



Evaluation of Deaths Cases Due To Traffic Accidents in the Pediatric Age Group

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Abstract

Background: In this study, it was aimed to analyze the traffic accidents in pediatric age group with postmortem examinations and autopsies. **Methods:** 35 traffic accident reports were sought from forensic autopsy performed in 64 pediatric age groups. External examination / autopsy reports of selected cases were examined retrospectively and demographic characteristics of dead cases, accident location, accident type, type of vehicles involved in the accident, year, season, day and accident time, victims' position in traffic, orthopedic and internal organ injuries, autopsy whether it was done, the cause of death, the place of death and the time of death were evaluated. **Results:** Among the 64 forensic death cases in pediatric age group, observed cause of death was determined to be traffic accidents in 35 (55%) cases. Male cases accounted 66%, and male to female ratio was 2:1. From the reports, 48.6% of the accidents happened in summer and most commonly sunday (22.9%). In 48% of accidents, the cause of death was head trauma. Moreover, it was determined that the most injured person was the pedestrian. Automobiles took the lead in the causes of the traffic accidents. **Conclusion:** Considering the increase of accidents in July and Sunday, when schools are holidays; It is important to review traffic education for children, increase traffic controls and be more careful about parents.

Keywords: Traffic accidents; Forensic medicine; Autopsy.

1. Introduction

Traffic accidents in our country and in the world are among the most important problems in terms of morbidity and mortality [1]. According to Highway Traffic Law traffic accident; is defined where one or more vehicles moving on highway involved in an event resulting in death, injury or material damage [2]. WHO reports that more than 3700 people died every day in traffic accidents and traffic accidents were the 8th among deaths worldwide [3, 4]. In our country, according to the data of the Ministry of Health, death due to traffic accidents ranks third among all causes of death [5]. While some of the deaths in traffic accidents occur due to brain, brain stem, spinal cord and great vessel injury; another part is due to epidural or subdural bleeding, lung, spleen and liver injuries, injuries that cause significant blood loss and multiorgan failure [6]. Head, abdomen and lower extremity injuries called "Waddle triad" are observed especially in non-vehicle traffic accidents involving pediatric cases [7].

Children, pedestrians, cyclists and the elderly are among the most vulnerable in traffic [3]. This study is aimed to assess evaluate the demographic characteristics of the pediatric age group patients who died due to a traffic accident in the province of Aydin and to evaluate that accidents in terms of forensic medicine.

2. Materials and Methods

In this study, cases of people under 18 years old who died due to traffic accident among all forensic death cases sent to Aydin Adnan Menderes University Forensic Medicine Department between 2013-2019 were selected. 35 reports related to traffic accidents were searched from 64 autopsy reports conducted in the pediatric age group. The reports of selected cases prepared by us were analyzed retrospectively and demographic features of dead cases, accident type, type of vehicles involved in the accident, year, season, day and accident time, accident location, the location of the victims in traffic, accompanying orthopedic and internal organ injuries, whether autopsy was performed, cause of death, place of death and time of death were evaluated. The data of the study were analyzed using SPSS 18.

3. Results

Among the pediatric age group forensic death cases in the 7-year period between 2013 and 2019, the cause of death of 35 (55%) cases included in the study was determined as a traffic accident.

Of the cases 23 (66%) were male, 12 (34%) were female and with a male-to-female ratio of 2/1. It was observed that the deaths related to traffic accidents mostly occurred in the group between the ages of 16-18 with a rate of

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42.9%, and the least between the ages of 11-15 with a rate of 14.3%. The average age of dead cases was 11.5 years old (minimum: 4 months; maximum: 17 years 11 months). The distribution of cases among age groups is presented in Table 1.

Table-1. Distribution of the cases according to age groups

Age groups(years)	n	%
0-4	7	20,0
5-10	8	22,9
11-15	5	14,3
16-18	15	42,9

According to the evaluation of the distribution of accidents over the years; it was determined that the most frequent deaths were in 2014 (20%) and at least in 2016 (5.7%). Distribution of accidents over the years; It is shown in Table 2. Accidents occurred most frequently in the summer season with 17 (48.6%) cases and in the spring season with at least 2 (5.7%) cases (Table 3).

