

Forensic medical evaluation of non-fatal occupational accidents: the case of Eskişehir

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Abstract

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Objective: Occupational accidents are forensic cases that represent a significant public health issue across all countries. This study retrospectively evaluated non-fatal occupational injury cases referred to our forensic medicine clinic for trauma-related assessment. The aim was to share the demographic and incident-related characteristics of these cases in light of the existing literature.

Method: The cases of non-fatal occupational accidents admitted to Eskişehir Osmangazi University Faculty of Medicine, Department of Forensic Medicine between the years 2019-2024 were evaluated retrospectively. Demographic data, injury types, injury severity and forensic report contents of the cases were evaluated. The data were uploaded to SPSS programme and evaluated. Frequency, standard deviation, median, mode, minimum and maximum values were used and chi-square test was applied. Statistical significance was accepted as $p < 0.05$.

Results: During the study period, forensic reports were prepared for 132 cases of occupational accidents in our department. It was found that 88.6% ($n=117$) of the cases were male, the mean age was 32.15 ± 7.9 years, the most common injuries occurred in summer months ($n=59$, 44.7%), the most common injuries occurred in the form of falling from height ($n=35$, 26.5%), and the most common injuries occurred in the upper extremities ($n=45$, 34.1%).

Conclusion: It is thought that injury characteristics should be known for measures to prevent occupational accidents. It was determined that the data in this study were generally compatible with the literature.

Keywords: Occupational Accident, Trauma Scoring, Forensic Report, Clinical Forensic Medicine, Forensic Medicine

Öz

Ölümle sonuçlanmayan iş kazalarının adli tıbbi değerlendirilmesi: Eskişehir deneyimi

Amaç: İş kazaları, her ülkede karşılaşılan ve önemli halk sağlığı sorunları arasında yer alan adli nitelikli olgulardır. Bu çalışmada, kliniğimizde travma nedeniyle adli tıbbi değerlendirmesi yapılan ve ölümle sonuçlanmamış iş kazası olguları retrospektif olarak incelenmiştir. Olguların demografik ve olayla ilişkili özelliklerinin literatürle paylaşılması amaçlanmıştır.

Yöntem: Eskişehir Osmangazi Üniversitesi Tıp Fakültesi Adli Tıp Anabilim Dalına 2019-2024 yılları arasında başvuran, ölümle sonuçlanmamış iş kazası olguları retrospektif olarak değerlendirilmiştir. Olgulara ait demografik veriler, yaralanma şekilleri, yaralanma ağırlıkları ve adli rapor içerikleri değerlendirilmiştir. Veriler SPSS programına yüklenerek değerlendirilmiştir. Frekans, standart sapma, medyan, mod, minimum ve maksimum değerler kullanılmış ve ki-kare testi uygulanmıştır. İstatistiksel olarak anlamlılık $p < 0.05$ olarak kabul edilmiştir.

Bulgular: Çalışmanın kapsadığı dönemde Anabilim dalımızda, 132 iş kazası olgusuna adli rapor düzenlenmiştir. Olguların % 88,6'sının ($n=117$) erkek olduğu, yaş ortalamalarının $32,15 \pm 7,9$ olduğu, yaralanmaların en sık yaz aylarında meydana geldiği ($n=59$, % 44,7) olguların en sık yüksekten düşme şeklinde yaralandığı ($n=35$, % 26,5), yaralanmaların en sık üst ekstremitelerde ($n=45$, % 34,1) meydana geldiği saptanmıştır.

Sonuç: İş kazalarını önlemeye yönelik tedbirler için yaralanma özelliklerinin bilinmesi gerektiği düşünülmektedir. Bu çalışmadaki verilerin genel olarak literatürle uyumlu olduğu tespit edilmiştir.

Anahtar Kelimeler: İş Kazası, Travma Skorlaması, Adli Rapor, Klinik Adli Tıp, Adli Tıp

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INTRODUCTION

Occupational accidents are a major public health problem that negatively affects the health and working life of employees and may lead to economic and social problems (1-3). Written rules related to occupational accidents have been found in historical documents. For example, there are provisions related to occupational accidents in the Code of Hammurabi (4). With the industrial revolution, machines and technology are used more and more every day. In parallel with this, the measures to be taken regarding occupational accidents have also differentiated and increased (5,6). Occupational accident is defined as “an event that occurs in the workplace or due to the execution of the work, which causes death or makes the body integrity mentally or physically disabled” (7). According to International Labour Organisation (ILO) data, 2.93 million people die and 395 million people are injured annually worldwide due to occupational accidents (8). Mechanisms and injury characteristics of occupational accidents may vary greatly according to the nature of the work and the characteristics of the event (9,10). Occupational accidents may be caused by machinery, workers or the environment. Periodic maintenance of machines and all devices, making the workplace environment safe, regular training of employees on occupational safety according to the characteristics of the workplace will reduce occupational accidents (4,9,10). Regional and multi-centre studies on occupational accidents will be guiding in terms of taking necessary measures.

