

## EVALUATION OF PATIENTS UNDER 18 YEARS ADMITTED TO EMERGENCY SERVICE AFTER BEING INVOLVED IN A TRAFFIC ACCIDENT BETWEEN 2016 AND 2018

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### Abstract

In this study, we aimed to reveal the descriptive characteristics of traffic accidents experienced by individuals under the age of 18 and to evaluate the consequences of the accidents. This cross-sectional epidemiological study was performed at Necmettin Erbakan University, Meram Medical Faculty, First Aid and Emergency Department. After obtaining ethical approval and written permission from the university, the data were filled in retrospectively by scanning patient files from the hospital system between July 2019 and October 2019. While arithmetic mean, standard deviation, and median (1st quartile-3rd quarter) were used in summarizing numerical data, numbers and percentages were used in summarizing categorical data. Relationships between categorical data were evaluated with the chi-square test. A value of  $p<0.05$  was considered statistically significant. The data of a total of 946 pediatric patients (62.6% male) who applied to our emergency department after a traffic accident between 2016 and 2018 were included in the study. The median age was 9.61 years. 50.7% (n=480) of the accidents occurred inside the vehicle. 39.8% of the patients were hospitalized and consultation was requested from 49.4% (n=467). The median age and length of hospital stay of the boys were higher than the girls ( $p<0.001$  and  $p=0.004$ , respectively). In addition, the death rate in patients who had a traffic accident inside the vehicle was found to be higher than those who had a traffic accident outside the vehicle ( $\chi^2=7.071$ ,  $p=0.009$ ). In traffic accidents, controls should be tightened and parents' awareness should be increased so that children do not get involved in traffic accidents.

**Keywords:** Children, emergency, traffic accidents.

### Öz

Bu çalışmada, 18 yaş altı bireylerin yaşadıkları trafik kazalarının tanımlayıcı özelliklerini ortaya çıkarmayı ve kazaların sonuçlarını değerlendirmeyi amaçladık. Bu kesitsel türde epidemiyolojik çalışma Necmettin Erbakan Üniversitesi Meram Tıp Fakültesi İlk Yardım ve Acil Servis Kliniğinde yapıldı. Üniversiteden etik onay ve yazılı izin alındıktan sonra Temmuz 2019-Ekim 2019 tarihleri arasında veriler hastane sisteminden hasta dosyaları taranarak geriye dönük olarak dolduruldu. Sayısal verilerin özetlenmesinde aritmetik ortalama, standart sapma, ortanca (1.çeyreklik-3.çeyreklik) kullanılırken, kategorik verilerin özetlenmesinde sayı ve yüzdeler kullanıldı. Kategorik veriler arasındaki ilişkiler ki-kare testi ile değerlendirildi.  $p<0.05$  değeri istatistiksel olarak anlamlı kabul edildi. 2016-2018 yılları arasında trafik kazası sonrası acil servisimize başvuran toplam 946 çocuk hastanın (%62,6 erkek) verileri çalışmaya dâhil edildi. Ortanca yaş 9,61 yıldı. Kazaların %50,7'si (n=480) araç içinde meydana geldi. Hastaların %39,8'i hastaneye yatırıldı ve %49,4'undan (n=467) konsültasyon istendi. Erkeklerin ortanca yaşı ve hastanede yatış süreleri kızlardan daha yüksek bulundu (sırasıyla  $p<0,001$  ve  $p=0,004$ ). Ayrıca araç içinde trafik kazası geçiren hastalarda ölüm oranı araç dışında trafik kazası geçirenlere göre daha yüksek bulundu ( $\chi^2=7.071$ ,  $p=0.009$ ). Trafik kazalarında, çocukların trafik kazalarına karışmaması için kontroller sıkılaştırılmalı ve ebeveynlerin farkındalığı artırılmalıdır.

**Anahtar Kelimeler:** Çocuklar, acil durum, trafik kazaları

## 1. INTRODUCTION

Road transportation is the most complex and dangerous system that most people have to use on a daily basis. Road traffic accidents are an important but neglected global public health problem that requires effective and sustainable efforts to prevent (1). According to the World Health Organization (WHO) Global Burden of Disease project, in 2004, approximately 1.3 million people died and 50 million people were injured in traffic accidents worldwide (1). Data from the Turkish Statistical Institute (TURKSTAT) stated that in 2019, 5.473 people died and 283.234 people were injured in traffic accidents in Turkey (2).

