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Research Article

Retrospective Analysis of Injuries Resulting from Traffic Accidents

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Abstract

Aim: To evaluate injuries and organ damage occurring in traffic accidents, and the cause of death in cases with mortality.
Material and Method: The study included cases involved in traffic accidents who presented at hospital in a 4-year period. The cases were evaluated in respect of age, gender, injuries, alcohol consumption, form of involvement in traffic, and cause of death in deceased cases. The data were analyzed using SPSS vn. 26.0 software.
Results: The total 3039 cases included in the study comprised 68.08% males and 31.92% females. Of the cases who presented at hospital, 4.11% died. The age group most involved in accidents was the 20-29 years group. The bones most frequently fractured were the costae. According to body regions, the nasal bone was the bone most often fractured in the head region, the humerus in the upper extremities, the pubis in the pelvis, the tibia in the lower extremities, and the costae in the chest region. The abdominal organ most often damaged was the liver.
Conclusion: A statistically significant correlation was determined between gender and fractures of the ischium, sacrum, iliac, and pubic bones, with these fractures seen more in females than males. This higher rate of pelvic fractures in females can be attributed to the differences in male and female pelvic anatomy.

Keywords: Traffic accidents, injuries, death

INTRODUCTION

Traffic accidents have started to become a significant health problem both in Türkiye and throughout the world. According to World Heaalth Organization (WHO) data, there are approximately 1.19 million deaths per year as a result of traffic accidents, more than 20-50 million individuals are injured, and most of these injuries result in disability (1).

Traffic accidents cause significant economic losses for both individuals and society. According to WHO data, road traffic accidents constitute a cost of 3% of gross domestic product of many countries (1). These losses are due to not only treatment costs, but also the loss of productivity of family members requiring leave of absence from work or school to care for those who are injured or disabled, and of those who die because of their injuries. Due to the increased number of vehicles with the economic development of countries, there has been an increase in the number of traffic accidents and deaths related to traffic accidents (2). One of the most frequent causes of early death throughout the world is traffic accidents (3). Injuries sustained in road traffic acidents are the leading cause of death for children and young adults aged 5-29 years (1). Traffic accidents are ranked 12th in the causes leading to death worldwide (4).

Together with developing technology, transport options have increased both in Türkiye and throughout the world. Although the options have increased, road transport is generally predominant worldwide, and this is the case in Türkiye (5).

The aim of this study was to determine injuries and organ damage occurring in traffic accidents, and the cause of death in cases with mortality.

MATERIAL AND METHOD

Approval for the study was granted by the Health Sciences Non-Interventional Clinical Research Ethics Committee of İnönü University (Decision no: 2021/2763, Session no: 24, Dated: 30.11.2021). Data of the cases included in the study were retrieved from the ward notes, consultation notes, radiological images, radiological results, laboratory tests,

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epicrisis notes, and the records of polyclinic follow-up examinations in the hospital automated records system.

The patients involved in traffic accidents were evaluated in respect of age, gender, injuries, cause of death, alcohol consumption, and type of traffic accident. The patients were separated into age groups, as 0-9 years (0=birth to 12 months), 10-19 years, 20-29 years, and in decades thereafter.

The type of traffic acident was defined as unknown, within vehicle-driver, within vehicle -passenger, within vehicle-unknown whether driver or passenger, not in a motor vehicle (pedestrian, cyclist), motorcycle, tractor, other agricultural vehicles, train. Traffic accidents experienced by individuals within cars, buses, minibuses, lorries, pickup trucks, articulated lories, and tow trucks, were accepted as "within vehicle traffic accident".

Statistical Analysis

Data obtained in the study were analyzed statistically using IBM SPSS Statistics vn. 26.0 software. In the analyses of the data, the Pearson Chi-square test, and Yates corrected Chi-square test were used. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

Within the defined study period, a total of 3039 individuals were involved in traffic accidents. The most presentations at hospital because of a traffic accident were seen to be in 2020 (Table 1).

Table 1. Number of traffic accidents per year

Year	n (%)
2017	764 (25.1)
2018	723 (23.8)
2019	758 (24.9)
2020	794 (26.1)
Total	3039 (100)

The type of traffic accident seen most frequently was within-vehicle traffic accident and train accidents were seen the least often. As the province of Malatya is an agricultural area, there were also accidents involving tractors and other agricultural vehicles (Table 2).

