		Driver		Passenger		Sayı	%
	Sayı	%	Sayı	%	Sayı	%		
Autopsy	167	94.4	68	95.8	153	87.9	388	91.9
Potmortem Examination	10	5.6	3	4.2	21	12.1	34	8.1
Total	177	100.0	71	100.0	174	100.0	422	100.0

χ^2 : 6.573, $p: 0.037$

Table 9. Distribution of areas of fatal injury in deceased persons based on their position in traffic*

Area of Injury	Position in Traffic						Total	
	Pedestrian		Driver		Passenger		Sayı	%
	Sayı	%	Sayı	%	Sayı	%		
Head	153	86.4	52	73.2	126	72.4	331	78.4
Chest	93	52.5	46	64.7	100	57.4	239	56.6
Abdomen	93	52.5	36	50.7	73	41.9	202	47.8
Ekstremiteler	7	3.9	1	1.4	9	5.1	17	4.0
Medulla Spinalis	18	10.1	3	4.2	22	12.6	43	10.1
Total	364	100	138	100	330	100	832	100

* In 255 cases there was more than one body area with fatal injuries.

DISCUSSIONS

The current study revealed that 422 (29.3%) of a total 1439 postmortem examination autopsy procedures included deaths related to traffic accidents. This figure is reported to be 35.8% in the Netherlands, 18.6% in Norway; and in similar studies conducted in Turkey, this figure is reported as 20.4% in Aydın and 43.9% in Kayseri, which are two provinces in Turkey (6-9). When these data are taken into consideration; deaths related to traffic accidents appear to be the most common cases among all forensic deaths. A statistically significant difference was detected, based on years in terms of the ratio of all forensic deaths to deaths resulting from traffic accidents (Table 1). It was concluded that this difference was a result of the increase in the number of fatal traffic accidents in 2012 combined with the opening of forensic medicine branch offices in surrounding cities, leading to a decrease in the number of forensic cases other than traffic accidents being sent to our department.

Of the 422 cases constituting our study, 322 (76.3%) were male and 100 (23.7%) were female (Table 2). In similar studies conducted in Turkey, as well, varying rates between 74.8% to 76.9% of those who died as a result of traffic accidents were male and similarly varying rates between 23.1% to 25.2% were female (10,11). Eighty-nine point eight percent of cases were men, with 10.2% women, 73.3% were men and 26.7% women and 80.5% were men and 19.5% women in the studies conducted by Kanchan et al., Spoerri et al. and Moharamzad et al. Respectively (12-14). The male/female ratio expressed in our study was consistent with other studies. The higher incidence of male deaths resulting from traffic accidents might be explained by the density of males in traffic, and the higher propensity of males for risky behaviors such as driving under influence and excessive speed.

It was determined that 41.9% of deaths in traffic accidents are pedestrians, 16.8% are drivers, and 41.2%

are passengers (Table 2). In a study conducted in Ankara, 62.9% were reported to be pedestrians, 16.7% were drivers, and 14.8% were passengers (15). In the study by Töro et al. 55.8% were reported to be pedestrians, 16.9% were drivers, and 27.3% were passengers while 57% in the study by Hizar et al. and 59% in the study by Cameron et al. were again reported to be pedestrians (16-18). In the majority of studies conducted both in Turkey as well as in developing countries, deaths related to traffic accidents were found to mostly occur due to out-of-vehicle accidents, which was consistent with the current findings. These findings stem from the high presence of pedestrians in the work force, the limited availability of pedestrian areas such as sidewalks and pedestrian crossings, and the failure to adequately comply with traffic signs and signals. It was concluded that vehicle manufacturing, in addition to in-vehicle safety measures, extravehicular safety measures, such as external airbags and changes in the structures of the front hood and windshield of the vehicle must also be taken into consideration.

The mean age of the cases is 43.5 (23.9), with 38.4% being between 20-49 years of age (Table 3). In the study conducted in the Netherlands, 24.7% of the cases were reported to be between 20 to 31 years of age (6). Due to people participating heavily in business and social life during life's most restless and active period, which is between 20-49 years of age, they have an increased need to travel and to be in traffic, for which reason they are more involved in traffic accidents with both injuries and fatalities. This situation, because it leads to the loss of people in their productive age in the country's young population, reveals how important it is to prevent traffic accidents.

When the cases were evaluated according to their position in traffic, drivers were most frequent (45.0%) in the 20-39 age range (Table 3). Forty-eight point nine percent of the cases in the study by Ndiaye et al. were reported to range between 20-39 years of age, and 36% of those in the study by Hayakawa et al. were reported to be between 16-34 years of age (19,20). Studies report that young drivers cause more fatal traffic accidents due to a propensity toward risky behavior such as alcohol and drug abuse, excessive speeding, and challenging their own abilities (21,22). In some studies, age is reported to be a significant risk factor for drivers and has been reported to increase the risk of causing accidents with advanced age (23,24). As age progresses, a person's reflexes are slowed, decision making time is extended, attention decreases and fatigue symptoms emerge more quickly, which may affect driving ability. While advanced age is reported to increase the rate of accidents in drivers in some studies, no data indicating this could be obtained.