Children are at risk of road traffic injuries for a variety of reasons. Young children are more vulnerable to injuries than adults in road traffic accidents since they are not sufficiently developed physically, cognitively, and socially (3). Although the exact number of children injured or disabled by traffic accidents every year is not known, it is estimated that this number is approximately 10 million (4, 5). In 2004, road traffic accidents caused the deaths of approximately 262.000 children and adolescents, and this number constitutes 30.0% of all injury-related deaths between the ages of 0 and 19 (6). Traffic accidents are also among the leading causes of disability for children. A 2007 study in Asia showed that one of the five leading causes of disability for children was injuries due to road traffic accidents (7).

In addition to causing death and injuries, road traffic accidents also create an economic burden for reasons such as treatment costs and disability-related workforce loss. According to a report from WHO, road traffic accidents have a serious impact on national economies, corresponding to 3.0% of the annual gross domestic product (GDP) of countries (3).

This study aimed to evaluate individuals under the age of 18 years, who presented to the emergency department after a traffic accident, in terms of the type of accident and outcomes, and to provide a basis for the measures that can be taken to prevent such accidents.

## 2. METHODS

The epidemiological study had a cross-sectional design. The study was conducted between July and October 2019. The required sample size was not calculated, and the files of all 946 patients under the age of 18 years, who presented to the First Aid and Emergency Clinic of Necmettin Erbakan University Meram Medical Faculty between January 1, 2016 and December 31, 2018 due to a traffic accident were included in the sample. Written permission was obtained from the Drug and Medical Device Ethics Committee of the University (Date: 10.05.2019 Issue: 2019/1830) and verbal approval from the emergency clinic.

For the research, a data collection form consisting of 22 open- and close-ended questions was prepared by the researchers. This form contained questions inquiring about the descriptive characteristics of the patients such as age, gender, application date and time, accident type, examinations performed, consultations requested, length of stay, and outcome (discharge, hospitalization, death, etc.).

The inclusion criteria of the study were being under 18 years of age and presenting to the emergency clinic due to a traffic accident inside or outside a vehicle. The form was retrospectively completed by the researchers by screening the patient files from the hospital system.

### 2.1. Statistical analysis

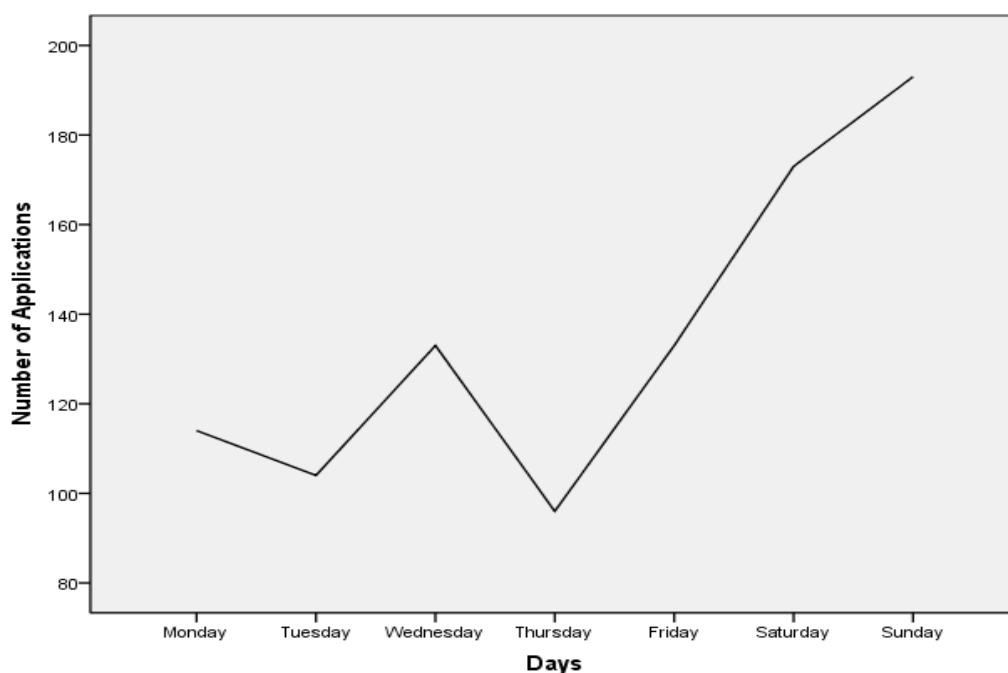
SPSS for Windows (SPSS Inc. Chicago, IL, USA) software package version 15.0 was used for data entry and analysis. The compliance of the data to normal distribution was examined using visual and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). During the analyses, median (25th-75th percentile) values were used in summarizing numerical data that were not normally distributed while frequency distributions and percentages were used in summarizing

