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OCCUPATIONAL ACCIDENT SERIES FROM THE DEPARTMENT OF FORENSIC MEDICINE IN TURKEY: A FIVE YEARS RETROSPECTIVE STUDY

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Abstract: Occupational accidents (OA) cause many deaths or injuries and have severe individual and social consequences, despite being preventable public health problems. Our study aims to obtain regional up-to-date data, risky working areas and the effects of COVID-19 pandemic, guide for preventive measures.

The data was obtained retrospectively from the university hospital in Izmir, Turkey, from January 1, 2016, to December 31, 2020. Parameters include socio-demographic characteristics, injury type/localization, and sector. SPSS 24.0 was used for statistical analysis.

The total number of cases included in the study was 186. Results indicated that 92% of the cases were male, most cases was working as a construction worker (29%), most of the accidents occurred in the building-construction sector (33.4%), and common mechanism of injuries was with cutting/penetrating/crushing tool (32.3%). Upper extremity injuries were the most common body parts (n:100). The bone fracture occurred in 61.3% of all cases and had a high rate (83.8%) of injured by falling from a height (p=0.002).

This study revealed that the building-construction sector is one of the riskiest areas. Traffic accidents were more frequent in our study than in the literature. The regional characteristics of OA need to be evaluated and the COVID-19 pandemic may increase OA exposure in some occupational groups like motorcycle couriers. It is necessary to reveal the environmental and social factors that cause OA and to take precautions.

Keywords: forensic traumatology, medicolegal evaluation, occupational accidents.

INTRODUCTION

International Labor Organization (ILO) defines occupational accident (OA) as; "an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death" [1]. According to ILO's current data, the latest global estimates show that more than 2.78 million workers die from work-related accidents or illnesses worldwide yearly, and approximately 374 million non-fatal work-related injuries occur [2].

It is reported that work-related mortality accounts for 5% of the total global deaths [3]. Although all these data reveal the seriousness of the OA, ILO; states that these numbers are higher for most countries due to deficiencies in the notification and registration system [4].

According to the European Statistical Office (Eurostat), Turkey ranks first in Europe regarding fatal OA annually. The current Eurostat data shows that; the OA mortality rate, which varies between 1 and 6 per 100 thousand in European countries, is above 11.0% in Turkey [5].

Forensic medicine practices are necessary part of occupational accidents. Injuries, deaths, and loss of body strength due to OA are frequently encountered. Laws defend employees' fundamental rights and the legal and criminal responsibilities of employers. In this context, all work accidents must be defined as a forensic event that may lead to the protection of rights. The factors that caused the accident and damage to the employee should have been determined, and judicial investigation and trial processes undergo with those [6,7].

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Given the importance of occupational health and safety on workers' well-being, living conditions, labor market performance, and economic outcomes, it is essential to have reliable data to assess the extent of occupational risks and hazards. In addition, OA is more common in some sectors and requires more precautions.

This study aims to obtain up-to-date regional data on OA, reveal the effects of accidents on people's health, risky working areas and the effects of COVID-19 pandemic, guide them for preventive measures.

METHODS

This is a retrospective, single-center study between January 2016 and December 2020. The data was obtained from the hospital information system, and the medicolegal evaluation reports from the Department of Forensic Medicine in a university hospital in Izmir, Turkey. The total number of patients who were injured due to OA were 218. Cases (n:32) whose medicolegal evaluation report was incomplete and insufficient data in their files were excluded from the study. A dataset was created for the determined 186 cases, and the cases' socio-demographic characteristics, the sector they worked in, the types of injuries, and their location were recorded in the data form. All data were analyzed using SPSS 24.0 program. Descriptive statistics are expressed in numbers and percentages; Chi-Square and Fisher's Exact Test were used to evaluate the relationship between variables, and $p<0,05$ was taken to indicate significance.

Table 1. Cases' distribution by year

Year	Total number of cases	OA cases	% *
2016	1340	51	3.8
2017	1165	45	3.8
2018	1289	37	2.8
2019	1446	42	2.9
2020	867	11	1.2
Total	6107	186	3

* Ratio of cases injured due to work accidents to the total number of cases.

Table 2. Demographic characteristics

Demographic characteristics	**N**	**%**
Age (years)		
<18	5	2.7
18-25	43	23
26-35	42	22.6
36-45	44	23.7
46-55	38	20.4
56-65	14	7.6
Gender		
Male	171	92
Female	15	8
Occupation		
Construction worker	54	29
Factory/ Industry worker	44	23.6
Motorcycle couriers	25	13.4
Others*	24	12.9
Cleaning staff	11	6
Kitchen worker/ Cook	10	5.4
Electrician	7	3.8
Truck driver	7	3.8
Medical Doctor	4	2.1

* Farmer, Machine operator, police, waiter, butcher, shipmaster, civil servant.

RESULTS

We have prepared 6107 medicolegal evaluation reports as a forensic medicine department between January 2016 and December 2020. Table 1 shows the cases' distribution by year. In 2016, 3.8% (n: 51) of all cases and 1.2% (n: 11) in 2020 were injured due to OA.

