CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Forensic medical assessment of amusement park injuries

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Received: 09 August 2024
Accepted: 04 September 2024
Published: 11 October 2024

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Abstract

Objective: Amusement park injuries can cause significant harm, especially in children and adolescents. This study aims to evaluate the cases of amusement park injuries presented to the Forensic Medicine Department in Eskişehir/Turkey over a 10-year period, to publish the characteristics of the injuries and demographic data with the literature.

Methods: Cases of amusement park injuries presented to the Forensic Medicine Department of Eskişehir Osmangazi University Faculty of Medicine(Turkey) between 2014-2023 were retrospectively evaluated. Age, gender, injury patterns, and the content of forensic reports of the cases were assessed.

Results: Over the 10-year period, 12 cases of amusement park injuries were reported to our department. Eight cases were male and four were female, with the youngest case being 13 and the oldest 23 years old. Nine cases involved falls and dragging, two involved falls and being trapped under objects, and one involved being crushed. Six cases sustained injuries that could be managed with simple medical intervention, six required more extensive medical care, and one was life-threatening.

Conclusion: Amusement park injuries are forensic cases. There is confusion regarding responsibility and legislation. Legal regulations and more effective inspections are needed for the legal process in injury cases. It is essential for physicians in emergency departments to recognize that amusement park injuries are forensic cases and report them accordingly.

Keywords: Amusement park; injury; forensic medicine

You may cite this article as: Simsek U, Saka B, Kiliboz T, Polat N, Kose OS, Karbeyaz K. Forensic medical assessment of amusement park injuries. *Cerasus J Med.* 2024;1(3):185-189. doi: 10.70058/cjm.1530368

Introduction

Injuries occurring at amusement parks can result in significant harm and even death, particularly among children and adolescents [1-8]. Numerous fatalities due to injuries such as falls, ejections, and crushes from/by amusement park rides have been reported in the literature [1,4]. The nature of injuries varies depending on the type, speed, and mechanism of the amusement park rides [4]. Injuries can result from neglected maintenance, technical faults, or user non-compliance with safety rules [9].

Amusement parks are equipped with a variety of complex mechanical systems designed to ensure the safety of their users. These systems include seat belts, emergency brakes and safety barriers, all of which require regular maintenance and inspection. Failure to follow these safety protocols can lead to serious accidents. Inspections of technical, hygiene and safety procedures in amusement parks are carried out by various agencies such as the municipal police, engineering chambers, the Ministry of Health and law enforcement agencies under the Ministry of Interior. This creates a complex situation. A more organized inspection system should be developed.

This study aims to evaluate the cases of amusement park injuries presented to the Forensic Medicine Department in Eskişehir over a 10-year period, publish the characteristics of the injuries and demographic data with the literature, and draw attention to the issue.

Materıals and methods

Cases of amusement park injuries presented to the Forensic Medicine Department of Eskişehir Osmangazi University Faculty of Medicine between 2014-2023 were retrospectively evaluated. Age, gender, injury patterns, injury locations, treatment methods, and the content of forensic reports were assessed. Health problems arising from fights, food stand poisonings, or other incidents in the amusement park were excluded from the study. Only injuries sustained on amusement rides were included.

Forensic reports were prepared by evaluating examination findings, all hospital documents related to the incident, and necessary consultations with relevant departments. Initial forensic examination reports prepared in emergency departments were reviewed for accuracy. Data were loaded into a statistical package for evaluation and analysis.

Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Eskişehir Osmangazi University.

Statistical analysis

IBM-Statistical Package for Social Sciences (IBM-SPSS Inc., Chicago, IL, USA) 22.0 programme was used to analyse the data obtained in the study. The conformity of the data to normal distribution was analysed by “Kolmogorov Smirnov test”. Continuous variables were expressed as mean ± standard deviation and categorical variables were expressed as number and percentage. ‘One-Way ANOVA test’ was applied in the analysis of continuous variables. Chi-square test or Fisher’s exact test was used to analyse categorical variables. Statistical significance level was accepted as $p<0.05$.

Results

In the 10-year period, 12 cases of amusement park injuries were reported to our department. All cases were classified as accidents in investigation files. The gender, age, injury characteristics, and forensic report contents of the cases are presented in Table 1. Four cases were injured on ballerina rides, three on Ferris wheels, two on roller coasters, two on carousels, and one on bumper cars. Eight cases were male and four were female, with the youngest case being 13 and the oldest 23 years old. Nine cases involved falls and dragging, two involved falls and being trapped under objects, and one involved being crushed.

