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# Occupational accidents and injuries: clinical experiences of a tertiary hospital

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## ABSTRACT

**Aims**: Occupational accidents are a significant public health problem due to mortality and morbidity. This study aims to examine the patients who present to the emergency department due to occupational accidents and their clinical outcomes.

**Methods**: In this retrospective, descriptive, and cross-sectional study, patients older than 18 who present to the emergency department of Samsun University Samsun Training and Research Hospital due to a work accident between January 1, 2020, and January 1, 2023, were included.

Data such as the sociodemographic characteristics of the patients, the mechanisms of the accidents, the season of the occupational accident, the injured anatomical regions of the patients, the clinical conditions requiring hospitalization, the hospitalized clinic, and whether mortality has developed or not recorded.

**Results**: Two hundred seventy patients were included in the study. 94.1% of the patients were male. There was no difference in age between men and women. Falling was the most common injury mechanism (49.3%). Extremity injuries were the most frequently injured anatomical location (51.8%). It was observed that occupational accidents occurred most frequently in summer (33.7%). Mortality developed in 2.6% (n=7) of the patients. It was determined that mortality did not develop in any of the patients admitted to the service, and the mortality rate was 13.6 % (6/44) among the patients who required intensive care treatment.

**Conclusion**: In this study, we determined that the injuries due to occupational accidents are primarily male and occur during the summer and fall seasons, orthopedic injuries occur more frequently, and the clinical follow-up style is essential in the outcome.

The data obtained will guide the determination of the measures that can be taken to improve occupational safety.

**Keywords**: Occupational injuries, emergency medicine, tertiary hospital

## INTRODUCTION

Occupational accidents are a significant public health problem due to mortality and morbidity.[1] The low number of occupational accidents measures a country's development. In addition, it is noteworthy that occupational accidents have increased in our country (in Samsun/Turkiye), similar to the world, in periods other than the COVID-19 Pandemic.[2] Although there are many definitions for work accidents, there has yet to be a definite consensus on this issue. Certain conditions must be met for an event to be considered an accident at work. These are that the person is working as an insured person, the incident is related to the work and takes place in the workplace or within the period worked by the employer, the incident occurs suddenly and involuntarily, a material or moral damage occurs as a result of the incident, and there is a connection between the incident and the result.[3]

According to the 2017 data from the Center for Labor and Social Security Training and Research (CASGEM), 88% of work accidents occur due to dangerous actions, 10% due to dangerous situations, and 2% due to unavoidable situations.[4] It is known that injuries due to occupational accidents differ in terms of gender. In addition, the incidence of occupational accidents varies over periods throughout the year, and patients often suffer extremity injuries.[4]

This study aimed to obtain detailed information about the sociodemographic characteristics of patients admitted to the emergency department due to occupational accidents, the temporal characteristics of the occupational accidents, the mechanisms of injury, and the outcomes of the patients. The data obtained will guide us in determining the measures that can be taken to improve occupational safety.

## METHODS

### Center and Methodology of The Study

In this retrospective, descriptive, and cross-sectional study, the data of patients admitted to the emergency department of Samsun University Samsun Training and Research Hospital due to occupational accidents between January 1, 2020, and January 1, 2023. The study was carried out with the permission of the Ethics Committee of the Samsun Training and Research Hospital of Samsun University (Date: 08.02.2023, Decision No: 2023/2/3). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

### Formation of The Study Group

It was planned to include all patients older than 18 who presented to the emergency department due to occupational accidents. Patients younger than 18 with incomplete data were excluded from the study.

### Study Protocol

Data such as mode of presentation (outpatient, ambulance, etc.), sociodemographic characteristics, mechanisms of occupational accidents, season, month and time of day of the occupational accident, anatomical regions of the patients injured, clinical conditions requiring hospitalization, duration of hospitalization, hospitalized clinic and whether mortality developed were obtained from the hospital information system and recorded.