Most of the patients were male (n:171, 92%). The male-to-female ratio was 11.4:1. The mean age of the male cases was 35.98 (±12.43), and for female cases was 38.4 (±11.43). The cases ranged from 15 to 63 years, with a mean age of 36.18±12.34 years.

Construction workers (n:54; 29%) were most injured, followed by factory/ industry workers (n:44;23.6%), and the third most frequent injured occupational group was motorcycle couriers (n:25; 13.4%). Table 2 shows demographic characteristics.

The accidents occurred most frequently in the building-construction sector (n:62; 33.4%), and all the workers were male. Women mostly worked in the food industry, and 7 of 37 cases working in this sector were women (Table 3). The most injured occupational group in the food industry was motorcycle couriers (n:23).

Table 4 shows the types of injuries and their distribution by sectors. Falling from height (FFH) (n:31) and cutting-penetrating-crushing tool (CPCT) injuries (n:15) were the most common in the construction industry. 32 of 43 cases (74.4%) working in the metal

Table 3. The distribution of accidents by sectors and genders

Sectors where the accident occur (n, %)	**Gender**	
	Male	**Female**
Building-construction (n:62, 33.4)	62	0
Metal works/furniture manufacturing (n:43, 23.1)	40	3
Food sector (n:37, 19.9)	30	7
Transport (n:9, 4.8)	9	0
Cleaning services (n:7; 3.8)	5	2
Health (n:4, 2.1)	4	0
Others* (n:24,12.9)	21	3

*Other: public services, tourism, agriculture.

works/furniture manufacturing sector were injured by a CPCT. The most common type of accident in the food sector was a traffic accident (n:23). 53.7% (n:29) of the construction workers were injured by FFH, 22.2% (n:12) by CPCT, 18.5% (n:10) by blunt trauma. Two had been exposed to electric shock, and one had been exposed to blunt trauma due to violence. 77.2% (n:34) of the factory/ industry workers were injured by a CPCT. Injuries were caused by blunt trauma in five cases, FFH in two cases, traffic accident in one case, electric shock in one case, and burns in one case. In all cases (n:4), working as medical doctors in the health sector were injured due to blunt trauma due to violence. The number of people injured due to FFH in construction workers and the construction industry, CPCT injuries in factory/industrial workers and the metalwork/furniture manufacturing sector, and traffic accidents in motorcycle couriers and the food industry was significant ($p<0.05$).

The anatomical locations of the injuries were examined. Since more than one injury site is possible in each accident, the frequency of each injury in the cases was evaluated separately. Upper extremity injury (n:100) occurred most frequently. Fifty-four cases who work in construction group suffered from accidents, including upper extremity (n:28), lower extremity (n:20), thoracic injuries (n:17), head and neck injuries (n:15), abdominal injuries (n:9), and spinal (n:9) injuries. The incidence of injuries to the thorax ($p=0.017$), vertebra ($p=0.005$), and abdomen ($p=0.039$) were significantly higher than in construction workers compared to other occupational groups. Of 44 cases were factory/ industrial workers; 34 had upper extremity injuries, which was more common than in other occupational groups ($p<0.001$). Fifteen motorcycle couriers had lower extremity injuries, and lower extremity injuries were found to be more common in this occupational group ($p=0.001$).

One hundred fourteen patients (61.3%) suffered from bone fractures, and the most frequent etiology was FFH (83.8%) ($p=0.002$).

DISCUSSION

As of 2020, approximately 3.49 billion over the age of 15 in the world; Turkey, one of the countries where OA is most common in Europe and the world, it is estimated that approximately 33 million people constitute the working population [8]. Between 2016 and 2019, OA comprised 2.8% to 3.8% of all cases admitted to our department. We saw that the total number of patients decreased in 2020. Only 1.2% of all cases were OA due to the decrease in forensic cases referred to us during the COVID-19 pandemic, which caused lockdowns and mitigation of working mobility. The data on the gender distribution of those exposed to OA are similar in many studies in Turkey and around the world. According to current national data [9], 96.4% of those injured due to OA are men. Many publications reported that mainly male individuals are affected by work-related injuries, from 88% to 100% of the patient population for each study (10-13). In our study, similar to the literature, most cases (92%) were male. This relates to the fact that men are more involved in business life in the world and our country, and women benefit less from social security systems.