In the current study, pedestrians were found most frequently (44.0%) to be over the age of 60 followed by the 0-9 and 10-16 age groups (Table 3), respectively. Fifty-nine percent of those who died due to out-of-vehicle traffic accidents were over age 54 in the study by Kitching et al. 50% were over age 54 in Japan, and in a

report published in the United States, pedestrian deaths were reported to be seen most frequently over the age of 75 (25). Reasons such as reduced physical mobility, weakening of the senses, and attention deficit in persons in this group suggest that they inhabit a higher risk group compared to other age groups in terms of becoming involved in an out-of-vehicle traffic accident. The other high-risk group is the under 10 age group (26,27). Children in this age group use streets and main roads as their playground due to a lack of adequate places they can use as a children's play area, and therefore their chances of being involved in traffic accidents are increased. Another important reason is that this age group has not received enough traffic education.

One of the factors that affects the frequency of traffic accidents is time-dependent factors, such as the season, month, and day. In a study carried out in England, a decline in the number of traffic accidents during the winter and in bad weather conditions was reported; the decline was attributed to a lower rate of vehicle use during winter months compared to other seasons and drivers reducing their speed and driving more carefully (28). In the current study, the highest number of deaths occurred during the summer season at a rate of 38.2%, particularly during August (15.4%), while the lowest number of deaths occurred during the winter season (10.1%), and in particular the month of February (2.1%), which was consistent with the literature (Figure 1-2). We believe that deaths related to traffic accidents occur more frequently during the summer season in Turkey because of working people generally going on holiday during the summer season and people spending more time outdoors due to the seasonal climate.

The current study revealed that deaths related to traffic accidents occur most frequently on Fridays (18.5%) and Mondays (16.4%) (Figure 3). The study by Karbeyaz et al. reported that 36.5% of accidents took place on Saturday and Sunday (29). When evaluating the data in our study, the reason for deaths due to traffic accidents occurring most frequently on Fridays was found to stem more from pedestrian accidents. The reasons for this, we believe, is that being the last business day of the week, people are both tired and careless and people are also outside more in order to fulfill religious obligations, whereas the frequent occurrence on Mondays is a result of people being unable to wake up due to it being the first business day of the week, both drivers and pedestrians rushing due to worrying about being late and breaching traffic rules.

Many studies all over the world have indicated that an important risk factor underlying fatal traffic accidents is alcohol (30). Twenty-one point three percent of fatal traffic accidents in the European Union region and 38.5% in the United States were reported to be alcohol related (31,32). Moreover, other psychoactive substances consumed with alcohol further increase the negative impact on the ability to drive that alcohol has (33). Studies show that among the cases admitted due to traffic accidents, higher amounts of alcohol are

present in drivers. It is reported in the study by Papadodima et al. that alcohol was detected in 37% of drivers and psychoactive agents in 9% (34). In the current study, when examining the position in traffic of cases whose blood alcohol levels were found to be higher than 20 mg/dL, a higher amount of alcohol was identified in the drivers, in accordance with literature. Alcohol was identified in 5.1% of pedestrians, 5.7% of passengers, and 16.9% of drivers among the cases. A statistically significant difference was detected in terms of the traffic positions of the cases in relation to their blood alcohol levels, and this difference stemmed from those who were present as drivers in traffic (Table 4).

Studies show that women are more sensitive in terms of the use of safety belts than men (35). In the study by Koushi and Bustan 64.0% of men and 18.2% of women were reported to constantly use seat belts (36). In the current study, 5.9% of men and 11.9% of women were found to be wearing the seatbelt.

It has been reported in Turkey, based on data from the General Directorate of Security Affairs, 41.2% of fatal traffic accidents that occurred in 2011 happened in a residential area and 58.2% in a rural area, while more than 90% of out-of-vehicle accidents with injuries and fatalities occurred in a residential area (37). Additionally, in the current study, 58.1% of similar accidents occurred in a residential area, with 41.9% occurring in a rural region, while 70% of accidents occurred in residential areas were due to out-of-vehicle traffic accidents; 83.3% of accidents taking place outside residential areas were found to be in-vehicle traffic accidents. Due to the presence of more pedestrians in residential areas and more speeding outside residential areas, fatal out-of-vehicle traffic accidents tend to take place more within residential areas, whereas in-vehicle traffic accidents occur outside of residential areas (Table 6).