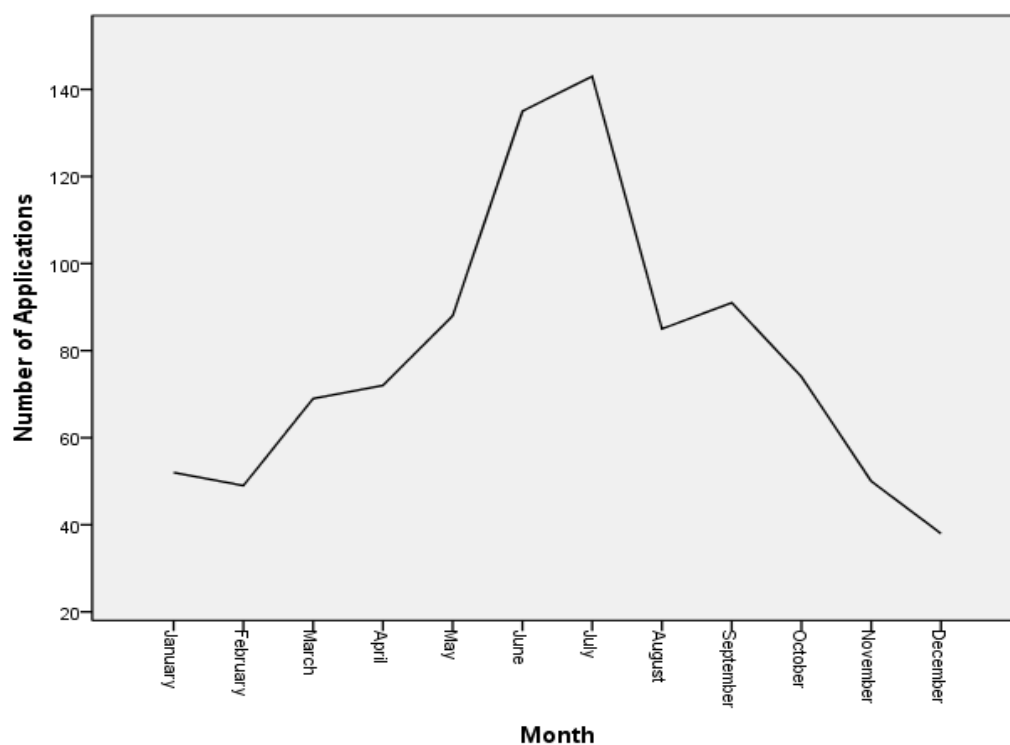
categorical data. The Mann-Whitney U and Kruskal Wallis tests were used for the statistical analysis of numerical variables that were not normally distributed. The post-hoc Man-Whitney U test and Bonferroni correction were used for paired comparisons between the groups for which the Kruskal-Wallis test results were significant. Relationships between categorical data were evaluated with the chi-square test. Results where  $p$  was less than 0.05 were accepted to indicate statistical significance.