According to the forensic evaluation guidelines of the Injury Crimes in Turkish Penal Code, six cases sustained injuries manageable with simple medical intervention, six cases required more extensive medical care, and one case was life-threatening [10]. Six cases had fractures: two had tibia and fibula fractures, two had radius fractures, one had a phalanx fracture, and one had a temporal bone fracture. The life-threatening case involved a temporal bone fracture and brain hemorrhage due to a fall from a ballerina ride. Six cases were treated as outpatients, and six were hospitalized: five in the orthopedic ward and one in

the neurosurgery ward. One case with tibia and fibula fractures underwent surgery, while others were treated conservatively. The neurosurgery case underwent surgery and was treated in intensive care for three days. No fatalities were reported.

Discussion and conclusion

Amusement park injuries are forensic cases. No other studies evaluating the forensic medical aspects of amusement park injuries have been found in our country. Males are more frequently injured in forensic cases [11-15]. A study in Bolu (Turkey) reported that 66.4% of forensic cases presented to emergency services were male [13]. In Bursa (Turkey), this rate was 68.4% [14]. In Sivas (Turkey), 76.8% of forensic cases presented to Cumhuriyet University Faculty of Medicine Forensic Medicine Department were male [11]. In Eskişehir (Turkey), 79.7% of life-threatening forensic injury cases were male [12]. Consistent with the literature, two-thirds of the cases in our study were male.

Table.1 Distribution of age, gender and injury characteristics of the cases

		Gender	
		Male	Female
Age Group	< 18 years old	7	3
	18 years and over	1	1
Instrument That Caused The İnjury	Ballerina Ride	2	2
	Ferris wheel	2	1
	Roller Coster	2	0
	Carousel	1	1
	Bumper car	1	0
Type of Injury	Falling and dragging	6	3
	Falling and being trapped under objects	1	1
	Crash	1	0
Can Be Resolved With Simple Medical Intervention	Yes	4	2
	No	4	2
Life Threatening	Yes	1	0
	No	7	4
Bone Fracture	Yes	4	2
	No	4	2
Injured Body Part*	Head and neck	3	2
	Thorax	1	1
	Abdomen	1	0
	Extremities	5	2

* More than one body part was injured in 3 cases.

Amusement park injuries can lead to severe injuries and fatalities [1-8]. Between 1990 and 2010, 92,885 children under 18 years old were reported to have presented to emergency services in the United States due to amusement park injuries [16]. Olympia and colleagues reported 95 cases of amusement park injuries in Eastern Pennsylvania between May and September 2006 [2]. Braksiek et al. reported subdural hematomas, internal carotid artery dissections, vertebral artery dissections, subarachnoid hemorrhages, intraparenchymal hemorrhages, and carotid artery thrombosis-related strokes in amusement park injuries between 1979-2001 [1]. Deniz et al. reported three cases of amusement park injuries, one of which was fatal [9]. In Canada, 13,770 injuries and 128 serious injuries related to amusement parks were reported in 2010 [17]. A study in South Korea reported 3,608 amusement park injuries in 2008, with two-thirds being soft tissue injuries [4]. Eid et al. presented a case of spinal cord infarction due to an amusement park injury [18]. Our study did not report any fatalities. Six cases had injuries that could not be managed with simple medical intervention, and one case was life-threatening, involving a temporal bone fracture and intraparenchymal brain hemorrhage due to a fall from a ballerina ride.

There are insufficient scientific studies on amusement park injuries in our country. Multi-center studies on the subject would be beneficial for understanding the importance, raising awareness, and taking necessary precautions. It is believed that amusement park rides are only used in specific seasons, resulting in insufficient mechanical maintenance. There is confusion regarding responsibility and legislation. Legal regulations and more effective inspections are needed for the legal process in injury cases. It is crucial for physicians in emergency departments to recognize amusement park injuries as forensic cases and report them accordingly. Forensic reports should be meticulously prepared following the "Guidelines for the Forensic Medical Evaluation of Injury Crimes in the Turkish Penal Code."

Funding: There is no institution or person supporting this study.

Conflict of Interest: None of the authors have a conflict of interest.

Authors' contribution: Concept: U.S, B.S, T.K, N.P, O.S.K, K.K. Design: U.S, B.S, T.K, N.P, O.S.K, K.K. Data Collection or Processing: U.S, B.S, T.K, N.P, O.S.K, K.K. Analysis or Interpretation: U.S, B.S, T.K, N.P, O.S.K, K.K. Literature Search: U.S, B.S, T.K, N.P, O.S.K, K.K. Writing: U.S, B.S, T.K, N.P, O.S.K, K.K.

Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Eskişehir Osmangazi University with decision number 02/05/2024 -153.

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