ORIGINAL ARTICLE

Occupational injuries admitted to the Emergency Department

Mustafa Burak Sayhan,[1] Esin Secgin Sayhan,[2] Serap Yemenici,[3] Serhat Oguz[4]

Abstract

Objective: To categorise the characteristics, causes and rates of occupational injuries referred to the Emergency Department of a Turkish hospital.

Methods: The cross-sectional study was conducted at a university-based hospital in Edirne, Turkey, from January 1, 2010 to May 1, 2011. Parameters evaluated included: gender, age, occurrence mechanism, injury type, injury localisation, sector, season, day of week, injury hours, the types of health insurance, working experience, educational level and outcome. SPSS 15 was used for statistical analysis.

Results: A total of 552 patients sustained occupational injuries. The male-to-female ratio was 11.54:1. The mean age of the patients was 36.03±11.77 years. The injury rate was the highest in the 18-29 age group (n=418; 75.7%). Most cases occurred in the summers (n=172; 31.2%). The largest number of injuries occurred on weekdays (n=184; 33.3%). Most injuries occurred between 8AM and 4PM (n=343; 62.1%). The construction industry had the highest injury rate (n=222; 40.2%). The most common mechanism of injuries was penetrating sharp-object injury (n=224; 40.6%). The most common type of injury in the general injury group was multiple-type (n=162; 29.4%). Of the total, 379 (71.7%) patients were discharged after treatment in the Emergency Department. Five patients died during the study period.

Conclusion: Further studies in the Emergency Department may contribute to the prevention of occupational injuries in the future.

Keywords: Occupational injuries, Emergency Department, Injury, Eastern Thrace, Industrial sectors. (JPMA 63: 179; 2013)

Introduction

Occupational injuries (OI) at the workplace are important because they necessitate emergency healthcare and have legal implications.[1] Each year, 270 million OI occur around the world, causing 1.1 million deaths.[2] Avoidable OI greatly impact productivity and the economy, in addition to causing great suffering.[3] In Turkey, an average of 70, 000 to 80, 000 workers per year visit health facilities due to OIs.[4] Most of these injuries result in presentation to Emergency Departments (ED).[2] More than 9,000 workers are treated in EDs each day, and approximately 200 of these workers are hospitalised. In 2006, workers' compensation costs for employers totalled $88 billion in the USA.[5] There are only limited data in the literature regarding OIs in developing countries.

Edirne is a city in Eastern Thrace, in the western part of Turkey, close to the borders with Greece and Bulgaria. The Turkey University Hospital is the most advanced research facility in Eastern Thrace and performs advanced interventions for OIs. The present study was performed to assess the characteristics, causes and rates of OIs referred to the ED.

[1,3]Department of Emergency Medicine, [2]Department of Public Health, [4]Department of General Surgery, Trakya University, Faculty of Medicine, Edirne, Turkey.

Correspondence: Mustafa Burak Sayhan. Email: mustafaburak@yahoo.com

Patients and Methods

The cross-sectional study was conducted at a university-based hospital in Edirne, Turkey. All patients presenting to the Trakya University ED between January 1, 2010, and May 1, 2011, due to injuries occurring at the workplace were included in the study. Approval from the institutional Review Board was obtained before the commencement of the study. Patient files were retrieved from hospital archives and reviewed. Data was collected through a pre-tested proforma based on previous studies on similar subjects.[2,4]

Parametres evaluated included: gender, age group, mechanism, how injury occurred, injury type, injury localisation, sector, season, day of week, injury hours, the presence of social security, working experience, educational level and outcome.

Patients re-admitted for treatment of previous OI, patients with non-traumatic occupational illnesses, those younger than 18 years of age and records of patients who could not be reached were excluded from the study.

All data were analysed using SPSS Version 15. Numerical variables were given as means and standard deviation (SD), while categorical variables were given as frequencies (n) and percentages. Categorical sociodemographic variables were compared using the χ^2 test. In all analyses, $P < 0.05$ was taken to indicate statistical significance.

Results

The total ED attendance for the 16-month study period was 33,614, of which 1,923 (5.72%) were for trauma-related complaints. A total of 552 (28.7%) of these 1,923 patients sustained OI. Most of the patients were male (n= 508; 92%). The male-to-female ratio was 11.54:1. The mean age of the patients was 36.03±11.77 years (range 16-76): 36.37±11.92 for males, and 32.13±9.13 for females.

