JCHR

Journal of Community Health Research 2020; 9(2): 90-99.

Analysis of Occupational Accidents in the Manufacturing Sector in Semnan Province during 2013-2015

Farin Fatemi [1], Alireza Dehdashti [2*], Besharat Zadehabbas [3], Hossein Kashani [4]

1. Department of Health in Disasters and Emergencies, Semnan University of Medical Sciences, Semnan, Iran
2. Social Determinants of Health Research Center, Semnan University of Medical Sciences, Semnan, Iran
3. Department of Occupational Health, Semnan University of Medical Sciences, Semnan, Iran
4. Department of Occupational Health , Hamadan University of Medical Sciences, Hamadan, Iran

ARTICLE INFO

Original Article

Received: 20 Jan 2020
Accepted: 12 April 2020

OPEN ACCESS

Corresponding Author:
Alireza Dehdashti
dehdasht@yahoo.com

ABSTRACT

Introduction: Occupational accidents have been regarded as the third cause of mortality around the world. This study examined the rates, types, and causes of occupational accidents in industrial sites.

Methods: In a cross-sectional design, 721 accident reports were examined in the manufacturing sites in Semnan which is located in the central part of Iran from 2013 to 2015. This study used the Social Security Organization database on workplace accident investigation reports. Frequency and percentage were used for the prevalence, whereas Chi-Squarewere used to identify the predictors of occupational accidents. SPSS version 21 was used for data analysis and 0.01 was considered as a cutoff for the significant level.

Results: Accident Frequency Rates were 1.46, 1.54, and 1.40 in 2013, 2014, and 2015, respectively. Also, the Safe T-score was calculated between +3 and -3. The majority of accidents occurred in males in the age group 24-45, having the educational level of high school diploma or lower. Furthermore, most accidents occurred during the morning shift. Unsafe actions were determined as the major cause of accidents. The maximum reported statistics related to the type of accidents, injuries, and injured organs of the body were hitting sharp edges or obstacles (25%), bruising (30%), and upper limbs (44%). The results indicated a statistically significant relationship between shift work, accident type, inured organs, and injury type (p =0.001).

Conclusion: This study revealed that workers' behavior as a main contribution to accidents and injuries in the industry. Health and safety training should be designed according to worker duties.

Keywords*:* Occupational accidents, Unsafe condition, Manufacturing sector, Safety indices

How to cite this paper:
Fatemi F, Dehdashti AR, Zadehabbas B, Kashani H. Analysis of Occupational Accidents in the Manufacturing Sector in Semnan Province during 2013-2015. J Community Health Research. 2020; 9(2): 90-99.

[DOI: 10.18502/jchr.v9i2.3407]

Introduction

Human resources are the driving force of the economic cycle in every country (1). Studies indicated that occupational accidents have a significant effect on the economic process (2). Occupational accidents expose workers to risks like death, deformation, disability, and work-related diseases (3, 4). Occupational accidents not only cause a significant effect on the injured person, but also have a major negative effect on employers, organizations, and society economically and socially (5-9). As there is a significant relationship between productivity and appropriate work environment (10), such accidents can result in high levels of absence from work and low performance (11). Occupational accidents and relevant injuries cause direct and indirect costs for different societies (12). As the cost of medical care in the hospitals of the Netherlands was more than € 76 million for the third of the workers suffering from occupational accidents in 2010 (7). Evaluating the information about some EU member states indicated that the total direct cost of occupational accidents insurance plans is € 20 billion per year (11). Total occupational accident costs are estimated as 4% of Gross domestic product (GDP) that impose considerable pressure on the economies of each country (13, 14). Based on the conducted studies, the trend of accidents has increased since 1994-2012 and if there is an accident registration system, there will be an almost constant ratio between fatal and non-fatal accidents (12, 13, 15). International Labor Organization (ILO) reports in 2012 showed that 2.4 million deaths and more than 330 million serious non-fatal accidents occur in the world each year due to occupational accidents and relevant diseases (15). Disability due to occupational accidents increases the rate of early retirement (16). Reporting the accident rate in various regions varies based on the coherence of accident registration systems so that the incidents reported by the ILO form only 3.9% of occupational accidents worldwide (12). At present, occupational accidents analysis has been considered as a critical process in formulating preventive policies (17). In Iran, there are few databases for having access to occupational accidents. In addition, the studies on work-related injuries are very limited. It is essential to analyze the demographic data of the accident victims and the workplace as well as the consequences of occupational accidents to gain an accurate understanding of the situation of accidents in industrial workplaces. The present study aimed to determine the frequency, types, and causes of occupational accidents and work-related injuries in Semnan industries to provide the necessary conditions for accident management and prevent the repetition of similar accidents. The present study determined the prevalence of occupational accidents, types of work-related injuries, and causes of such accidents among workers.