In our study, 61.6% of all deaths took place in the hospital, 28.7% at the location of the accident, and 9.7% occurred while being transported to the hospital. In the study conducted in Afyon, 56.1% of cases were reported to have died at the scene of the accident (38). The incidence of on-site mortalities due to traffic accidents in the current study was lower than in other studies. Due to the availability of a university hospital in Elazığ, traffic accident injuries from neighboring cities are transferred here. In the case of the death of transferred patients at the hospital, their postmortem examination and autopsy procedures are carried out by the Elazığ Public Prosecution Office, leading to an increase in the number cases who died at the hospital. The average duration of treatment for the 260 cases who received treatment at the hospital is 6.9 ± 15.5 days. The longest length of stay was 139 days. The casualties in traffic accidents are received by the hospitals and this causes a heavy occupation of the beds in hospitals by these casualties and the costs arising from treatment of them negatively affect the national economy. While 64.5% of deaths at the scene took place outside of residential areas, 55% of hospital deaths occurred in a residential area. A statistically significant difference was observed between

whether the deaths took place at scene of the accident or the hospital and the location of the accident ($p < 0.05$) (Table 7). It was concluded that this due to accidents taking place in rural areas causing more severe injuries due to excessive speed and death occurring more frequently at the accident scene, whereas accidents in residential areas more being pedestrian accidents, death occurring more frequently while they are being treated at the hospital.

Of the 422 cases brought to our department after dying as a result of a traffic accident, an autopsy was conducted on 91.9% and a death certificate was issued to 8.1% after postmortem examination (Table 8). In the studies conducted in Turkey, 1.1% of the cases who died due to traffic accidents in the study performed in Eskişehir and 6.2% in the study performed in Ankara were reported to have issued death certificates after being autopsied, and the majority of deaths resulting from traffic accidents were reported to have been issued death certificates after postmortem examinations without being autopsied (15,29). However, it can be seen that this ratio is much higher in many European countries than in Turkey. It is reported that an autopsy is performed on 58.3% of deaths due to traffic accidents in Norway (7). In Turkey, it is reported that in the case of deaths originating from murder or suspicious deaths, public prosecutors and physicians are more quick to make a decision in favor of an autopsy, but when it comes to incidents resembling death due to an accident or suicide, tend to be content with a postmortem examination instead of overseeing an autopsy (39). However, deaths most urgently requiring an autopsy are deaths due to injuries suffered in traffic accidents, and this will only be possible with a detailed and careful autopsy and necessary laboratory investigations (40). We hold the opinion that conducting an autopsy is necessary to prevent disputes in terms of judicial and criminal matters.

Injuries to the head are the most common cause of mortality and morbidity in traffic accidents. Some studies have reported that injuries to the head region are the most common site of injuries in in-vehicle and out-of-vehicle traffic accidents (16). The head region has been indicated as the most common site of injury in traffic accidents at a rate of 63.0% in the study by Sharma et al. and 66.0% in the study conducted by Montazeri et al (1,41). In the current study, head trauma was present in 89.3% of the cases, head traumas were noted to be the most common site of injury in pedestrians, drivers, and passengers. Injuries to the extremities were reported to be especially common in out-of-vehicle traffic accidents (42). Due to the direct impact on pedestrians during collision and drivers' lower extremities receiving a shock from the front panel, they endure more injuries to their extremities than passengers do. Additionally, in the current study, 50% of injuries to the extremities are seen in pedestrians, while an examination of the positions of the cases in traffic indicate limb injury in 51.4% of pedestrians, 47.9% of drivers, and 32.7% of passengers, and a statistically significant difference was detected in

the distribution of limb injuries based on the position of the cases in the traffic (Table 9).

The most common cause of mortality and morbidity in traffic accidents are head traumas. It is also stated in some studies that injuries to the head are the most common site of injury in both in-vehicle and out-of-vehicle traffic accidents (16). One study conducted in Canada that in those who died due to a traffic accident, the head region was the most frequently injured (74.0%) (42). In the current study, there are multiple sites of fatal injuries in 255 of the cases (60.4%), while in accordance with literature, death related to head injuries was seen most frequently in 331 (78.4%) cases. In the study by Masson et al. head injury was noted to lead to more deaths in pedestrians compared to those inside a vehicle, while at the same time, deaths resulting from head traumas were also observed to be the most common cause of death in those who suffered an in-vehicle accident. Additionally, in the current study, 86.4% of pedestrians, 73.2% of drivers, and 72.4% of passengers were reported to have died most frequently from injuries to the head region. No statistically significant difference was detected in the comparison of the fatal injury sites of cases with their position in the traffic (Table 9).

In conclusion, the use of passive safety measures such as the seat belt, head restraints, child seats with belts, and airbags, known as secondary prevention methods, in motor vehicle accidents should be encouraged and the inspections in this field must be increased. Measures should be taken for pedestrian safety, and special measures should be taken especially for the safety of the elderly with limited mobility and small children. Traffic control and checks should be more frequent during the summer seasons. The knowledge and skills of health personnel should be kept up-to-date by periodic training courses in order to improve the quality of their early and accurate intervention to head injuries and emergency medical services in the country should be additionally expanded and reinforced.

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