The OI rate was the highest in the 18-29 age group (n=184; 33.3%). Most cases occurred in summer (n=172; 31.2%), while (n= 418; 75.7%) of the OIs occurred on weekdays compared to 134 (24.3%) during weekends. Most OIs occurred between 8AM and 4PM (n=343; 62.1%). The construction industry had the highest injury rate (n=222; 40.2%). The mean admission time was 211±1.55 minutes (Table-1).

A large proportion of both the men (n=367; 72.2%) and the women (n=36; 82.9%) in the study had only completed primary school education. The mean working experience of patients was 11.25±10.99 years, 11.46±11.16 for males, and 8.88±8.48 for females. In addition, 126 (24.8%) of the men and 7 (15.9%) of the women were not covered by any form of social security (Table-2).

The most common mechanism of OI was penetrating sharp-object injury (PSOI), which accounted for 224 (40.6%). The most common type of injury in the general injury group was multiple type, which occurred in 162 (29.4%).

Isolated extremity injuries were the most common type of OI (n=364; 65.5%). Isolated upper extremity injuries accounted for 283 (51.2%) cases, while the lower extremity involvement rate was 65 (11.4%). Hand injuries accounted for 251 (88.7%), while the least frequent injury location was the pelvic region (n=12; 2.1%).

About half of the female workers with OI (n=20; 45.4%) were employed in the textile industry, while most of the injured male workers were in construction (n=216; 97.3%) and manufacturing (n=130; 94.9%). The difference was statistically significant (p=0.000) (Table-3).

In terms of age group, the results indicated that while the number of OIs in the agricultural industry increased with age, that in the manufacturing industry decreased. This difference was statistically significant (p=0.004).

Workers in most of the industries had work experience lasting less than 10 years, and except for the agriculture sector, the incidence of OI decreased with increasing level of work experience in all other industries (p=0.007).

Table-1: Sociodemographic data.

Variable			n	%
Gender		Male	508	92.0
		Female	44	8.0
Presence of Social security		TSSI or Private Insurance	419	75.9
		None	133	24.1
Age (years)		18-29	184	33.3
		30-39	179	32.4
		40-49	113	20.5
		50>	76	13.8
Education level		Primary school	456	82.6
		Secondary school	92	16.6
		High education	4	0.7
Working experience (year)		≤10	338	61.2
		>10	214	38.8
Days of the week		Weekday	418	75.7
		Weekend	134	24.3
Time of the day		08 00-16 00	343	62.1
		16 00-0800	209	37.9
Season		Winter	143	25.9
		Spring	150	27.2
		Summer	172	31.2
		Autumn	87	15.8
Sector		Textile	64	11.6
		Agriculture	52	9.4
		Construction	222	40.1
		Manufacturing	137	24.9
		Other*	77	14
Mechanism of Injuries		PSOI	224	40.6
		BOI	85	15.4
		Fall	92	16.7
		OFB	50	9.1
		Electrical injury	11	2.0
		LHW	63	11.4
		Burn	21	3.8
		Other	6	1.1
Injury Type	Isolated (n=390)	Superfisial	158	28.6
		Strain-sprain	57	10.3
		Bony injury	104	18.8
		Burn injury	21	3.8
		Okuler injury	50	9.1
	Multiple (n=162)	Bilateral	130	23.6
		Triple	29	5.3
		Quarlet	3	0.5
Injury Site		Head-Neck	31	5.6
		Facial	61	11.2
		Torax	26	4.8
		Abdomen	17	3.2
		Spine	13	2.3
		Pelvis	12	2.1
		UE	283	51.2
		LE	65	11.4
		UE+LE	16	2.9
		MOI	28	5.3
Prognosis		Discharged from ED	397	71.9
	Admitted to hospital	Neurosurgery	11	1.99
		Plastic and Reconstructive Surgery	51	9.23
		Thoracic Surgery	11	1.99
		Orthopaedic surgery	44	8.15
		General Surgery	6	1.08
		Ophthalmology	21	3.80
		Cardiovascular Surgery	5	0.91
		Intensive Care Unit	6	1.08
		Exitus	5	0.91

TSSI:Turkish Social Security Institution, UE:upper extremity, LE:lower extremity, MOI:Multiple organ injuries. PSOI: Pentrating-sharp-object injury. BOI: Blunt object injury. OFB: Ocular foreign body. ED: Emergency department. *Mining,Transportation,Wood product sector.

