



## Original Article

### Epidemiological study of the occupational accidents in the industries and plants covered by the Social Security Organization in Ilam city during 2010-2012



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#### ABSTRACT

**Introduction:** Occupational accidents result in pain, suffering, death of workers in some cases, many financial losses, reduce production levels and so forth; thus it is counted as a national loss. The aim of this study was to investigate the causes of occupational accidents in the industries and plants supported by the Social Security Organization of Ilam during the years 2010-2012.

**Methods:** In this cross-sectional study, 462 occupational accidents occurring for employees covered by the Social Security Organization were evaluated. Data were collected using the pre-designed checklist filled out with the records of the accidents available in the Social Security Organization by the researcher. Data were analyzed by SPSS (ver. 23) software.

**Results:** The results of the study showed that 42.6% of the accidents occurred in 2010. The most accidents occurred in the age group of 21-30 years old (46.8%) and 461 of injured people (99.8%) were male. The majority of the people (62.55%) were married and 90% had work experience less than five years. Unsafe acts were the most cause of the incidents (57.1%). The most important type of the incident was dropping and slipping (37.9%). There was significant correlation between the cause of incident, type of incident and type of injury ( $P < 0.000$ ).

**Conclusion:** According to the results, most of the injured people had work experience less than five years, indicating that improving the safety needs monitoring and cooperation of relevant organizations and recruit training.

## Introduction

The incident is an unplanned, damaging and uncontrollable event that results in injury to persons, damage to equipment and supplies, side costs for the person and organization, and disturbing the activity, and always occurs by unsafe acts and conditions or combination of these two causes (1-7).

Occupational accidents refer to physical injuries that occur in workers, ranged from a crash and a traumatic event to organ failure and death (8). Occupational accident is considered as one of the major factors resulting in the loss of labor and working hours (1, 9). According to available statistics, work-related accidents are considered as the third cause of death in the world, the second

cause of death in Iran after driving accidents and one of the most important social, hygienic and economic risk factors in developed and developing societies (1, 3, 4, 10-12). According to the World Health Organization (WHO), 350,000 workers die annually due to occupational accident (6). According to the International Labor Organization (ILO), about one third of the work-related deaths are due to occupational accidents (13, 14). Developing countries involve 60% of the world's workforce (14), but only 15.5% of the population has access to the occupational health care services. Hence, work-related incidents in developing countries is higher than that in developed countries (1, 5, 10, 14). In the last decade, Iran has also developed exponentially, and one of its adverse effects has been the dramatic increase in the number and variety of work-related accidents (1). In Iran, there are 14,000 job incidents annually, most of which are related to industries (10, 15). The statistics of the Social Security Organization show that there were 98621 cases of disability in 2009, of which 25070 were total and partial disabilities arising from occupational accidents (10, 16), 21,740 persons were injured due to accidents during the work, led to 110 deaths and 234 disabilities (12, 4). According to an estimate in China, about 2% of gross domestic product (GPD) is lost annually through occupational incidents (14). In recent years, many studies have been conducted to find out the factors that cause occupational accidents. The results of this research indicate that occupational accidents occur due to unsafe acts in the workplace so that human factor has greater role in the incidents than technical problems in equipment (unsafe conditions), and most occupational accidents are caused by unsafe behaviors of industrial managers, engineers, supervisors and workers (17). The researches performed in this field have indicated that unsafe acts directly or indirectly cause 80-90% of accidents in working environments (18, 19). Previous studies have shown that the risk of occupational accidents in recruits is higher. The probability of occupational injuries is much higher in adolescents and young adults than in older adults. In the United States, the workers who have been under 25 years old had the most occupational injuries and illnesses (4). In similar situations, men are more employed in the environment with high risk of damage and death, compared to women (20). Generally, women choose safer jobs (4). The most common causes of incidents in workplaces cited in various studies were falling, colliding with hard or sharp objects, being stuck and other causes (3). To provide and improve the health of employees in a community, the first step in the planning and prevention of these events is to identify

the risk factors in occupations and work environments. The accident prevention strategy should be reasonable and proportional to the important variables of work-related accidents. Accident analysis can be used to identify and prevent common causes of accidents, work-related injuries and occupational deaths in more efficient industries (21). Regarding the presence of various industries in different populations and countries, and due to financial burden, direct and indirect costs for the employer, as well as various disabilities and physically handicap for the employees, the epidemiological survey of occupational accidents in different societies and time is important. Therefore, this research was conducted to epidemiologically study work-related accidents in industries and plants covered by the Social Security Organization of Ilam City during 2010-2012.