Table 2. Types of traffic accidents in which the cases were involved

Type of traffic accident	n (%)
Unknown	182 (5.99)
Within vehicle-unknown whether driver or passenger	1783 (58.67)
Within vehicle-driver	128 (4.21)
Within vehicle-passenger	138 (4.54)
Not a motor vehicle (pedestrian, bicycle)	427 (14.05)
Motorcycle	188 (6.19)
Tractor	110 (3.62)
Other agricultural vehicle	78 (2.57)
Train	5 (0.16)
Total	3039 (100)

The total cases comprised 68.08% males and 31.92% females. The mean age was determined to be 33.806±19.447 years, median age was 31 years, and the age range was from 0 to 95 years. The age group most involved in traffic accidents was determined to be the 20-29 years age group, followed by the 30-39 years group (Table 3).

Table 3. Distribution of traffic accident cases according to gender and age groups

		n (%)
Gender	Male	2069 (68.08)
	Female	970 (31.92)
Age groups (years)	0-9	306 (10.07)
	10-19	469 (15.43)
	20-29	679 (22.34)
	30-39	514 (16.91)
	40-49	406 (13.36)
	50-59	287 (9.44)
	60-69	227 (7.47)
	70-79	120 (3.95)
	80-89	28 (0.92)
	90-99	3 (0.10)

Alcohol was determined to be present in 152 (5%) cases. As there were cases of unknown type of accident, the rate of drivers who had consumed alcohol could not be clearly determined. Mortality developed in 125 (4.11%) of the traffic accident cases. The cause of death was determined by examining the data in the hospital information system (clinician notes, radiological imaging results, etc.). For the cases where the cause of death could not be explained from the hospital data, the autopsy reports had to be examined, but as the forensic autopsies were conducted in a different centre, the autopsy reports could not be accessed. Of the exitus cases, the cause of death was skull fracture together with intracranial bleeding in 14.4%, and in 30.4% of casaes, the cause of death could not be determined (Table 4).

Table 4. Cause of death in traffic accident cases

Cause of death	n (%)
No death	2914 (95.89)
Cause of death undetermined	38 (1.25)
Skull fracture together with intracranial bleeding	18 (0.59)
Only internal organ damage	18 (0.59)
Internal organ damage together with intracranial bleeding	16 (0.53)
Internal organ damage, skull fracture, and intracranial bleeding	15 (0.49)
Only intracranial bleeding	8 (0.26)
Only skull fracture	5 (0.16)
Internal organ damage together with major vascular injuries	3 (0.10)
Internal organ damage and skull fracture	2 (0.07)
Medulla spinalis injury together with skull fracture	1 (0.03)
Only major vascular injuries	1 (0.03)

The bones most frequently fractured were determined to be costae at the rate of 12.08%, followed by vertebrae at 10.86%, and the nasal bone at 4.74%. The bone most often fractured in the head region was determined to be the nasal bone. In the other regions of the body, the most frequently fractured bones were seen to be the humerus (3.29%) in the upper extremities, the pubis (3.92%) in the pelvis, the costae (12.08%) in the chest region, and the tibia (4.74%) in the lower extremities. The liver was determined to be the abdominal organ most often damaged (2.40%) (Table 5).