### Endpoint of The Study

The primary endpoint of our study was to identify occupational accidents presented to the emergency department and to determine the time of occurrence, mechanisms of occurrence, and outcomes.

### Statistical Analysis

Obtained data were analyzed using the IBM SPSS Statistics 25 package program. Categorical variables are expressed as frequency and percentage. The mean ± standard deviation for the numerical variables that fit the normal distribution, the median (minimum-maximum) for the variables that did not fit the normal distribution; Student's t-test was used to compare numerical data with the normal distribution, the Mann-Whitney U test was used to compare data that did not fit. The Chi-square or Fisher's exact test was used to compare categorical data. All statistical tests were two-tailed, and the statistical significance level was accepted as $p<0.05$ for all analyses.

## RESULTS

The study included 270 patients who met the criteria and whose information was available. Of the patients included in the study, 94.1% were male and 5.9% were female. The mean age of all patients was 40.56±11.77 years. There was no statistically significant difference between male and female patients regarding mean age (Table 1).

**Table 1.** Comparison of demographic data of patients

| Gender, n (%) | Age (year) (mean ± SD) | p value |
|---|---|---|
| Male, n=254 (94.1) | 40.37 ± 11.75 | 0.275 |
| Female, n=16 (5.9) | 43.69 ± 12.09 | |

The mechanism of injury and anatomical classification of the injured sites of the patients included in the study are presented in Table 2. In our study, 49.3% (n=133) of the patients were injured as a result of falls, 12.2% (n=33) as a result of sharps injuries and 10.4% (n=28) as a result of traffic accidents, resulting in 28.9% (n=78) upper extremity injuries, 21.9% (n=59) lower extremity injuries and 13% (n=35) neurosurgical injuries.

**Table 2.** Mechanism of injury and evaluation of injured anatomical regions

| Site of injury | n (%) | Injury mechanism | n (%) |
|---|---|---|---|
| Head-neck | 35 (13) | Penetrating object injury | 33 (12.2) |
| Face | 2 (0.7) | Blunt object injury | 11 (4.1) |
| Thorax | 35 (13) | Fall | 133 (49.3) |
| Abdomen | 3 (1.1) | Caught-in-machinery | 12 (4.4) |
| Spine | 10 (3.7) | Burn | 22 (8.1) |
| Pelvis | 9 (3.3) | Intoxication | 5 (1.9) |
| Upper extremity | 78 (28.9) | Lifting heavy weight | 1 (0.4) |
| Lower extremity | 59 (21.9) | Electric | 9 (3.3) |
| Skin | 8 (2.9) | Car traffic accident | 28 (10.4) |
| Multiorgan injury | 16 (5.9) | Non-vehicle traffic accident | 9 (3.3) |
| Other | 15 (5.6) | Other | 7 (2.6) |
| **Total** | **n=270** | **Total** | **n=270** |

Table 3 provides an analysis of the time-related factors influencing occupational accidents. Accordingly, it was observed that occupational accidents occurred most frequently in summer (33.7%), most frequently in August (11.5%), and most frequently in the evening period after 16:00 (69.6%).

**Table 3.** Occupational Accident Patterns Over Time

| | Time of day, n (%) | | |
|---|---|---|---|
| | Morning, 08:00-16:00 | | 21 (7.8) |
| | Evening, 16:00-00:00 | | 188 (69.6) |
| | Night, 00:00-08:00 | | 61 (22.6) |
| **Season** | **n (%)** | **Month** | **n (%)** |
| Winter | 61 (22.6) | December | 12 (4.4) |
| | | January | 25 (9.3) |
| | | February | 24 (8.9) |
| Spring | 52 (19.3) | March | 14 (5.2) |
| | | April | 21 (7.8) |
| | | May | 17 (6.3) |
| Summer | 91 (33.7) | June | 30 (11.1) |
| | | July | 30 (11.1) |
| | | August | 31 (11.5) |
| Autumn | 66 (24.4) | September | 19 (7) |
| | | October | 26 (9.6) |
| | | November | 21 (7.8) |

The follow-up patterns and outcomes of patients with occupational accidents are given in Table 4. It was seen that 9.3% of the patients who had occupational accidents were discharged from the emergency department, 74.4% were

hospitalized in the ward, and 16.3% were hospitalized in the intensive care unit. It was determined that the orthopedics branch most frequently performed ward and intensive care unit hospitalizations. In this regard, orthopedics was followed by plastic surgery. None of the patients required intensive care after hospitalization in the ward.