All occupational accidents are forensic cases. In the cases admitted to a health institution due to occupational accidents, occupational accident and forensic case notification should be made together in order to carry out the necessary investigations (11). Occupational accidents have an extremely important place in forensic medicine practice. Forensic reports to be prepared related with occupational accidents are important for criminal investigation and compensation arising from the accident. In this study, it was aimed to evaluate the cases which were admitted to our Department of Forensic Medicine due to occupational accidents and did not result in death and to share them with the literature.

MATERIALS AND METHOD

The cases of non-fatal occupational accidents admitted to Eskişehir Osmangazi University Faculty of Medicine, Department of Forensic Medicine between 2019 and 2024 were evaluated retrospectively. Demographic data, injury types, injury severity and forensic report contents of the cases were evaluated. Information about the cases was obtained from forensic reports and data in the hospital automation system. Parameters such as age, gender, distribution according to the season of the incident, origin of the incident, mechanism of occurrence, injured body region, distribution of occupations according to sectors, blood ethanol level were

analyzed. The cases were analysed according to parameters such as mild injury that can be remedied with a simple medical intervention, leading to a life-threatening situation, causing permanent weakening or loss of function of one of the senses or organs, causing a permanent change in the face with a permanent scar on the face, and whether there was a bone fracture. Injuries were evaluated according to the guideline named “Guideline for the Evaluation of Injury Offences Defined in the Turkish Criminal Code in terms of Forensic Medicine”. Since the final reports submitted to our department and the records available in the hospital automation system were handled, the limitations of our study include the inability to access important information such as the educational status of the cases, occupational information, the day and shift of the accidents, lost working days, and details of the business lines. The data were uploaded to a statistical package programme and evaluated. Frequency, standard deviation, median, mode, minimum and maximum values were used and chi-square test was applied. Statistical significance was accepted as $p < 0.05$.

The study was approved by the Eskişehir Osmangazi University Non-Interventional Clinical Research Ethics Committee with the decision dated 28/11/2024 and numbered 38. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

In the 5-year period covered by the study, 6318 forensic reports related to forensic traumatology were prepared in our department. It was determined that 132 (2.1%) of these reports were issued due to occupational accidents. In our study, 88.6% ($n=117$) of the patients injured due to occupational accidents were male and 11.4% ($n=15$) were female.

The youngest and oldest cases were 17 and 64 years old, respectively, with a mean age of 32.15 ± 7.9 years. Injuries were most common in the 30 to 39 age group ($n=45$, 34.1%) and there were 2 cases (1.5%) under the age of 18 (Graph 1).

It was found that occupational accidents occurred most frequently in summer ($n=59$, 44.7%). Then, it was determined that accidents occurred in spring ($n=37$, 28%), fall ($n=28$, 21.2%) and winter ($n=8$, 6.1%), respectively.

It was found that the most common injury was a fall from a height ($n=35$, 26.5%) (Graphic 2). Crush injuries were the second most common injury ($n=33$, 25%).

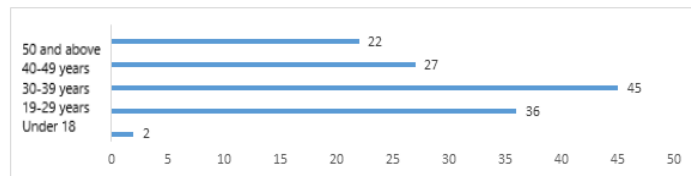
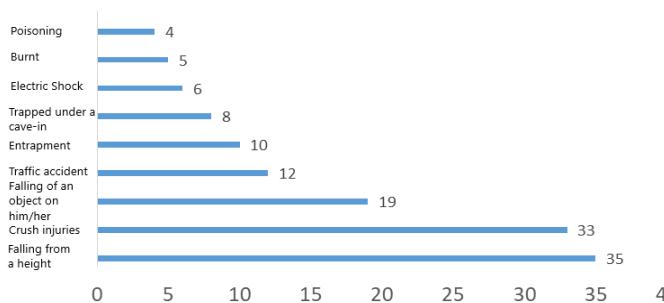
The most common injuries occurred in the upper extremities ($n=45$, 34.1%). 4 cases were poisoning cases. In 10 cases, more than one body region was injured (Table 1).