## Methods

The present study is a descriptive-analytic cross-sectional study, which was carried out to investigate work-related accidents in the industries and plants covered by the Social Security Organization of Ilam City during 2010-2012, based on the information recorded by this organization. All workers who have experienced occupational accidents during 2010-2012 and their incident were recorded at the Social Security Organization of Ilam City took part in this study, and the information extracted from their cases were analyzed. After obtaining the necessary permissions from the relevant organizations, the required information was collected based on the aims of the plan using a checklist. The sampling method was census-based and included all available information related to accidents occurring during 2010 to 2012. The information was collected based on the goals set in the plan and a total of 462 occupational accidents were investigated. The checklist of this research contained 14 questions, the first part of which was about demographic information including age, gender, marital status, work experience, and the second part was about the incident including the year of incident, occupation, type of accident, the number of work hours per day, the location of the incident, the unit of work, type of injury, and the cause of the incident. The ethical considerations of this plan include confidentiality of information revealed to the researcher, observance of the research ethics, obtaining the necessary permissions from the Social Security Organization (code: 91018.186). Data analysis was performed using SPSS (ver. 23) software. Frequency and percentage of data were used in order to analyze the

qualitative data, and the central and dispersion indices were used for quantitative data. Chi-square and ANOVA tests were used to analyze the data.

## Results

In this research, a total of 462 work-related accidents were recorded in the plants covered by the Social Security Agency over a three-year period. The highest rate of incident with 197 cases (42.6%) was recorded in 2010, and after that, 145 cases (31.4%) in 2011, and 120 (26%) cases in 2012. The subjects were at least 14 years old and at most 67 years old, with an average age of 33(10). According to Table 1, the highest rate of incident occurred in 21- to 30-year old group with 216 cases (46.8%). The average of work experience (85.5 days) was in the range of one month to 32 years. The Occurrence of incident in the people with work experience less than 5 years was the most rate with 420 cases (90.9%), in people with work experience between 5 and 15 years was 32 cases (6.9%), and in people with work experience more than 15 years was the least rate with 10 cases (2.2%). The distribution of gender in occupational accidents for men was 461 cases (99.8%) and for women was 1 cases (0.8%). Of the total number of injured people, 289 cases (62.55%) were married and 173 cases (37.44%) were single. The highest rate of incidence was related to the manufacturing industry. Table 2 shows the prevalence of occupational accidents in terms of type of industry. The job of most injured people (226 cases or 48.9%) was laboring. As shown in Table 3, the most type of the incident was dropping and slipping (175 cases or 37.9%). Also, being stuck inside or between objects

**Table 1:** Frequency distribution of incident based on age groups in the studied population.

Age group	Frequency	%
Less than 20	16	3.5
21-30	216	46.8
31-40	136	27.3
41-50	71	15.4
More than 51	33	7.1
Total	462	100

**Table 2:** Frequency distribution of incident based on the type of industry in the studied population

Type of industry	Frequency	%
Building	111	24
Productive	138	29.9
Executive	26	5.6
Services	51	11
Technical	26	5.4
Developmental	111	24
Total	462	100

(16.2%) and 73 cases (15.8%), respectively. The results of this study indicated that 16 cases (3.5%) of the accidents resulted in death, and the most damages and machinery, and falling objects were 75 cases were contusion, dislocation, rupture, cut, torsion, and cramp with 200 cases (43.3%). After that, fractures, cracking and sprain of the organs were found in 142 cases (30.7%), and injury, pain and discomfort with 58 cases (12.6%) were in the next ranks (Fig. 1). Based on the results of this study, the most cause of the incident is related to unsafe acts with 264 cases (57.1%). Unsafe conditions are found in 161 cases (34.8%) and other causes with 37 cases (8%) were ranked in next orders. The most incidents occurred on the morning shift (8 to 16 A.M.) with 404 cases (87.44%) and after that on the evening shift (16 to 24 P.M.) with 30 cases (49.6%) and on the night shift (8 A.M to 24 P.M.) with 28 cases (6.06%) were ranked in the second and third orders, respectively. According to Table 4, Chi-Square test showed significant relationship between the cause of accident and the type of accident and the type of injury ( $P < 0.000$ ). On the other hand, there was no significant relationship between the age and the cause of the accident based on ANOVA test ( $P = 0.207$ ).