Table-2. Distribution of accident numbers over the years

Year of accident	n	%
2019	4	11,4
2018	6	17,1
2017	5	14,3
2016	2	5,7
2015	6	17,1
2014	7	20,0
2013	5	14,3

Table-3. Distribution of accidents by season

Season	n	%
Summer	17	48,6
Autumn	12	34,3
Winter	4	11,4
Spring	2	5,7
Total	35	100

Accidents most often occurred in July with 7 (20%) cases. It was followed by 14.3% in August, September and June, 11.4% in October, November, 5.7% in December, and this rate was 2.9% in January, March and February. There were no traffic accident cases in the pediatric age group in April.

According to the distribution of traffic accidents within days, it was determined that the accidents occurred most on Sundays (22.9%), and the least accidents occurred on Friday (5.7%). It was observed that accidents were more common between 17:00 - 20:59 during rush hours.

Of the accidents 22.9% occurred in the city center, 62.9% in the districts, 11.4% in the village. 24 of these accidents (68.6%) occurred in urban areas and 9 of them in rural areas.

In this study, it was determined that 11 (31.4%) cases had in-vehicle traffic accidents, 9 (25.7%) cases had non-vehicle traffic accidents and 13 (37.1) cases had bicycle, motorcycle and tractor accidents.

In this study, 9 (25.7%) of the cases were pedestrians, 13 (37.1%) were passengers, 11 (31.4%) were motorcycles or cyclists (Table 4).

Table-4. Distribution of cases by accident situation

Victims' position in traffic	n	%
Passenger	13	37,1
Driver	11	31,4
Pedestrian	9	25,7
No data	2	5,7
Total	35	100

Among the vehicles involved in traffic accidents, automobiles ranked first (40%), then motorcycles (28.6%). Minibus accidents are 8.6%, tractor accidents are 5.7%, bicycle accidents are 5.7%, train and truck accidents are 2.9% (Table 5).

Table-5. Distribution of vehicle types involved in the accident

Vehicle Type	n	%
Automobile	14	40,0
Motorcycles	10	28,6
Minibus	3	8,6
Bicycle	2	5,7
Tractor	2	5,7
Train	1	2,9
Truck	1	2,9
No data	2	5,7

It was determined that the rate of multiple injuries (head-body-limb) was 40%, head-limb injuries were 37.1%, head-neck injuries were 8.6%, head-trunk and limb-trunk injuries were 5.7%, only limb injuries were 2.9% and there was no body injury only.

In the examination of injury zones; The most frequent injuries were craniofacial injuries with 32 cases (91%), then 23 cases (65.7%) and 24 cases (68.6%) had lower extremity and upper extremity injuries, respectively. It was determined the least injuries were neck injuries with 6 cases (17.1%).

In the examination of wound types; Abrasion in 33 (94.3%) cases, ecchymosis in 21 (60%) cases, crushing in 4 (11.4%) cases, laceration in 17 (48.6%) cases, amputation in 2 (5.7%) cases, hematoma in 17 (48.6%) cases, blunt body injuries in 10 (28.6%) of cases and limb deformation in 11 (31.4%) cases were detected.

97.1% of the accidents were internal organ injuries, the most common was intracranial injury with 17 cases (48.6%), 5 cases (14.3%) were intracranial-intrathoracic-intraabdominal injuries. it was determined that the least injury was intrathoracic-intraabdominal and only intrathoracic injury with 2.9%. Brain injuries were 85%, lung injuries 37.1%, liver injuries 22.9%, kidney injuries 20%, spleen injuries 11.4%, with no heart and intestinal injuries.

Bone fracture was detected in 94.3% of the cases. It was observed that there were single bone fractures in 11 cases and mutiple bone fractures in 22 cases. The rate of skull fractures was 31.4%, skull and limb fractures 20%, skull, trunk and limb fractures 11.4%, skull and trunk bones 17.1%, limb and trunk fractures only 5.7%, trunk bones only 2.9%. There were no bone fractures in two people from the cases collected.

Skull dome fractures were the leading fractures in 25 patients (71.4%).

Skull base fracture was detected in 54.3% of the cases, facial bone fracture in 17.1%, spinal fracture in 8.6%, costa fracture in 22.9%, clavicle fracture in 8.6%, pelvic fracture in 5.7%, femur fracture in 22.9%, tibia-fibula-foot bones fracture in 17.1%, humerus fracture in 11.4% and ulna-radius-hand bone fracture in 11.4% of the cases.

The leading cause of death due to traffic accidents was intracranial bleeding that developed as a result of head trauma with 17 (48.6%) cases. 31.4% of deaths occurred due to general body trauma, 8.6% due to chest trauma and 11.4% due to both head and chest trauma (Table 6).