44 cases (33.3%) were injured while working in construction (Graph 3). 32 cases (24.2%) were injured in heavy industrial

Table 1. Distribution of injury sites

Site of Injury	n	%
Upper extremity	45	34.1
Lower extremity	39	29.5
Chest	21	15.9
Abdomen	18	13.6
Head, neck	15	11.4

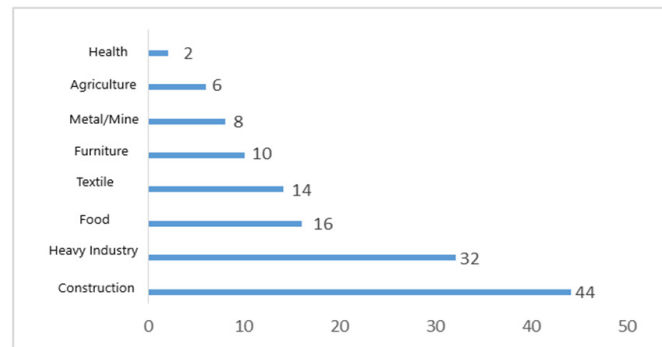
*In 10 cases, more than one body part was injured

**Graph 1.** Distribution of cases according to age groups**Graph 2.** Distribution of injury types

factories or repair and maintenance works. Table 2 presents the distribution of the workplaces in which the cases were injured according to gender. It was determined that 5 of the female cases were injured in food sector and 6 in textile sector.

It was determined that 78 (59.1%) of the cases had injuries that could not be treated with simple medical intervention, 43 (32.6%) had bone fractures, and 24 (18.2%) had life-threatening injuries. 8 cases (6.1%) were found to have loss of function. In 3 cases (2.3%), there was a permanent scar on the face due to the incident. There was no significant difference between forensic report contents and gender (Table 3).

In 55 cases (41.7%), it was observed that there was no information about the blood alcohol level of the injured person in the Emergency Service notes. Alcohol was detected in the blood in 6 (7.8%) of the 77 cases in which there was information about alcohol. No drug or stimulant substance was detected.

**Graph 3.** Distribution of occupational accidents by business lines

63 (47.7%) of the cases were discharged after outpatient treatment. Of the 69 inpatients (52.3%), 45 (65.2%) underwent surgery. Among the 69 hospitalized cases, the mean length of hospital stay was 5.9 ± 5.1 days. When stratified by injury site, cases with head and neck injuries and lower extremity injuries had significantly longer hospital stays compared to other injury types ($p < 0.05$). This suggests that such injuries are associated with more complex clinical management and prolonged recovery periods.

DISCUSSION

In our study, 132 cases of occupational accidents that did not result in death in a 5-year period were evaluated. This corresponds to 2.1% of all forensic traumatology cases in the same period. Although there are regional differences according to the region where the study was conducted, it is observed that males are more frequently injured in studies on occupational accidents (1-4, 12,13). In a study conducted by Kadioğlu et al. in Kütahya, it was reported that 89.3% of the patients admitted to the emergency department due to occupational accidents were male (12). Asılbaş et al. reported that this rate was 97.5% (1). In a study conducted by Oğuzlar et al. in a university hospital, 89.8% of the patients who were injured due to occupational accidents and admitted to the emergency department were found to be male (13). In this study, 88.6% ($n=117$) of the cases were found to be male and 11.4% ($n=15$) were found to be female in accordance with the literature. The reason for this situation is thought to be that men are more involved in working life and work in more heavy and risky jobs.