## Discussion

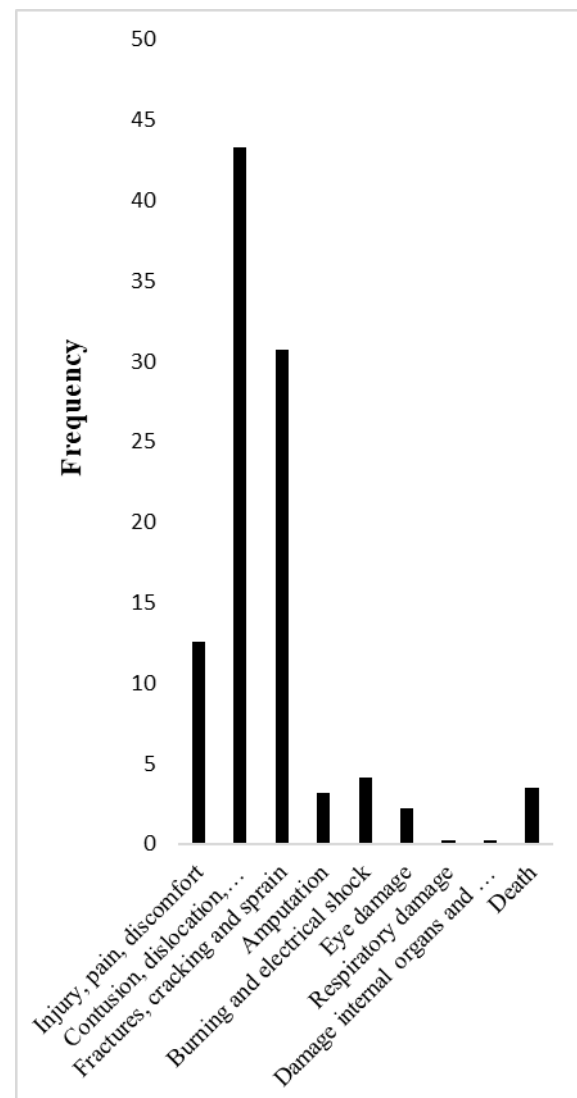
The aim of this study was to investigate and evaluate the occupational accidents occurring in the city of Ilam during three consecutive years in order to identify high-risk occupations in the province, to provide practical information for use in future studies and to adopt preventive methods for the injuries and accidents. The results of this study showed that most of the accidents occurred in 2010. The most rate of accidents occurred in the age group of 21-30 years. Most of the injured people were male, married, who have work experience less than five years and their job was laboring. Morning shifts (8 to 16 A.M.) had the most rate of accidents, and most accidents occurred in the manufacturing sector. Unsafe actions were the most cause of the incident, and the most types of accidents were falling and slipping, and the most types of injuries were fractures, cracking and sprain, torsion, cutting. Statistical analysis also showed that there was significant relationship between the cause of accident, type of accident and type of injury, but there was no significant relationship between the age and cause of the incident. The results of this research showed that the pattern of incidents in this study was almost consistent with other studies, in terms of age, gender, cause of accident, type of incident, etc. (4, 22, 23).

**Table 3:** Frequency distribution of incident based on the cause of incidence in the studied population

The cause of incidence	Frequency	%
Slipping and dropping*	175	37.9
Being stuck in and between machines and objects	75	16.2
Falling objects	73	15.8
Burn	13	2.8
Electrocution	7	1.5
Colliding with hard or sharp objects	20	4.3
Other causes	99	21.4
Total	462	100

Observing the frequency distribution of work-related accidents during the 3 years showed that most of the events occurred in younger people (the age group of 21-30 years old), which was consistent with the studies conducted by Mahmoud Bakhtiari et al., and Aghili-Nejad et al. (14), and also with the studies conducted in other countries (22, 23). This event may be argued by assigning harder work to younger people with less experience by the employer. However, younger people with less experience and education usually have high curiosity and risk taking (4, 16). Also, the results indicated that the incidence rate in the individuals, with average work experience of 18.67 months, has decreased with increasing work experience, and the most incidents occurred in the subjects with work experience less than 5 years old. This conclusion was consistent with the results of the study conducted by Halvani et al. (5). Also, Webb et al. showed that the probability of the incident for workers with three-year work experience was more than that of other workers (24). The distribution of occupational accidents for men and women in the three years showed that about 99.8% of the accidents occurred for men. It can be argued that the accident has been significantly reduced in women due to the higher number of male workers than women, as well as the increased attention and precaution of women during work (4). Various studies, such as Bakhtiari et al. (4) and Hashemi Nejad et al. (25) also reported the incidence rates which were more in men than that in women. In the present study, most occupational accidents occurred in married individuals with the score of 55.52%, which was consistent with the other studies (3, 4, 25). Also, the highest incidence rates were in the manufacturing and construction industry, respectively. Mehparov et al. reported that the highest incidence rate was observed in metal and construction industries (3), which is consistent with the present study. In the study conducted in Turkey, the highest incidence rate was related to the manufacturing sector (7). In the other studies, the

highest rate of accidents and occupational injuries were observed in the construction industry (3, 4, 7), which are also in agreement with the present study. In most studies along with the present study, the number of occupational accidents in married men was more than single ones, which may be due to stresses resulting from family and economic problems, multiple employment, etc. (3). The most common types of the incidents in the present study were dropping and slipping (37.9%), and being stuck in or between machines and objects (16.2%). Halvani et al. reported that the most common type of the incident was the dropping (20.8%) (5), which was consistent with the present study. This result was also reported by Bakhtiari et al. (4). Solomon also stated that most occupational accidents occur due to the displacement of objects and the fall from height (26).