Table-2: Demographic characteristics according to the gender.

Variable		Gender			
		Male		Female	
		n	%	n	%
Age (years)	18-29	164	32.3	20	45.5
	30-39	165	32.5	14	31.8
	40-49	104	20.5	9	20.5
	≥50	75	14.8	1	2.3
	Total	508	100	44	100
Working experience (years)	≤10	310	61.0	28	63.6
	>10	198	39.0	16	36.4
	Total	508	100	44	100
Presence of social security	TSSI or Private Insurance	382	75.2	37	84.1
	None	126	24.8	7	15.9
	Total	508	100	44	100
Mechanism of Injuries	PSOI	196	38.6	28	63.6
	BOI	79	15.6	6	13.6
	Fall	89	17.5	3	6.8
	OFB	49	9.6	1	2.3
	Electrical injury	10	2.0	1	2.3
	LHW	59	11.6	4	9.1
	Burn	20	3.9	1	2.3
	Other	6	1.2	-	-
	Total	508	100	44	100
Injury Type	Superfisial injury	138	27.2	20	45.5
	Strain-sprain injury	47	9.3	10	22.7
	Bony injury	101	19.9	3	6.7
	Burn injury	20	3.9	1	2.3
	Okuler injury	49	9.6	1	2.3
	Multple	153	30.1	9	20.5
	Total	508	100	44	100

PSOI: Penetrating-sharp-object injury, BOI: Blunt object injury, OFB:Oculer foreign body, LHW:Lifting heavy weight, TSSI:Turkish Social Security Institution.

Comparison of OI occurrence rates according to specific seasons and industry indicated a significant increase in injuries in the agricultural (n=24; 46.2%) and construction (n=72; 32.1%) industries during the summer, while those in the textile industry increased during winter (n=26; 40.6%). These differences were statistically significant (p=0.000).

There was no statistically significant difference in the occurrence of OI according to days of the week among the various industries included in the analysis (p=0.838).

In the textile industry, the most frequent type of OI was superficial injury (n=33; 51.6%), and there were no cases of ocular injury in this industry. In the construction industry, the most frequent types of OI were multiple type (n=62; 27.6%), superficial (n=52; 23.5%), and bone injuries (n=49; 21.7%). In the agricultural industry, the most frequent types of OI were multiple type (n=22; 42.3%) and bone injuries (n=17; 32.7%).

While 397 (71.9%) of the patients were discharged after treatment in the ED, 155 (28.1%) were referred to various departments for hospitalisation. The distribution of patients according to the wards to which they were admitted was evaluated and the results indicated that 51 (32.9%) were admitted to plastic and reconstructive surgery; 44 (29.0%) to orthopaedic surgery; and 21 (13.6%) to ophthalmology wards. The mean length of hospital stay was 4.2±1.9 days.

A total of five (0.91%) patients died during the study period. The mean age of the patients who died was 42.40±10.13 years. Two of the patients who died used to work in construction, one worked in transportation, and the remaining two patients worked in 'other' industries (mining). One of the patients working in construction died due to a fall, and the other died from an electric shock (ES). One of the two miners died from burns due to a methane explosion, and the other died after lifting heavy weights. One patient working in transportation died in a car accident. This patient had developed subdural haematoma and had multiple

Table-3: Demographic characteristics according to industries.