It is known that the most common age group in working life is between 25-44 years old. This age group also works in heavier and riskier jobs. In a study conducted in the United States of America, it was reported that occupational accidents that did not result in death were most commonly seen in the age range of 25-44 years (14). In a study conducted in Iran, it was reported that the mean age of those injured in occupational accidents was 32.9 years (15). In a study conducted in Izmir in our country, it was reported that the

Table 2. Distribution of business lines by gender

Business lines	Gender				Total	
	Male		Female			
	n	%	n	%	n	%
Construction	44	37.6	0	0	44	33.3
Industry*	69	59.0	11	73.4	80	60.6
Agriculture	4	3.4	2	13.3	6	4.6
Health	0	0	2	13.3	2	1.5
*Metal/mine, furniture, textile, food and heavy industry						

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mean age of those injured in occupational accidents was 31.1 years (16). Consistent with the literature, in our study, the mean age was found to be 32.15 ± 7.9 years and injuries were most common in the 30-39 age group (n=45, 34.1%).

There are studies in the literature on which days and time periods occupational accidents occur more frequently. In these studies, different results were found in terms of days and time zones due to regional differences and differences in the intensity of work branches (12,17-20). In these studies, it was emphasized that occupational accidents are generally more common in summer months (10,12,13,17-20). Sufficient data on the day and time zone could not be obtained in the current study due to missing data in the investigation documents and the hospital automation system. However, in line with the literature, it was found that accidents occurred most frequently in the summer season (n=59, 44.7%). The reason for this is thought to be the effect of working more in summer season and hot weather in many business lines such as construction, production, tourism and agricultural works.

Injury mechanisms related to occupational accidents may vary according to the region where the work is performed and, depending on this, according to the business line. It is known that injuries in the form of falling from a height are more common in construction, injuries in the form of cuts are more common in the furniture sector, and types of accidents such as cave-in, entrapment or object impact are more common in mines. In a study conducted in Diyarbakır, it was reported that the most common occupational accidents were fractures and dislocations due to blunt impact (21). A study conducted in Iran reported that the most common type of occupational accidents was falling from a height (22). In a study carried out on patients admitted to the emergency department of Cerrahpaşa Medical Faculty in İstanbul, it was reported that occupational accidents occurred most frequently (38.1%) in the form of contact with cutting and piercing instruments (10). In the present study, the most common type of injury was falling from a height (n=35, 26.5%) and the second most common injury was crush injury (n=33, 25%). Injury characteristics are thought to vary according to the predominant business line in the region where the study was conducted. It is thought that the reason why our cases were most frequently injured by falling from a height may be explained by the fact that the most common injuries in our region are in the construction sector.

It was found that injuries occurred in the extremities (n=84, 63.6%) in relation to the fact that the most common injuries occurred in the construction sector and in the form of falling from height. Extremity injuries have an important place in

Table 3. Distribution of forensic report contents by gender

	Gender				Total		P and χ^2
Contents of the forensic report	Male		Female				
	n	%	n	%	n	%	
With simple medical intervention							
Treatable	45	38.5	9	60.0	54	40.9	P>0.05 $\chi^2 = 2,551$
Not Treatable	72	61.5	6	40.0	78	59.1	
Life-threatening injuries							
Yes	22	18.8	2	13.3	24	18.2	P>0.05 $\chi^2 = 0,267$
No	95	81.2	13	86.7	108	81.8	
Bone fracture							
Yes	39	33.3	4	26.7	43	32.6	P>0.05 $\chi^2 = 0,269$
No	78	66.7	11	73.3	89	67.4	
Function weakness							
Yes	7	6.0	1	6.7	8	6.1	P>0.05 $\chi^2 = 0,011$
No	110	94.0	14	93.3	124	93.9	
Permanent scar on the face							
Yes	3	2.6	0	0	3	2.3	P>0.05 $\chi^2 = 0,394$
No	114	97.4	15	100.0	129	97.7	

injuries related to falling from height (23-26). In the study conducted by Asıldağ et al. it was emphasized that 48.6% of occupational accidents involved upper extremity injuries (1). In the study by Oğuzlar et al. it was also observed that 48.6% of the cases had upper extremity injuries. Upper extremity injuries are the body region where incisional injuries such as furniture and textile sector injuries are most frequently observed in addition to falling from height (27). In a study conducted in Ankara evaluating 1038 cases, it was reported that the upper extremity was injured in 588 (56.6%) of the cases and production jobs such as workshops and furniture had an important place in upper extremity injuries (28). The high number of extremity injuries in occupational accidents in the literature suggests that injuries can be reduced with simple precautions. Wearing protective clothing in the production sector, reducing falls from height with protective ropes and similar systems will reduce extremity injuries.