Table 5. Injuries resulting from traffic accidents

Injury type	n (%)	Injury type	n (%)
Nasal fracture	144 (4.74)	Humerus fracture	100 (3.29)
Subarachnoid bleeding	141 (4.64)	Radius fracture	98 (3.22)
Frontal fracture	97 (3.19)	Ulna fracture	56 (1.84)
Subdural bleeding	96 (3.16)	Metacarpal fracture	28 (0.92)
Temporal fracture	86 (2.83)	Hand phalanx fracture	26 (0.86)
Maxilla fracture	79 (2.60)	Carpal bone fracture	16 (0.53)
Orbita fracture	72 (2.37)	Shoulder dislocation	8 (0.26)
Cerebral contusion	69 (2.27)	Elbow dislocation	2 (0.07)
Zygoma fracture	62 (2.04)	Pubis fracture	119 (3.92)
Epidural bleeding	57 (1.88)	Acetabulum fracture	78 (2.57)
Occipital fracture	46 (1.51)	Sacrum fracture	58 (1.91)
Parietal fracture	45 (1.48)	Iliac fracture	51 (1.68)
Mandibula fracture	40 (1.32)	Ischium fracture	46 (1.51)
Sphenoid fracture	34 (1.12)	Sacroiliac separation	24 (0.79)
Ethmoid fracture	32 (1.05)	Hip dislocation	19 (0.63)
Pneumocephaly	27 (0.89)	Pubic diastasis	9 (0.30)
Cerebral parenchyma bleeding or hematoma	22 (0.72)	Tibia fracture	144 (4.74)
Diffuse axonal damage	18 (0.59)	Femur fracture	137 (4.51)
Cornea laceration	12 (0.39)	Fibula fracture	113 (3.72)
Ventricular bleeding	6 (0.20)	Tarsal bone fracture	37 (1.22)
Septum fracture	6 (0.20)	Patella fracture	31 (1.02)
Sclera laceration	2 (0.07)	Metatarsal fracture	28 (0.92)
Cerebellar bleeding-hematoma	2 (0.07)	Foot phalanx fracture	10 (0.33)
Costae fracture	367 (12.08)	Liver laceration or hematoma	73 (2.40)
Lung contusion	190 (6.25)	Spleen laceration or hematoma	46 (1.51)
Pneumothorax	177 (5.82)	Kidney laceration or hematoma	21 (0.69)
Clavicle fracture	126 (4.15)	Renal gland bleeding or hematoma	4 (0.13)
Hemothorax	91 (2.99)	Stomacch or intestine perforation	4 (0.13)
Scapula fracture	91 (2.99)	Bladder rupture	2 (0.07)
Sternum fracture	45 (1.48)	Testis injury	2 (0.07)
Traumatic cyst in the lung	15 (0.49)	Pancreas laceration	2 (0.07)
Acromioclavicular dislocation-separation	7 (0.23)	Placenta detachment	1 (0.03)
Diaphragm rupture	1 (0.03)	Urethra rupture	1 (0.03)
Mitral papillary muscle rupture	1 (0.03)	Ureter rupture	1 (0.03)
Vertebra fracture or dislocation	330 (10.86)	Nerve damage	22 (0.72)
Spinal cord injury	6 (0.19)	Compartment syndrome	2 (0.07)
Tendon rupture	43 (1.41)	Major vascular injury	27 (0.89)

Costae fractures were seen most in males, and vertebrae fracture/dislocation in females. A significant correlation was determined between ischium, sacrum, iliac, and pubic fractures and gender, with these fractures seen more in females than in males. A significant correlation was determined between costa, zygoma, and scapula fractures and gender with these fractures seen more in males than in females (Table 6).

Table 6. Distribution of injuries according to gender

		Gender		p value
		Male n (%)	Female n (%)	
Ischium fracture	**Absent**	2050 (99.08)	943 (97.22)	**<0.001****
	Present	19 (0.92)	27 (2.78)	
Sacrum fracture	**Absent**	2043 (98.74)	938 (96.70)	**<0.001***
	Present	26 (1.26)	32 (3.30)	
Iliac fracture	**Absent**	2042 (98.70)	946 (97.53)	**0.029****
	Present	27 (1.30)	24 (2.47)	
Pubic fracture	**Absent**	2012 (97.25)	908 (93.61)	**<0.001***
	Present	57 (2.75)	62 (6.39)	
Costa fracture	**Absent**	1799 (86.95)	873 (90.00)	**0.016***
	Present	270 (13.05)	97 (10.00)	
Scapula fracture	**Absent**	1996 (96.47)	952 (98.14)	**0.016****
	Present	73 (3.53)	18 (1.86)	
Zygoma fracture	**Absent**	2019 (97.58)	958 (98.76)	**0.045****
	Present	50 (2.42)	12 (1.24)	
Vertebra fracture and dislocation	**Absent**	1844 (89.13)	865 (89.18)	0.967*
	Present	225 (10.87)	105 (10.82)	

*: Pearson Chi-square test, **: Yates corrected chi-square test

DISCUSSION

The gender distribution of the traffic accident cases in this study was found to be 68.08% males and 31.92% females. In a study in Sri Lanka by Fernando et al., the rate of males was 72% and females was 28% (6). Gender distribution in other studies has been determined to be males 69.7% and females 30.3% by Varlik et al. (7), 68.2% males and 31.8% females by Perysinakis et al. in a study in Crete (8), 71.2% males and 28.8% females by Kourouma et al. in a study in Guinea (9), and 69% males and 31% females by Özdemir et al. in a study in İstanbul (10). The current study rates were seen to be consistent with those of previous studies.