Methods

Study design: The present study was a cross-sectional descriptive-analytical research being conducted during 2013-2015 to analyze the occupational accidents. The population under study included the industrial-manufacturing units in Semnan city involving the industrial-manufacturing companies of chemical, metal, plastic, shoe, textile, and tile products. Investigating the accident reports was carried out in 19 industrial companies.

Instrument and data gathering

In the present study, the method was based on eliciting data from the provincial database. For this purpose, the necessary licenses for collecting and analyzing data were obtained through correspondence with the head of the social security organization. The required data were elicited and collected from the information of the Social Security Organization by using the accident investigation reports. According to the rule of Iran and the article 65 of Social Security Organization, each employer must report the workplace occupational accidents to this organization during three working days. Therefore, occupational health and safety experts in the post-accident industrial units conducted an accident investigation and provided a full report based on the forms of the

[DOI: 10.18502/jchr.v9i2.3407]

Social Security Organization. In general, the report of every accident included the data of accident date, demographic information, work pattern of the injured person, accident cause, accident type, the injury caused by the accident, injured body organ, industry name, and the number of workers in that industry.

The studied variables and accident indices

In this study, the statistical indices of accidents were measured for estimating the occurrence of accidents and comparing the workplaces with each other as well as determining the risk level of industrial activities. The outcome variable in this study included occupational accidents and accident indices. The type of accidents (falling from a height, falling objects, hitting sharp objects and obstacles, getting stuck in or between objects, slipping and sliding, throwing sharp objects, biting, electric shock, inappropriate cargo carriage, accident with vehicles, spray of chemicals, others and the lack of information), type of injury (burns, contact with electricity, inhalation of toxic substances, amputation, fracture, bruising, cutting) and injured body organ (head, face, respiratory system, upper limb, lower limb, body, whole-body) were considered as the input variables. Besides, the factors affecting the occurrence of accidents (unsafe conditions, unsafe actions, and the lack of information) were studied. Furthermore, the accident investigation indices including AFR and Safe T-score were calculated for monitoring the safety situation and the probable changes during years understudy in the industrial-manufacturing companies of Semnan province. Equations 1 and 2 indicate how the AFR and safe T-score were calculated in this study:

$$AFR = \frac{N}{S} \times 200000 \qquad \text{Equation 1}$$

Number of accident: N

Total working hours: S

$$Safe - T - score = \frac{AFR_2 - AFR_1}{\sqrt{\frac{AFR_1}{S/200000}}} \qquad \text{Equation 2}$$

AFR_2 *Accident Frequency new:*

Accident Frequency past: AFR_1

Total working hours: S

The independent variables used in the statistical analysis of the study included demographic information like gender, age (less than 24 years, 24 to 45 years, more than 45 years) (11), marital status (single, married), educational level (diploma and lower, academic education) as well as industry type (chemical, metal, plastic, shoe manufacturing, textile and tile manufacturing), and shift work of individuals (constant morning, evening, night, and rotating shifts).

Data analysis

the collected data were analyzed through SPSS software (Version 21). Statistical processing of data as descriptive statistics included frequency and percentage mean, standard deviation, and accident frequency rate.

The relationship between the occurred accidents and studied variables including shift work, industry type, age, gender, marital status, and educational level were analyzed using the chi-square test (k2). Statistical significance in statistical tests was considered at 0.01.

Findings

Demographic information and working conditions of injured individuals

The demographic features and work patterns of injured individuals were presented in Table 1. Most accidents occurred in men. Of all recorded incidents, the age of the injured person was not recorded in 10 cases (1.4%) and more than half of the injured individuals were in the age range of 24-45 years. The minimum age of the injured individuals was 17 years and the maximum age was 60 years. The individuals over the age of 45 years had the minimum occurrence of accidents. In terms of marital status, there were 12 missing data (1.7%) and the married people with more than two-thirds of accidents had the maximum frequency. In 15 cases (2.1%) of the recorded accidents, the level of education of the injured person was not mentioned. Most of the injured individuals had a diploma or lower. In 28 cases (3.9%) of the recorded accidents, the work shift of the injured

[DOI: 10.18502/jchr.v9i2.3407]

person was not included. In the morning shifts, individuals with more than half of the accidents allocated the highest occurrence of accidents but in the night shifts, the minimum occurrence of accidents was reported. In general, 721 occupational accidents were recorded and reported during the study period. The number of occurred accidents being reported in 2013, 2014, and 2015 was respectively 305, 285, and 131. The average number of workers during the studied period was 5209. The average number of workers in the chemical, metal, textile, plastic, tile, and shoe manufacturing industries was 1941, 1876, 570, 457, 280 and 85. The chemical industry (37.2% of all workers) had the maximum number of workers while the shoe manufacturing industry (1.6 % of all workers) had the minimum number of workers.