### 3. RESULTS

The files of 946 patients under 18 years, who presented to our emergency clinic after a traffic accident between 2016 and 2018 were included in the study. Of the accidents evaluated, 40.2% ( $n=380$ ) occurred in 2017, 35.4% ( $n=335$ ) in 2016, and the remaining 24.4% ( $n=231$ ) in 2018. The median age of the patients was 9.61 (5.18-14.02) years, and 62.6% ( $n=592$ ) were male. According to the three-year data, the highest number of presentations was seen in summer ( $n=363$ , 38.4%) and the lowest in winter ( $n=139$ , 14.7%). In terms of month, the highest number of pediatric presentations due to traffic accidents was observed in July ( $n=143$ , 15.1%), followed by June ( $n=135$ , 14.3%) and the lowest in December ( $n=38$ , 4.0%), followed by February ( $n=49$ , 5.2%). When evaluated according to the day of the week, the highest number of cases occurred over the weekend ( $n=173$ , 18.3% for Saturday and  $n=193$ , 20.4% for Sunday) and the lowest on Thursday ( $n=96$ , 10.1%). Figures 1 and 2 show the distribution of traffic accident-related pediatric presentations according to the day of the week and months.

**Figure 1: Distribution of traffic accident-related presentations according to the day of the week**



**Figure 2. Distribution of traffic accident-related presentations according to month**

The mean age and length of hospitalization were found to be statistically higher in the boys compared to the girls ( $p < 0.001$  and  $p = 0.004$ , respectively). Evaluations regarding gender, accident type, and outcomes are shown in Table I. Among the patients included in the study, mortality was statistically significantly higher in those involved in a traffic accident inside a vehicle than those involved in a traffic accident outside a vehicle ( $\chi^2 = 7.071$ ,  $p = 0.009$ ).

**Table I. Evaluation of gender and patient outcomes in pediatric traffic accident presentations**

Characteristic	Girl		Boy		$\chi^2$	p
	n	%	n	%		
<b>Accident type</b>						
Inside a vehicle	244	68.9*	236	39.9	74.857	<0.001
Outside a vehicle	110	31.1	356	60.1		
<b>Consultation</b>						
Requested	147	41.5	320	54.1	13.911	<0.001
Not requested	207	58.5*	272	45.9		
<b>Outcome*</b>						
Hospitalization	119	33.6	257	43.7	9.383	0.002
Discharge	235	66.4*	331	56.3		

<b>Mortality</b>						
Yes	4	1.1	18	3.0	3.560	0.074
No	350	98.9	574	97.0		

\*Not including patients referred to another center and those that died in the emergency clinic.

Of the patients included in the study, 50.7% (n=480) presented to the emergency clinic due to a traffic accident inside a vehicle and 49.3% (n=466) due to traffic accident outside a vehicle. Of the patients in the latter category, 53.9% (n=251) had been involved in a pedestrian accident, 26.6% (n=124) in a motorcycle accident, 16.5% (n=77) in a bicycle accident, and the remaining 3.0% (n=14) in an accident involving another vehicle (tractor, ATV, horse carriage, etc.). A statistically significant difference was found between age and duration of hospitalization according to the accident type (Table II). The median age of the patients involved in a traffic accident inside a vehicle was lower and the median age of those involved in a motorcycle or bicycle accident was greater compared to the other patients ( $p < 0.001$ ). In addition, the length of stay of the patients hospitalized due to a traffic accident inside a vehicle was found to be statistically lower compared to other accident types ( $p = 0.013$ ).

**Table II. Evaluation of age and length of hospital stay according to accident type**

Accident type	Age	Length of hospital stay *
Inside a vehicle	7.9 (3.3-12.4)	2.0 (1.0-5.0)**
Pedestrian	8.3 (5.1-12.5)	3.0 (1.0-8.0)
Motorcycle	14.9 (13.2-15.7)	4.0 (2.0-7.0)
Bicycle	12.4 (8.8-14.3)	3.0 (1.0-4.0)
Other (ATV, tractor, etc.)	7.0 (5.6-13.0)	4.0 (3.5-9.5)
	<b>p &lt; 0.001</b>	<b>p = 0.013</b>

\*Not including patients that were discharged from the emergency clinic, referred to another institution, or died in the emergency clinic.

\*\*Indicates the group that caused a significant difference.

While 59.8% (n=566) of the patients who applied were discharged, 16.0% (n=151) were hospitalized in intensive care units, 13.2% (n=125) in services, 10.6% (n=100) in the emergency observation area. Furthermore, 0.1% (n=1) of the patients were referred to another center, and 0.3% (n=3) died in the emergency clinic. Nineteen patients (2%) who were hospitalized to be monitored died during their follow-up. For the 376 patients admitted to emergency observation, inpatient and intensive care units, the median length of stay was 3.0 (1.0-6.0) days. Table III shows the clinics to which the patients were admitted for follow-up.