The mean age of the traffic accident cases in the current study was 33.806±19.447 years and the median age was 31 years. Previous studies in Türkiye have reported these ages as mean 35.33±18.26 years and median 32 years by Polat in a study in Edirne (11), 32.06 years by Özdemir et al. in İstanbul (12), mean 30.57±18.44 years by Varol et al. in Sivas (13), and mean 35 years by Çetinoğlu et al. in Samsun (14). The mean age of the cases in the current study was seen to be consistent with these previous studies.

In the current study, the age group that presented most often at hospital was the 20-29 years age group (22.34%), followed by the 30-39 years group (16.91%). In a study in İzmir, Bilgin et al. reported that the 21-25 years age group (13.4%) was most freqquently involved in traffic accidents, followed by the 26-30 years age group, and in total the 21-30 years group was involved in traffic accidents at the rate of 26.3% (15). Özdemir et al. determined traffic accident cases in the 19-35 years age group at the rate of 44.2% in İstanbul (10). In a study in Tokat by Armağan et al., there was seen to be a peak in patients in the age range of 20-30 years (16). The current study results on this point were consistent with the findings in literature. The greater involvement of the young population in traffic accidents can be attributed to a more active social life, more travelling, and using more exciting and fast cars.

The types of accidents in the current study were found to be within vehicle traffic accidents at the rate of 67.42%, outside the vehicle at 14.5%, motorcycle accidents at 6.19%, tractor accidents at 3.62%, and other agricultural vehicle accidents at 2.57%. In a study in Edirne, Polat et al. reported rates of 55.5% for within vehicle accident cases and 44.5% for outside the vehicle (11). Bilgin et al. reported 48.6% within vehicle acccidents and 46.3% outside the vehicle in a study in İzmir (15). In a study in Ankara, Durdu et al. determined that most traffic accidents were within vehicle accidents followed by outside the vehicle, and motorcycles (17). Özdemir et al. in İstanbul stated rates of 51.4% within vehicle accidents, 29.5% outside the vehicle, 16.6% motorcycles, 1.9% bicycles, and 0.6% horse-drawn vehicles (10). The rate of within vehicle traffic accidents in the current study was higher than the rates reported in

these other studies.

The current study results showed that ischium, sacrum, iliac, and pubic fractures occurred more in females than in males. Compared to males, the pelvic bones of females are thinner, the attachment sites of muscles and ligaments are less evident, the spina iliaca anterior superior are further from each other and the apertura pelvis superior is round in shape and wider (18). That there were more ischium, sacrum, iliac, and pubic fractures in females was thought to be due to the difference in pelvis anatomy.

In the current study, the costae were the bones most frequently fractured, followed by vertebrae fracture/dislocation. When evaluated according to body regions, the most frequently fractured bones were seen to be the humerus in the upper extremities, the pubis in the pelvis, and the tibia in the lower extremities. In males the most frequently fractured bones were the costae, and in females vertebrae fracture/dislocation. When traffic accidents were evaluated in general by Polat et al. in a study in Edirne, the most frequently fractured bones were determined to be the costae, followed by vertebrae (11). In another study by Aloudah et al. in Saudi Arabia of patients hospitalised because of of bone fracture following a traffic accident, the femur was seen to be the most frequently fractured bone, followed by the humerus, and vertebrae. In males, the femur was fractured most often and in females, the humerus (19). In a study in Nigeria by Igho et al., of the bones fractured after a traffic accident, the femur was seen to be the most frequent followed by the tibia/fibula (20). The results of the current study were seen to be consistent with the findings of some studies and different from those of some others.

CONCLUSION

Traffic accidents are a preventable health problem. To be able to decrease the number of traffic accidents, more importance must be given to traffic education, practical examinations should be longer and more difficult, and the driving ability of individuals should be sufficiently supervised. For drivers, passengers, and pedestrians to follow the rules of the road, traffic penalties should be increased to an amount that will be a deterrant.

A significant correlation was determined between ischium, sacrum, iliac, and pubic fractures and gender, with these fractures seen more in females than in males. That there were more pelvic fractures in females was thought to be due to the difference in pelvis anatomy.

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