**Figure 1:** Frequency distribution of injured people according to the type of injury in the studied population



**Table 4:** Relationship between the cause of accident, the type of accident and the type of the injury (based on Chi-Square test)

Variable	The cause of accident				
	Unsafe acts	Unsafe condition	Other causes	P-value	
	Frequency(%)	Frequency(%)	Frequency(%)		
Type of accident	Slipping and dropping	99 (56.6)	63 (36)	13 (7.4)	<0.001
	Being stuck in or between machines and objects	47 (62.7)	24 (32)	4 (5.3)	
	Falling objects	35 (47.9)	37 (50.7)	1 (1.4)	
	Burning	8 (61.5)	3 (23.1)	2 (15.4)	
	Electrocution	2 (28.6)	5 (71.4)	0 (0)	
	Colliding with dangerous objects	7 (35)	2 (10)	11 (55)	
	Other factors	66 (66.7)	27 (27.3)	6 (6.1)	
Type of injury	Injury, pain, discomfort	42 (70)	15 (25)	3 (5)	<0.001
	Contusion, dislocation, rupture, cut	124 (63)	68 (33)	8 (4)	
	Fractures, cracking and sprain	72 (50.7)	56 (39.4)	14 (9.9)	
	Amputation	7 (46.7)	8 (53.3)	0 (0)	
	Burning and electrical shock	12 (63.2)	6 (31.6)	1 (5.3)	
	Eye damage	4 (40)	3 (30)	3 (30)	
	Disabilities	3 (18.8)	5 (31.3)	8 (50)	

In the studies conducted by Mehpervar et al. and Vazirinejad et al., the most common types of the incidents were being stuck in or between machines and objects (3), and dropping and collisions with bodies (27), respectively. Ghasempouri et al. reported colliding with dangerous objects (7) as the most common type of accident (52%), which was not consistent with the present study. The most common types of injuries, ranked in the present study, were related to contusion, dislocation, rupture, cut, torsion, and cramp (43.3%) and after that, fracture, cracking and sprain of the organs (30.7%). In the study conducted by Mehpervar et al., the most frequent injuries were fracture with 45.6%, and then contusion with 22.2% (3). In the study conducted by Ghasempouri et al., 44% of the incidents resulted in fracture (7). Wound and fracture were the most frequent injuries in the study conducted by Halvani et al. (5). In Mohammadfam's study, the most frequent injuries were traumatic injuries (30.6%), fracture (22.9%), and burn (19.4%) (28). All of these studies were consistent with the results of the present study. In this study, 3.5% of the accidents resulted in death. According to the results reported by Mehrparvar et al., and Halvani et al., in Yazd, 10.8% and 1.4% of the accidents resulted in death, respectively (3, 5). Because the type of industry is different in each province, the results of the accident in different provinces can be various. In the present study, the highest rate of accident was due to unsafe acts (57.1%). Qods et al. studied this case on all workers and employees of a pipe-making factory in Semnan,

and showed that unsafe acts with 62.7% were the most important cause of the accident (8), which was consistent with the findings of this study. The findings of this study also showed that the highest rate of incidence (87.44%) occurred on the morning shift (8 A.M. to 16 P.M.). The high prevalence of incidents in this time domain as the most active time in most work environments and most industries is relatively evident, and in other researches, such as studies conducted by Janmohammadi et al. (7:00 A.M. to 13:30 P.M.) (12), Halvani et al. (16), Bakhtiari et al. (9-11 A.M.) (4), Qods et al. (8 A.M.-14 P.M.) (8), Mehrpur et al. (3), Hashemi-Nezhad et al. (10-12 A.M.) (25), this result have also been reported.

### Conclusion

Regarding the importance of work-related accidents and its complications at the community level, in order to obtain better and more accurate results, it is necessary to have accurate and standard information recording system, and skilled individuals in this field. Since most of these incidents can be prevented, and accident prevention programs, such as the use of personal protective equipment, safety and health education, effective monitoring of plants and factories, and increasing the education level of workers can reduce the incidents. High rate of unsafe acts as the cause of the incident and reporting its adverse consequences in this study shows that, although the importance of work-related accidents and its consequences has been revealed today,

relevant executive agencies have failed to address this issue. Therefore, in order to achieve safety at the optimum level, the pursuit of safety regulations seriously by the relevant organizations, and the obligation of employers and workers to comply with the safety regulations will be more effective.

### Ethical disclosure

The ethical considerations of this plan include confidentiality of information by the researcher, observance of the ethics in the research, the provision of necessary permits from the Social Security Organization, and informing this organization about the results of the present study (code: 186.914018).

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### Authors' contribution

All authors contributed equally in planning and carrying out this project.

### Conflict of interest

There is no conflict of interest in this study.

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