Accident frequency rate in workplaces

Figure 1 indicates the accident frequency rate in different industries during the period under investigation. As it can be observed in the figure, most of the occurred accidents (52.1% of total accidents) were in the metal industry. Accidents occurred in the metal and chemical industries have had a declining trend in the years 2013-2015. The number of accidents that occurred in the plastic industry has increased in 2014 compared to 2013 while the number of accidents has decreased in 2015. In the shoe and textile industries, the number of occurred accidents has been the same during 2013 and 2014 but decreased in 2015. In the tile manufacturing industry, the number of recorded accidents has been constant over the studied years. (Figure 1)

Table 1. Demographic information and work patterns of injured individuals

Variable	Frequency	Percentage (%)
Gender		
Male	683	94.7
Female	38	5.3
Total	721	100
Age		
<24	137	19
24-45	548	76
<45	36	5
Total	721	100
Marital Status		
Married	586	81.3
Single	123	17
Missing	12	1.7
Total	721	100
Educational Level		
Diploma and less	647	89.7
Academic education	59	8.2
Missing	15	2.1
Total	721	100
Work Shift		
Morning	406	56.3
Evening	186	25.7
Night	53	7.3
Rotating	54	7.4
Missing	22	3.3
Total	721	100

[DOI: 10.18502/jchr.v9i2.3407]

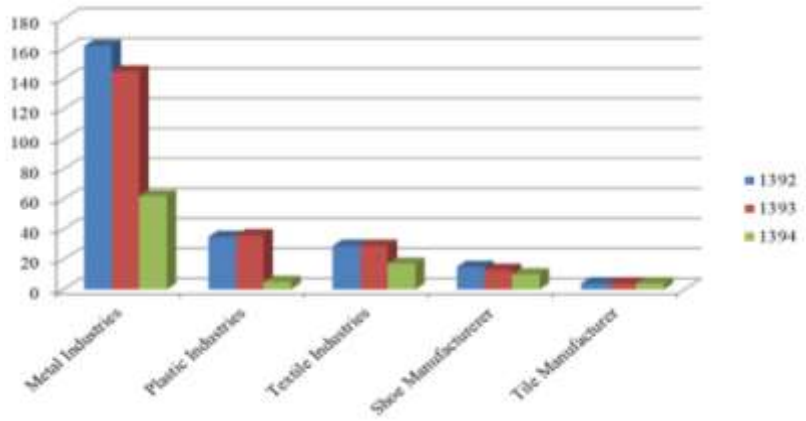

Figure 1. The frequency of occupational accidents in the industries under study (2013-2015)

Calculating the Accident Frequency Rate (AFR) and Safe-T score in Semnan industries

Table 2 shows the AFR for a variety of industries. As indicated in the figures of the table, the accident frequency rate in all surveyed industries for 200000 working hours in 2014 was 0.08 compared to 2013 with an ascending trend while it was 0.14 and had a declining trend in 2015. In the plastic and chemical industries, as in the accident frequency rate in all industries, there were ascending trend and descending trend. The accident frequency rate in the metal industry was declining. The accident frequency rate in the shoe manufacturing industry in 2015 had an ascending trend of 12.94 as compared to 2014. In tile manufacturing industry in 2013 and 2014, the accident frequency rate has remained constant and in 2015 and has reached twice the accident frequency rate in 2014. The accident frequency rate in the textile industry was the same in the study interval. In addition, the calculated Safe-T score based on the research data was -0.82. The value of this score is specified by an algebraic sign. In this technique, the positive sign shows the worsening of safety conditions when it is greater than + 3 while the negative sign shows an improvement in the current safety conditions compared to the past in the studied workplace provided that it is less than -3.

Table 2. Accident Frequency Rate (AFR) for a variety of industries

Industry Type	Accident Frequency Rate		
	AFR_{92}	AFR_{93}	AFR_{94}
Chemical	0.86	1.20	1.08
Metal	2.21	1.95	1.71
Plastic	1.57	1.96	1.09
Shoe manufacturer	15.29	15.29	28.23
Textile	1.75	1.75	1.75
Tile manufacturer	0.71	0.71	1.42
Total	1.46	1.54	1.40

The causes of the occurrence of accidents in the workplace

The causes of the occurrence of accident were reported in Figure 2 based on a completed report from the workplace safety and health unit.

As the figure indicates, most accidents recorded in a variety of industries were due to unsafe work actions.