Variable		Textile		Agricultural		Construction		Manufacturing		Others*		p
		n	%	n	%	n	%	n	%	n	%	
Gender	Male	44	73.3	47	90.3	216	97.3	130	94.9	71	92.2	<0.0001
	Female	20	26.7	5	9.7	6	2.7	7	5.1	6	7.8	
	Total	64	100	52	100	222	100	137	100	77	100	
Age group	18-29	22	34.4	11	21.2	65	29.4	56	40.9	30	39.0	0.004
	30-39	26	40.6	12	23.1	80	36.2	37	27.0	23	29.9	
	40-49	14	21.9	13	25.0	45	20.4	26	19.0	15	19.5	
	50>	2	3.1	16	30.8	31	14.0	18	13.1	9	11.7	
	Total	64	100	52	100	221	100	137	100	77	100	
Working experience (years)	≤10	37	57.8	23	44.2	130	58.5	98	71.5	50	64.9	0.007
	>10	27	42.2	29	55.8	92	41.5	39	28.5	27	35.1	
	Total	64	100	52	100	222	100	137	100	77	100	
Days of the week	Weekday	50	78.1	38	73.1	163	73.8	105	76.6	61	79.2	0.838
	Weekend	14	21.9	14	26.9	58	26.2	32	23.4	16	20.8	
	Total	64	100	52	100	222	100	137	100	77	100	
Time of the day	08 00-16 00	34	53.1	32	61.5	142	63.9	86	62.8	50	64.9	0.577
	16 00-08.00	30	46.9	20	38.5	80	36.1	51	37.2	27	35.1	
	Total	64	100	52	100	222	100	137	100	77	100	
Season	Winter	26	40.6	6	11.5	59	26.7	37	27.0	14	18.1	<0.0001
	Spring	20	31.3	8	15.4	54	24.4	47	34.3	21	27.3	
	Summer	15	23.4	24	46.2	72	32.1	38	27.7	24	31.2	
	Autumn	3	4.7	14	26.9	37	16.7	15	10.9	18	23.3	
	Total	64	100	52	100	222	100	137	100	77	100	

* Mining,Transportation,Wood product sector.

bone fractures, and also had contusion of the lungs. All patients had been admitted to the intensive care unit and had a mean period of hospitalisation of 4.8±2.77 days.

Discussion

Previous literature reviews indicated that the manufacturing industry has the highest injury rate, followed by the construction industry.[2,6] Consistent with these previous reports, evaluation of OI according to work sector in the present study revealed that the construction industry had the highest injury rate (40.1%), followed by the manufacturing industry (24.9%).

Literature reviews indicated a higher risk of OI among males than females,[6,7] and a reported annual average OI incidence rate of 3.6 per 1,000 for women and 10.7 per 1,000 for men.[8] A study in central Anatolia reported 1.3% for women and 98.7% for men.[2] In the present study, the rate of injury among women was 8%. Our OI rates for women were much higher than the previously reported statistics. Approximately half of the female workers included in the present study were employed in the textile industry, while most of the male workers were in the construction and manufacturing industries. Thus, more men with OI worked in industries that required physical labour.

The highest average annual occupational injury incidence rate has been reported in the 40-49 age group, followed by the 30-39 and 19-29 groups.[8] Another study reported that 89.9% of OI occurred in workers less than 44 years old. Other studies also underlined the higher risk among younger workers.[6,7,9] Consistent with these previous reports, most patients included in the present study were below 40 years age, with the highest injury rate seen in the 18-29 age group. According to the data in our study, most of the OIs in manufacturing industries affected the younger population and these injuries decreased with increasing age.

For young workers, serious OIs have health, economic, social and psychological impacts. Almost all serious OIs in young workers are preventable, and it is an ethical imperative to prevent as many of these injuries as possible. Educational level has been shown to be associated with OIs. A study reported that most Turkish workers who suffered from OI had only primary school education.[10] Consistent with this report, most of the patients in the present study had completed only primary school education. OI increases with poor education, given that higher levels of education help reduce the incidence of accidents occurring at the workplace.

One study reported that the number of women working

with health insurance was much lower than that of men.[7] In contrast, in the present study, 24.9% of the men and 15.9% of the women were not covered by any form of health insurance. The lowest rate of uninsured workers was seen in the agricultural industry in the present study.

It was earlier reported that most cases of OI occurred in June,[11] and another study indicated more injuries in July and August than the other months.[6] We also found that most OIs occurred in summer. The numbers of OI occurring during specific seasons were compared according to industry in the present study, and the results indicated that injuries increased significantly in the construction and agricultural industries during summer.

One study reported that 23.3% of OI occurred on the first day of the week,[4] while others reported that most work-related injuries occurred on Tuesdays and Wednesdays. In the present study population, most OIs occurred on Mondays, and the fewest injuries occurred on Sundays.

A total of 18.5% of all OI occurred within the first working hour in 2005, while 31.8% were reported to occur in the first 3 hours.[4] A study reported that the highest frequency of OI was observed from 8AM to 12PM, while others reported that 56.1% of all OIs occurred between 8AM and 4PM.[4] In the present study, most OIs occurred between 8AM and 4PM, both for all industries taken together and when evaluated separately. These observations indicated that safety programmes should be implemented to increase vigilance during these times.