**Table 4.** Follow-up patterns and outcomes of patients in the study

| Follow-up of patients (n=270) | | n (%) |
|---|---|---|
| **Discharged** | | **25 (9.3)** |
| **Admitted to the service** | General surgery | 2 (1) |
| | Thoracic surgery | 1 (0.5) |
| | Ophthalmology | 2 (1) |
| | Otorhinolaryngology (ENT) | 1 (0.5) |
| | Neurosurgery | 5 (2.5) |
| | Orthopedics | 149 (74.1) |
| | Plastic surgery | 39 (19.4) |
| | Cardiovascular surgery | 2 (1) |
| | Total | **201 (74.4)** |
| **Admitted to the ICU** | Neurosurgery | 1 (2.3) |
| | Orthopedics | 27 (61.4) |
| | Plastic surgery | 15 (34.1) |
| | Total | **44 (16.3)** |
| **Mortality** | Mortality (-) | 263 (97.5) |
| | Mortality in the ICU (+) | 6 (2.1) |
| | Mortality in the ED (+) | 1 (0.3) |

ICU: Intensive Care Unit, ED: Emergency Department

Gender, age, length of hospitalization, and outcome characteristics of the patients according to the hospitalization location are presented in **Table 5**.

**Table 5.** Evaluation of patient characteristics and outcomes by hospitalization location

| | | | Service(n=201) | ICU (n=44) | p-value |
|---|---|---|---|---|---|
| Gender | Male | n (%) | 188 (82.1) | 41 (17.9) | 0.574 |
| | Female | n (%) | 13 (81.2) | 3 (18.8) | |
| Age | | (mean ± SD) | 39.94 ± 11.46 | 43.39±12.58 | 0.077 |
| Length of stay in hospital | | Median(min-max) | 3 (1-29) | 3.5 (0-93) | 0.173 |
| Mortality | Mortality (+) | n (%) | 0 (0) | 7 (15.9) | **<0.001** |
| | Mortality (-) | n (%) | 201 (100) | 37 (84.1) | |

ICU: Intensive Care Unit

Patients admitted to the emergency department due to occupational accidents were treated for 3 (1-29) days in inpatient wards and 3.5 (0-93) days in intensive care units. Mortality occurred in 2.6% (n=7) of the 270 patients in the study, one of which occurred in the emergency department and the remaining six after hospitalization in the intensive care unit. No mortality occurred in any patient hospitalized in the ward. The mortality rate among patients requiring intensive care treatment was 13.6% (6/44). The patient who died in the emergency department was a patient with multiple trauma who was brought to the emergency department with cardiac arrest. Of the 263 patients who did not develop mortality, 201 were hospitalized in the ward and 37 in intensive care unit. 25 patients were discharged after follow-up in the emergency department. There was no difference between the hospitalized patients according to the place of hospitalization (ward/intensive care unit) in terms of gender, age, duration of hospitalization and mechanism of injury (p=0.574, p=0.077, p=0.173; respectively). There was a statistically significant difference in mortality between patients hospitalized in the ward and intensive care unit (p<0.001). It was also found that all of the patients with mortality were male. Of the 22 burn patients included in the study, 45.5% (n=10) were hospitalized in the intensive care unit. Mortality occurred in 13.6% (n=3) of all burn patients and this rate was 42.8% (3/7) of all patients with mortality.