Table-6. Causes of death resulting from traffic accidents

Cause of death	n	%
Head trauma	17	48,6
General body trauma	11	31,4
Head and chest trauma	4	11,4
Chest trauma	3	8,6

68.7% of cases died during clinical treatment, 25.7% of cases died at the scene of accident. It was determined that 40% of the cases were operated surgically and 74.3% were hospitalized (Table 7). While autopsy was performed in 10 (28.6%) of the cases, only external examination was performed in 25 (71.4%).

Table-7. Distribution of cases by death locations

Place of death	n	%
Crime scene	9	25,7
Hospital	26	74,3
Total	35	100,0

4. Discussion

Traffic accidents have an important place in pediatric age group deaths and are the main cause of death and disability among children in the 10-19 age group [8].

Children account for 21% of traffic accident-related deaths [9]. In our study, it was determined that 35 (55%) of 64 pediatric death cases examined in 7 years occurred due to traffic accidents.

In our study, 65.7% of the children who were exposed to traffic accidents were male, which is compatible with various articles [10-12]. Ince, et al. [13] found in their study that 63% of the patients who were exposed to serious accidents were male under the age of 10. In a similar study conducted by De Tomas, et al. [14], this rate was reported as 62%. The fact that 65.7% of the patients who died in our study were male and were exposed to multiple injuries supports the data above. The reasons for these results may be that boys are more active and careless about traffic rules [15].

Traffic accident injuries are mostly seen in children and young people [16]. In this study, it was most common in the 16-18 age group (42.9%). Similar to our study; In the study conducted by Oh, *et al.* [16], found that 26% of the cases were happening in the 15-17 age group, also Vera-Lopez, *et al.* [17] reported that they found 24% of the cases were happening in the 10-19 age group.

Although it seems that the number of accidents decreases in the following years in our study, we think that such a distribution occurred due to the fact that autopsy cases collected in one center in the first years were directed to other centers in the following years.

According to the traffic statistics of the Turkish National Police, it is reported that traffic accidents in Turkey occur frequently in July and at least in February [18]. Studies have reported that child deaths due to these accidents frequently occur between 14:00 and 18:00 [15]. In our study, the most frequent season is the summer, the month when the most occurring is July, the month when the least occurrence is February and the day when the most occurrence is Sunday. On the other hand, more accidents occurred between 17:00 and 20:59. Our study supports the data mentioned above.

In our country, a total of 2101 fatal traffic accidents occurred in 2019 and 2524 people died and 1,387 of these accidents occurred outside the urban area, 714 of them occurred at the urban area [18]. In our study, 25.7% of accidents occurred outside the urban area, 68.6% of the accidents occurred within the urban area.

In the study conducted by Baskin Embleton, *et al.* [19] 54% of injuries belonged to in-vehicle traffic accident and 29% to non-vehicle traffic accidents; Similarly, in this study, the majority of mortality associated with in-vehicle traffic accidents is 31.4%. Children who grow up in an environment with poor socioeconomic environment are exposed to more accidents, which are based on environmental conditions (inadequate maintenance of roads and traffic signs, less awareness of traffic rules, sociocultural level of drivers, etc.) and less interest of parents [20]. In our study, 5 of 9 non-vehicle traffic accidents cases with an average age of 8 died as a result of a motor vehicle crash in front of their home or in a residential area, while 6 and 11-year-old boys were riding their bicycles outside the residential area. We think that it will be beneficial to increase the areas where children can spend time such as playgrounds and bicycle paths.

In our study, 37.1% of dead cases were passengers, 25.7% were pedestrians, 31.4% were motorcycle or bicycle riders. In the study by Serinken *et al.*, it was reported that the rate of in-vehicle traffic accidents was 59%, the rate of non-vehicle traffic accidents was 19.9%, and bicycle and motorcycle accidents were 12% and 9%, respectively [15]. In other study, Lee *et al.* performed in cases between 0-16 years; They stated that the in-vehicle traffic accidents rate was 60.4%, non-vehicle traffic accidents was 28.5%, the rate of bicycle accidents was 9.9% and the rate of motorcycle accidents was 1.2% [21]. In a similar study by Vera-Lopez *et al.*, they stated that the in-vehicle traffic accidents rate was 33.8%, the non-vehicle traffic accidents rate was 15.4%, the bicycle and motorcycle accident rates were 10.6% and 39.7%, respectively [17]. While pedestrian children constitute 5-10% of all deaths due to traffic accidents in developed countries, this rate is 30-40% in developing and underdeveloped countries. While pedestrian children constitute 5-10% of all deaths due to traffic accidents in developed countries, this rate is 30-40% in developing and underdeveloped countries. In traffic accidents, a maximum of 5-14 age groups are at risk from pedestrian children [3]. It may be thought that child pedestrian deaths are more common in low and middle-income countries due to the lack of playgrounds for children thus the tendency of them playing on streets or avenues with motor vehicle traffic, or uncontrolled activities on roads with vehicle traffic for financial gain.