Workers with less than 5 years of experience had double the rate of OI compared to those with more than 5 years of experience.[13] The results of the present study indicated that, except for the agriculture sector, in all industries, OI decreased with increasing level of work experience. This was attributed to a reduction in carelessness among workers with more experience performing a given task. These observations suggest that less experienced workers should work under the supervision of more experienced workers, and refresher courses should be implemented to prevent OI.

The most common mechanism of injury involved getting caught in machinery (31.5%), followed by blunt object injury (BOI), falls, PSOI and ocular foreign bodies.[2] Others reported that PSOI was the most common form of OI, followed by falls.[14] Another study reported rates of 22.5% and 18% for PSOI and falls, respectively.[6] In Singapore, reported that falls represented the most common cause of major OI (66.3%).[15] In the present study, the most common mechanism of OI was PSOI followed by falls and BOI.

An earlier study reported that falls were the most common cause of OI in the construction industry, while PSOI was the most frequent cause in the manufacturing industry, and BOI were observed at high rates in both industries.[2] In the present study, while PSOI was the most frequent type of OI in the textile, manufacturing, and agricultural industries, the most frequent mechanisms of injury in the construction industry were PSOI and falls (in similar proportions). With the exception of the transportation industry, the most frequent mechanism of injury was PSOI in the present study. Falls constituted the second most frequent mechanism of injury in the construction industry. Awareness of the most frequently occurring mechanisms of injury in each of various industries and the passing of this information to workers through proper channels will help reduce OI. Safety practices and effective interventions among workers at the highest risk will reduce OI.

Previous studies indicated that the main types of OI were superficial injuries (lacerations/cuts), followed by sprains and strains and bony injuries.[13,16] Soft tissue injuries in 36.7% of workers, cuts and lacerations in 26.3% of workers and bone injuries in 11.2% of workers have been reported.[2] Another study reported rates of 17% for superficial injuries, 10% for sprains and strains and 5% for bone injuries.[8] In the present study, the most frequently seen type of injury was multiple type, followed by bone and strain/sprain injuries. Among male workers, the most frequent type of OI was multiple type, while this was the third most common injury type among female workers.

The most common sites of injury in the present study were isolated extremity injuries, which accounted for 51.2% of OIs in the study population. The most common sites of upper extremity injuries were hand injuries. Our results were consistent with those reported previously by other studies.[2,4] Several precautions have been shown to reduce the risk of hand injuries. Encouragement of glove usage alone can reduce superficial injuries and PSOI by 60%, but this has no effect on bone injuries, amputations, crushing or avulsion injuries.[16]

In an earlier study, 90% of all patients with OIs were treated at the ED and discharged, while 7% were hospitalised.[2] In another study, 78% of all OIs first treated at the ED were discharged, while 21% were hospitalised.[4] Similar to most previous reports, most patients in the present study were discharged from ED. Most OI patients present to the ED, and therefore observations in the ED can help to determine the details of injuries and associated sociodemographic characteristics.

Mortality rates of 7.8% and 3.2% for OI have been reported.[2,6] However, the present study indicated a much

lower mortality rate of 0.91%, which may have been due to differences in industrial sectors between the regions investigated in these studies.

One study compared the distribution of mortality according to various industries, and reported that most work-related deaths occurred in the construction, manufacturing and mining industries, in the order.[14] Another compared the distribution of mortality according to the mechanism of injury, and reported that motor vehicle-associated accidents had the highest rate of 40%, followed by accidents related to lifting of heavy weights, falls and ES (each 5%).[6] ES was found to be responsible for 3% of all work-related deaths.[17] Of the two deaths in the construction industry in the present study, one was from a fall and the other was from ES. In addition, of the two deaths that occurred in the mining industry, one was due to a methane explosion and subsequent burns, while the other was a crush injury.

The present study was limited by its cross-sectional nature and by the fact that it was a single-centre study. In addition, patients under the age of 18 were admitted to the paediatric clinic and, therefore, data related to them could not be collected. Child labour is a major issue in both industrialised and developing countries. Nevertheless, the data of the present study provide insight into the OI situation in Turkey, and will pave the way for future comprehensive multi-centre studies.

Conclusion

Observations and further studies in ED may help to reveal details of injuries, sociodemographic characteristics, risk factors and will contribute to the prevention and reduction of OI in future.

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