All occupational accidents are forensic cases. A review of the forensic medical aspects of occupational accidents in the literature revealed that 79.3% of injuries related to occupational accidents in a study conducted in Sivas were not mild enough to be treated with a simple medical intervention (29). In a study conducted in Gaziantep, it was reported that 8.3% of occupational accidents were life-threatening (19). In the current study, it was determined that 78 (59.1%) of the cases had injuries that could not be treated with simple medical intervention, 43 (32.6%) had bone fractures, and 24 (18.2%) had life-threatening injuries. 8 cases (6.1%) were found to have loss of function. No case with loss of function was found. In 3 cases (2.3%), there was a permanent scar on the face due to the incident. There was no significant difference between forensic report contents and gender.

In occupational accidents, the injured worker being under the influence of alcohol or drugs has legal consequences. In this context, alcohol and drug tests should be performed completely in cases admitted to the emergency department with occupational accidents. However, in this study, it was observed that in 55 cases (41.7%) there was no information about the blood alcohol level of the injured person in the Emergency Department notes. Alcohol was detected in the blood in 6 (7.8%) of the 77 cases in which there was information about alcohol.

In a study conducted in Isparta, 69.4% of the patients admitted to the emergency department with occupational accidents were discharged after outpatient treatment (13). This rate was found to be 72.1% in the study conducted by Orhan et al. in Cerrahpaşa Medical Faculty (10). In the study conducted by Avınca et al. in Diyarbakır, 46.1% of the patients were treated only in the emergency department (21). In this study, 63 (47.7%) of the patients were discharged as outpatients in accordance with the literature. Of the 69 inpatients (52.3%),

45 (65.2%) underwent surgery. The analysis of hospitalization duration revealed that injuries to the head/neck and lower extremities were associated with significantly longer hospital stays. These findings not only reflect the clinical burden of certain injury types but also have medico-legal implications. In the context of compensation law, prolonged hospitalization may indicate greater physical impairment and longer periods of work incapacity, which are often used as criteria in the calculation of indemnity. Additionally, extended stays increase healthcare costs and contribute to the economic burden of occupational accidents. Evaluating hospitalization length by injury type can thus inform both clinical planning and legal assessments of occupational injury cases.

All of the cases evaluated in this study involved non-fatal occupational accidents. However, when compared with data from the literature on fatal occupational injuries, it has been reported that head trauma, intrathoracic organ damage, and multiple system injuries are more strongly associated with fatal outcomes (30, 31). In the present series, injuries to the upper and lower extremities were more common, indicating that non-life-threatening traumas predominated in this group. This comparison is important for determining prognosis and for legal classification in the forensic evaluation of such cases.

Some of the cases included in our study involved individuals under the age of 18, which should be evaluated within the scope of child labor. In Türkiye, the employment of individuals under 18 years of age is restricted within the framework of the Regulation on the Employment Conditions of Children and Young Workers, which defines the statuses of “child worker” (aged 14–15) and “young worker” (aged 15–18) (32). Moreover, the International Labour Organization (ILO) Convention No. 138 sets the minimum age for employment in hazardous work at 18 years, while Convention No. 182 explicitly prohibits the employment of children in the worst forms of child labor, including hazardous work (33, 34). In this context, beyond forensic medical evaluation, it is of great importance that such cases are reported to the child protection system and that necessary social and ethical interventions are implemented.

In conclusion, the data obtained in this study were generally consistent with the literature. It is known that occupational accidents are preventable injuries. It is important to increase the safety measures of machinery and equipment, to ensure the use of clothing and protective equipment and to provide the required trainings. Our study revealed significant deficiencies in emergency department notes and all hospital documents related to occupational accidents. In occupational accidents, all physicians involved in the treatment process, especially emergency physicians, should include the characteristics of the event such as the way the event occurred, the business line, and the mechanism of

the accident in the hospital documents. In addition, injury and wound characteristics should be carefully prepared as they will form the basis of forensic reports or disability reports. Alcohol and drug tests must be performed and the results of the tests must be included in the hospital file. It is thought that physicians' knowledge and care on this subject is deficient.

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Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

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Ethical Declaration

This study was deemed appropriate and approved for implementation by the Non-Interventional Clinical Research Ethics Committee of Eskişehir Osmangazi University, with decision number 38 dated 28.11.2024.

Authorship Contributions

Conceptualization: ÜŞ; Design: ÜŞ, TK; Supervision: KK; Data Collection: TK; Analysis: ÜŞ, TK; Writing – Original Draft: ÜŞ; Critical Review: KK.

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