## DISCUSSION

In our study, 94.1% of the participants were male, while 5.9% were female. According to SSI (Social Security Institution) data, it was reported that 588,823 people had work accidents in 2022, of which 465,769 (73.6%) were male and 123,054 (26.4%) were female. Of those injured, 1.517 (0.2%) died, 1,478 (97.4%) were male, and 39 (2.6%) were female.[5] According to NSC (National Safety Council) data, it was determined that 1,176,340 people had work accidents in the USA in 2020, and 577,990 (49.1%) of these cases were male and 585,540 (49.7%) were female.[6] According to the NSC, 103,020 people died in work-related accidents across the country.[7] In a study by Anderson et al.[8] involving 9187 patients with work accidents, 91.8% of the patients were male, and 8.2% were female. In a study by Tadros et al.[9] involving 377 work accidents in 2015, it was reported that approximately 80% were men. Although SSI data and Anderson's study show that men have more work accidents, similar to our study, NSC data show that men and women have similar rates of work accidents. 2022 According to SSI data, men who had work accidents were found to work in open areas more than women.[5] The reason for the gender difference among those who had occupational accidents in our study may be that men are more involved in business life than women, and men work in open areas relatively more. In addition, women are more likely to be unregistered workers, which may be another reason for this difference. Statistics show that men are exposed to non-fatal accidents at a higher rate than women and show that male patients are exposed to the majority of fatal occupational accidents.[5,10] There are also sources reporting that the primary explanation for this gender gap in occupational accidents in our country is gender discrimination in the labor market, as men and women usually work in different fields of work.[5,11,12]

We found that the mean age of the patients in our study was 40-45 years. In addition, we found that 53.7% of the occupational accidents in our study were in the age range of 25-44 years. Although the numerical values of the mean age were not reported in the study by Tadros et al.[9], the ages of the patients are similar to our study according to the data on the bar chart graph when the study details are examined. According to SSI and NSC data, the most common age range of occupational accidents is 25-44, and the frequency is found to be 55.3% 5, and 41,7, 6, and this information is consistent with our study. When evaluated with the current data, the age at the time of work accidents admitted to our hospital is similar to the literature data.

In the study by Tadros et al.[9], it was reported that 5 patients were referred to occupational medicine, but there was no information about hospitalization. In a study by Toolaroud et al.[13] involving 429 patients, the length of hospital stay was 10.38±10.37 days, and the length of hospital stay was longer than in our study. In the study by Nurczyk et al.[14], the duration of hospitalization was found to be 1.4 (0-203) days. Work accidents caused by burns were included in the studies by

Tollaroud et al.[13] and Nurczyk et al.[14] Burns are known to have a higher mortality and morbidity rate. Similar to the literature, in our study, almost half of all patients with mortality were burn patients.[13-15] However, the small number of patients and the number of patients with mortality prevented us from making strong comments on this subject. However, the difference in trauma mechanisms between the patients included in our study and the patient groups in the literature data may have caused this difference between our study and the literature data. In our study, there was no statistically significant difference between the length of hospitalization of the hospitalized patients and the ward in which they were treated (p=0.173). This may be attributed to the fact that patients whose intensive care treatment was completed were included in the ward hospitalization. As a matter of fact, in our study, the maximum length of stay of patients hospitalized in the intensive care unit was longer than that of ward patients.

Toolaroud et al.[13] found that 28.7% (n=123) of the patients had upper extremity injuries, 21% (n=90) had lower extremity injuries, and 19.3% (n=3) had head and neck injuries. In the Tadros et al.[9] study, 78.2% of the patients were discharged, and only 5 patients were referred to occupational medicine still, more information needed to be provided on the follow-up of patients in inpatient wards. According to SSI data, the most common mechanisms of injury were falls, slips, and loss of control of the tool used, and the most common injury sites were the upper and lower extremities (54.1%) and the head and neck region.[5] According to NSC data, it was determined that injuries occurred due to exposure to harmful substances or environments, overexertion, bodily reactions, and falls.[6] The study by Anderson et al.[8] found that musculoskeletal disorders were the most common reasons after accidents. The available data differ between studies. This is due to the differences in the fields of work between countries, sample sizes, the location of the hospital where the study was conducted, and the fact that repeating the study with a multi-center and larger sample would allow for more precise data. Our study found that patients were most frequently consulted with orthopedics and traumatology, followed by plastic surgery and neurosurgery. The fact that orthopedics, trauma, and plastic surgery departments were the most frequently consulted departments in the study by Tadros et al.[9] involving 377 patients is similar to our study. Considering the regions injured as a result of occupational accidents, it is seen that the number of consultations requested and the hospitalization data are in line with this.