The most critical step in preventing OA is determining the sectors and occupational groups where the accidents occur and taking appropriate measures for each sector. ILO; states that a few sectors are much more dangerous than others in terms of OA, the construction sector is at the forefront of these sectors, fatal accidents are 3-4 times more in the building-construction sector compared to others, and approximately 30% of all

Table 4. Types of injuries and their distribution by sectors

	Types of injury							
Sectors where the accident occur	CPCT (n:60)	FFH (n:37)	Traffic accident (n:28)	Blunt Trauma (n:30)	Electric shock (n:4)	Blunt trauma due to violence (n:5)	Burns (n:10)	FFSL (n:10)
Building-construction	*15*	*31*	-	*12*	*3*	*1*	-	-
Metal works/furniture manufacturing	*32*	*1*	-	*4*	*1*	-	*2*	*3*
Food sector	*6*	-	*23*	*2*	-	-	*4*	*2*
Transport	-	*1*	*1*	*5*	-	-	*1*	*1*
Cleaning services	*3*	-	*3*	-	-	-	-	*1*
Health	-	-	-	-	-	*4*	-	-
Other*	*4*	*4*	*1*	*7*	-	-	*3*	*3*

*Other: public services, tourism, agriculture. FFH, Fall From Heigh; CPCT, Cutting-Penetrating-Crushing Tool; FFSL, Fall From Same Level.

fatal occupational injuries occur in the construction sector [14]. The functioning of the construction sector has hazardous features in terms of both fatality and sequelae of the accidents. Different workers must work simultaneously and harmoniously in the building construction business, unlike production processes, where there are repeating mechanisms in the factory or band type. In addition, outsourcing and lack of supervision; make this sector riskier for employees [15]. In the period covered by our study, the national data in Turkey is similar, with the construction sector in the first place, the food products manufacturing and food and beverage sectors in the second place, and the factory and industry sector in the third [9]. Similar to the studies conducted, and in line with the data of our country, we found that the accidents occurred most frequently in the building-construction sector (n: 62; 33.4%), and construction workers were exposed to the highest number of injuries (n: 54; 29%).

In our findings, 62.1% of the cases working in the food sector were motorcycle couriers. The traffic accidents of motorcycle couriers in Istanbul in 2015 were examined [16], and 156 (90.2%) of 176 couriers participating in the study stated that they had been injured due to a work accident before, and it was revealed that the cases were absent from work for an average of 2 months after the accident. It has been stated that working hours exceeding 10 hours a day is distracting in accidents. With the home quarantines implemented since the middle of 2020 due to the COVID-19 pandemic and the closure of cafes/restaurants other than a takeaway, the working hours of the motorcycle couriers have been prolonged; the working conditions have become more difficult. This situation could manifests itself with increased accidents among motorcycle couriers in 2020 and beyond.

According to national data, women had the most frequent OA in the food industry and food/beverage service between 2017 and 2019 [9]. In our study, 7 out of 15 female cases worked in the food industry, which is consistent with this situation. However, it should be remembered that women can work informally and uninsured in sectors such as cleaning and agriculture and remain vulnerable to OA and diseases.

Revealing the occurrence of OA is one of the most critical steps to prevent accidents. Recently, a publication revealed that injuries were most frequently caused by a sharp object (25%), followed by falls (20%) [12]. Similarly, another study stated that of patients admitted to the emergency department among those, 40.6% were injured by sharp objects and 16.7% by falling [17]. In both studies, traffic accidents are in last place. In our findings, the most common injuries occurred by CPCT (32.3%) and FFH (19.9%). Unlike the literature, traffic accidents were more frequent in our study, and it was the third with 15.1%. The increased frequency of accidents among motorcycle couriers can explain this. If injuries during transportation activities are included in work accidents, we believe that the rate of vehicle accidents may increase.

Accidents in the health sector have no priority both in official records throughout our country and in studies on OA. Previous studies stated that the most common type of accident in this area was injury with a sharp object [18,19]. In our study, four cases worked in the health sector as medical doctors and were exposed to blunt trauma due to violence. According to a study conducted in Finland, psychiatric nurses rank 3rd and doctors 4th in terms of exposure to violence [20]. A study in our country has reported that 72.6% of healthcare workers have been exposed to any violence during their working time, and 47.8% have witnessed violence [21]. Despite violence against health workers increasing gradually in Turkiye, these cases are rare in our study and other studies on OA. It is possibly due to reporting problems of violence against health workers as work accidents.

The occurrence of OA and the mechanism of injury, injured body parts, and injury patterns are examined in detail in forensic traumatology. In our study, upper extremity injury (n:100) was the most common, and a CPCT most commonly caused it. It was reported in the literature that the most common injury was in the upper extremities [13,22,23], and in one study, 56.6% [23] of the cases and in another [22] 39.6% of the upper extremity injuries. Consistent with these previous reports, it is expected that upper extremity injuries are more common since the upper extremity is used more frequently in almost all sectors. High-energy and whole-body accident types, such as FFH and electric shock, may cause more frequent vertebral, thoracic, and abdominal injuries in construction workers. Accordingly, bone fractures are the leading injury in the same group.

In conclusion, each worker deserves to work in a healthy and safe environment. By obtaining reliable data on the regional characteristics of OA and the effects of accidents on people's health, identifying risks and hazards specific to occupations and sectors will be the first step in preventing accidents and developing measures. We again emphasized that the most frequent accident occurs in the building-construction sector.

Developing specific policies for occupational health and safety practices are essential. It is crucial to evaluate the individuals exposed to occupational accidents bio-psycho-socially and to determine the precautions to be taken by revealing the environmental, social, economic, and political factors that cause the accidents.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethics approval

This research received clearance from the Dokuz Eylul University Medical Faculty non-Clinical Research Ethics Committee, number 5963-GOA.

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