**Table III. Clinics and units where the patients were followed up**

		n	%
<b>Inpatient service</b> (n = 125)	Orthopedics	72	57.6
	Neurosurgery	20	16.0

	Pediatric surgery	14	11.2
	Plastic surgery	11	8.8
	Thoracic surgery	5	4.0
	General surgery	2	1.6
	Pediatrics	1	0.8
<b>Intensive care unit (n = 151)</b>	Emergency	85	56.3
	Pediatric surgery	34	22.5
	Neurosurgery	15	9.9
	Reanimation	9	6.0
	Pediatrics	3	2.0
	Thoracic surgery	3	2.0
	General surgery	1	0.7
	Cardiovascular surgery	1	0.7

Consultation was requested from different branches to 49.4% (n = 467) of the patients who applied. The consulted departments and the examinations requested for the patients are shown in Table IV.

**Table IV. Consultations and examinations requested for the patients**

Consulted department*	n	%
Neurosurgery	233	49.9
Orthopedics	220	47.1
Pediatric surgery	151	32.3
Plastic surgery	107	22.9
Thoracic surgery	107	22.9
Pediatrics	71	15.2
Ophthalmology	45	9.6
Cardiovascular surgery	39	8.4
Otorhinolaryngology	20	4.3
Other (obstetrics, urology, cardiology, and reanimation)	23	4.9

<b>Examination**</b>		
Direct radiography	866	91.5
Blood test	828	87.5
Computed tomography	603	63.7
Ultrasonography	233	24.6
Magnetic resonance imaging	9	1.0

\*More than one department consulted.

\*\*More than one examination requested.

#### 4. DISCUSSION

This study, conducted in 2019 in the First Aid and Emergency Clinic of Necmettin Erbakan University Meram Medical Faculty, retrospectively evaluated the data of a total of 946 pediatric patients involved in traffic accidents over a three-year period. The median age of the patients was 9.61 years, and 62.6% were male. The causal and temporal characteristics of the accidents experienced by the patients were inspected, and the examinations and consultations requested during the process were evaluated. Various factors such as gender, development level of the country and age are involved in the etiology of road traffic accidents. Although children of all ages are at risk, some age groups are at higher risk. According to the 2014 WHO data, deaths due to road traffic accidents are among the first four causes of death in children over the age of five, and deaths due to traffic accidents rank first even between the ages of 15 and 17 (8). In addition, as the age increases in the pediatric group, the possibility of being involved in accidents also increases. There are also differences in road traffic accidents in terms of gender. According to the WHO report, deaths in road traffic accidents are two times more common among boys than girls and three times more common in countries with low-middle income compared to high-income countries (3, 9,10). In our study, approximately two-thirds of the children involved in a traffic accident were boys, and the rate of being involved in a traffic accident inside a vehicle was significantly higher among the girls than boys. However, the mortality rate did not significantly differ between genders. The frequency of outpatient treatment was higher for the girls, and among inpatients, the duration of hospitalization was also shorter for the girls. As boys get older, their tendency to engage in risky behavior increases. In addition, due to the cultural characteristics, boys usually more actively engage in outside-home errands, which may expose them to traffic and related accidents more, leading to severe trauma and long-term hospitalizations.

According to the TURKSTAT 2019 road traffic accident statistics, there were 147.896 accidents results in fatal injuries in the road network. When evaluated according to months and days, the highest number of traffic accidents occurred in August (10.5%) and on Friday (14.8%) and the lowest in February (5.8%) and on Wednesday (13.9%) (2). The accidents included in the current study occurred mostly in July and June and least in December and February. When evaluated according to the days of the week, the highest number of traffic accident-related presentations was seen on Sunday and Saturday and the lowest on Thursday. Similar to the literature, the reason for the increase in traffic accident presentations during the summer months and weekends may be due to the increase in traffic density and mobility and the higher number of children being outside home and school during official holidays.