Similar to our study, SSI data showed that injuries occurred most frequently in August, June and September. According to SSI data, 60.2% of injuries and according to NSC data, 35.1% of injuries occurred between 08-16:00 hours.[5,6] Anderson et al.[8] found that the most common injuries occurred in the summer and fall seasons, and the most common time of day for injuries was during working hours. There is a difference between the SSI and NSC data in the percentage of the time of day when work accidents occur. This is because 42.8% of work accidents in NSC data are not reported.[6] There is a difference between the data we obtained in our study, SSI data and NSC data in the time of day of work accidents. We believe that this is due to the fact that the time of 42.8% of work accidents in NSC data is not clearly reported, the time of presentation of the patient to the emergency room is recorded as the time of the incident, and people with minor injuries present to the emergency room after completing their working hours during the day. In addition, there are publications that fatigue and carelessness, which increase as a result of prolonged working hours during the day, increase work accidents and support our study. In addition, we think that the increase in work accidents in our country in the summer and autumn months is due to the increasing labor shortage in the construction and agricultural areas in these seasons and the employment of seasonal workers who have not received the necessary and sufficient training about the work areas.[16,17] In addition, the increase in air temperature in the summer months causes a slowdown in people's physical functions and this situation creates a ground for work accidents.[16]

In contrast to the data, we obtained in our study, mortality was found to occur in 0.2% of work accident victims according to SSI data and in 0.9% according to NSC data.[5,7] The mortality rate was 11.2% in a study of 429 patients by Toolaroud et al.[13] and 0.47% in a study of 641 patients by Nurczyk et al.[14] It is seen that the mortality data obtained in our study is higher than that of Nurczyk et al.[14] and lower than that of Toolaroud et al.[13] We can say that the mortality rate is higher than in Nurczyk et al.[14] study because the hospital where we conducted the study is a tertiary hospital, the patients admitted are complicated cases and also patients with poor general conditions who could not be solved in other hospitals are referred to our hospital. In addition, due to the small number of patients included in our study and the fact that the injuries were usually extremity-related, we may think that the mortality rate was lower than the Toolaroud et al.[13] study. We also think that this difference may be due to the sample size from which the data were obtained.

It is known that burn patients have high mortality rates. The mortality of the burn patients included in our study supports the literature.[13-15] In addition, all patients with mortality were followed up in intensive care units. However, since the statistically significant difference found in the endpoint may be due to the numerical difference between the groups, we believe that re-evaluation with more appropriate data would be beneficial.

### Limitations

Since our study was retrospective, we could not obtain sufficient information about the workplaces where the accidents occurred. In addition, since our study was planned as a single-center study, the small number of patients is noteworthy. For this reason, prospective, multicenter studies with more patients will contribute more to clinicians and occupational safety specialists.

## CONCLUSION

We believe that the data we obtained from this study will contribute to the prevention of occupational accidents, which is a public health and emergency department problem, and to all health professionals, especially health managers, in the clinical management of patients.

## ETHICAL DECLARATIONS

**Ethics Committee Approval:** The study was carried out with the permission of the Ethics Committee of the Samsun Training and Research Hospital of Samsun University (Date: 08.02.2023, Decision No: 2023/2/3). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

**Informed Consent**: All patients signed and free and informed consent form.

**Referee Evaluation Process:** Externally peer-reviewed.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

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