WHO states that bicycle accidents account for 2-8% of all child deaths due to traffic accidents all over the world and 1/3 of all child deaths due to traffic accidents in some countries in Asia are caused by children riding bicycles [3]. According to various studies, it has been reported that most of bicycle accidents occur in the 11-20 age group in Belgium, under the age of 15 in England, and in the 0-9 age group in Izmir [22]. Young people aged 15-25 constitute the majority of the cases who died as a result of motorcycle accidents [23]. In our study, it was found that 9 cases were motorcycle riders over 15 years old, and the age of two cyclists was 6 and 11 years old.

In our study, 74.3% of the patients are alive following their clinical treatment or first intervention in the emergency room and 25.7% died at the scene. It will be helpful to overcome the lack of knowledge about first aid, as the reason for the high rate of death at the scene may be related to insufficient first aid information and the severity of the injury [10].

In studies conducted in Turkey; Gören *et al.* reported a traffic accident-related autopsy rate of 1.2%. Karbeyaz *et al.* reported this rate as 1.1% in their studies [24]. In our study, unlike these rates, autopsy was performed in 10 (28.6%) cases and external medical examination was performed in 25 (71.4%) cases.

Deaths due to traffic accidents are most often caused by head injuries. In their study, Singha, *et al.* [20] reported that 81% of the causes of death due to traffic accidents were due to head trauma, and in a similar study conducted by Erkol, *et al.* [25], 96% of the causes of death caused by traffic accidents were related to head injuries. In our study, in accordance with these studies, it was observed that the cause of death in most of the cases (48.6%) was respiratory circulatory failure due to brain hemorrhage developing on the base of head trauma.

In most of the studies conducted in our country, injuries due to traffic accidents were found most frequently in the head and neck regions and then in the lower extremities [15, 25, 26]. In a study conducted in Brazil, traffic accidents involving cases of the pediatric age group were examined, and it was reported that lower extremity injuries were 37.5%, followed by upper extremity injuries, multiple injuries (25.1%) and chest-abdomen-pelvic region injuries (6.5%) respectively [27].

In our study, in which we examined children aged 0-18 years, it was found that craniofacial injury was the most common 32 cases (91%), similar to these studies. It was determined that injuries of the lower extremities and upper extremities occurred in 23 cases (65.7%) and 24 cases (68.6%) respectively. These injuries are followed by chest injuries with 12 cases (34.3%), and abdominal injuries with 11 cases (31.4%). According to these results, children

are seen to be affected more than adults in traffic accidents and it is seen that there is a need for research in different regions in our country [15].

5. Conclusion

According to the results of this study, especially boys are exposed to more accidents in July, on Sundays, in the city, at the end of working hours. Considering the increase of accidents in July and Sunday, when schools are holidays; It would be beneficial to review the traffic education given to the children and to increase the traffic controls and for parents to be more careful during the months and hours when the accidents are highest. Since the families and police reports could not be reached, the data on road condition and helmet-knee pad use, seat belt use, whether there is a child seat in the vehicle, and whether the child is sitting in the back or front seat are among the limitations of our study. The use of child seats in cars prevents a child in the vehicle from being thrown away from his seat in the event of an accident [28, 29]. Therefore, the use of child seats in cars prevents a child in the vehicle from being thrown from the seat in the event of an accident [28, 29]. For this reason, there should be awareness about the necessity of using a child seat and more promotion and education from post-natal hospital discharge to routine child follow-ups and all of these should be under the watch of family doctors [30, 31]. Not having children in the front seats, ensuring that their seat belts are fastened and that children use protectors, such as helmets, while using bicycles or motorcycles may reduce mortality. Traffic accident-related child injuries and deaths should be further researched for the cause and efforts should be made to reduce the mortality and morbidity rates in accidents.

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