Traffic accidents have serious effects on human health, as well as on the health system and economy. According to WHO, patients admitted to the hospital with injuries due to road traffic



accidents constitute 13.0 to 30.0% of all injury cases (1). In some countries, 40.0% of beds in surgical services are occupied by those who had a road traffic accident. Patients requiring the facilities of operating theaters and intensive care units are also most frequently those presenting with injuries due to a traffic accident. In addition, increased workload in radiology and patient intensity in physical therapy and rehabilitation services are also associated with those that have been involved in road traffic accidents (11). According to a study examining the duration of traffic accident-related hospitalizations, the mean length of hospital stay was found to be 20 days, and the highest length of stay was observed in patients with spinal injuries (12). According to the results of a study conducted in the United States in 2000, people involved in non-fatal traffic accidents received medical services resulting in a medical cost of US \$ 31.7 billion. It was also reported that the injury that incurred the highest medical cost was head and spinal cord injury (13). In Turkey, estimated loss of GDP due to road traffic accidents was 1.1% in 2010 (14). In this study, nearly half of the patients who presented to the emergency clinic after a road traffic accident were hospitalized for at least one day. Laboratory tests were requested for almost all of the patients, and computed tomography was performed in more than half. Furthermore, other hospital departments were consulted for approximately half the patients. In addition to preventing and reducing traffic accidents, making efforts to ensure the least damage to individuals in traffic accidents would not only improve public health but also help prevent economic losses due to hospitalization and laboratory tests.

The official TURKSTAT data on traffic accident faults show that in Turkey, between 2009 and 2018, drivers were the party most at fault, causing 89.3% of traffic accidents, followed by those caused by pedestrian, road, vehicle and passenger faults. The most important driver fault was reported to be not complying with the speed limit (39.3%) (2). Passenger faults were seen at a very low rate in traffic accidents. Not wearing a seatbelt was the most common passenger fault and not using a helmet among motorcycle riders. However, in 2018, compared to the previous year, being involved in an accident due to not using a seatbelt decreased from 17.0 to 13.9% and the rate of not using a helmet on a motorcycle decreased from 17.0 to 5.64%. In the road network in Turkey, 53.1% of traffic accidents with fatal injuries in 2019 involved cars, 16.3% motorcycles, 14.9% vans, 3.0% minibuses, and 12.8% other vehicles (tractors, buses, etc.) (15). Concerning global pediatric deaths every year, 38.0% of those that are injured or die are pedestrians, and 36.0% are those traveling in a car. The remainder consist of those traveling on a bicycle or motorcycle (1).

In our study, approximately half the traffic accidents had occurred inside a vehicle. Almost half the traffic accidents that occurred outside a vehicle were seen among pedestrians and more than a quarter in those riding on a motorcycle. In addition, according to our data, the length of hospital stay was lower in those who had been involved in a traffic accident inside a vehicle. When the relationship between age and accident type was evaluated, the age of the patients who had been involved in a traffic accident inside a vehicle was lower than those that had experienced a motorcycle or bicycle accident. In addition, the age of the patients involved in motorcycle accidents was higher than the remaining patients. These differences may be due to children beginning to travel in traffic on their own as they get older while younger children traveling with their parents inside a vehicle.

### **Limitations**

Our study has some limitations. First, the current study is a retrospective study and data were collected from a single center, which limits the generalizability of the results. Secondly, in in-vehicle traffic accidents, there is no clear information about whether the seat belt was worn during the accident, the driver's condition and the position of the child in the vehicle. Finally, we could not reach the information whether there were adults with the children in non-vehicle accidents.

### **Conclusion**



In this study, in which traffic accidents under the age of 18 were examined, 946 cases who applied to the emergency service due to traffic accidents were examined. About half of the accidents were recorded as in-vehicle traffic accidents. It was observed that the majority of the accidents occurred during the summer season and on weekends. Although roads are dangerous for children and teenagers, road traffic fatalities and injuries can be largely prevented. There are proven and effective measures that can be implemented to minimize these risks. One of them is to comply with speed limits and to use seat belts for everyone in the vehicle. In order to prevent the vast majority of road traffic accidents, it is necessary to implement measures with proven effects, increase public awareness of the causes of accidents, implement laws and sanctions, and tighten inspections. Such measures can make roads safer for everyone, including children.

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