[DOI: 10.18502/jchr.v9i2.3407]

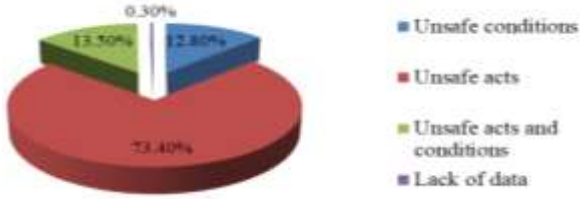

Figure 2. The percentage of occupational accidents causes based on accident investigation reports (2013-2015)

Table 3. The frequency of different types of accidents in manufacturing industries

Accident type	Activity type						
	Tile manufacturing	textile	Shoe manufacturing	Plastic	Metal	Chemical	Total
Falling from height	2	4	*	*	5	10	21
Falling objects	*	2	*	3	37	9	51
Hitting sharp objects and obstacles	2	27	3	11	121	14	178
Getting stuck in or between objects	1	10	2	20	48	6	87
Slipping	1	3	*	*	10	9	23
Throwing sharp objects	*	8	12	13	34	10	77
Biting	*	*	*	*	2	16	18
Electric shock	*	4	*	1	1	*	6
Inappropriate carrying goods	1	4	*	5	16	5	31
Accident with vehicles	*	*	*	*	9	3	12
Spraying chemicals	*	1	1	6	10	31	49
Others	1	3	*	1	24	7	36
Lack of information	4	9	20	16	56	23	128
Missing							4
Total							721

*No accident was reported.

Types of injury in workplaces

Table 3 indicates the frequency of the type of accidents that occurred in the studied industries. In general, hitting sharp objects and obstacles was the maximum type while electric shock was the minimum type of injury that occurred in a variety of industries. Furthermore, in accidents related to metal and textile industries, the most frequent type of accident was hitting sharp objects and obstacles. Most accidents occurred in the chemical industry was because of the sprayed chemicals. In the plastic industry, stuck in or between objects, in the shoe manufacturing industry, throwing sharp objects, and in the tile manufacturing industry, fall from height and hitting sharp objects and obstacles were the most frequent type of accident.

Types of injuries caused by accidents in the workplace

Table 4 shows the type of injuries caused by the accident in the studied industries. In general, bruising (30%) and then cuts (28.7%) were the maximum type of injury caused by the accident, and contact with electric current (0.7%) was the minimum type of injury caused by the accident. In the accidents caused in chemical, shoe manufacturing, textile, and tile manufacturing industries, the maximum type of injury was bruising while in the metal and plastic industries the maximum type was cut.

[DOI: 10.18502/jchr.v9i2.3407]

Table 4. The frequency of work-related injuries in manufacturing industries

Injury type	Industry type						
	Tile manufacturing	Textile	Shoe manufacturing	Plastic	Metal	Chemical	Total
Burn	*	1	1	5	18	31	56
Contact with electricity	*	4	*	1	*	*	5
Inhalation of toxins	*	*	*	*	2	16	18
Amputation	*	*	*	6	8	2	16
Fracture	2	7	2	1	16	11	39
Bruising	6	27	13	20	109	42	218
Cut	1	12	6	24	154	10	207
Others	3	24	17	19	68	31	161
Total							721

*No accident was reported.

Types of injured organs in the workplace

The frequency of the injured organ caused by the accident in the studied industries is shown in Figure 3. The maximum and minimum frequencies were based on the injured organ in more than one-third of the cases and the whole body was less than 0.1. In the occurred accidents of the tile manufacturing industry, unlike other industries, the most frequently injured organ in accidents was related to the lower limb.

The relationship between the occurred accidents and studied factors

The results of this study indicated a significant difference between shift work with accident type (p= 0.001), and injury type (p= 0.001). In addition, based on the accident data, a significant relationship was found between injured organs and shift work (p= 0.001). No significant relationship was found between age, gender, marital status, and educational level with any of the consequences of the accident in this study.

Discussion

The present study aimed to determine the frequency, types, and causes of occupational accidents in the industries of Semnan. The most important results of this study indicated that according to the nature of industries, accident type, injury type caused by the accident, and injured organs are different. Since in the present study, the mean age of most injured individuals was in the age range 24-45 years, low work experience and false self-esteem in young individuals can be also considered as the important causes of occupational accidents. Based on the present study, most injured individuals were married males, with a diploma education or lower, and the maximum time of occurring accidents was in the morning shift as being reported in many previous studies (2, 4, 6, 18).

In analyzing the occupational accidents, studying the causes of accidents has been considered in many studies. In the present study, the failure to work safely has been the main cause of many accidents. Different studies were conducted on Qazvin occupational accidents, workers of the construction industry in Yazd, and concrete industries, human error was reported as the main cause of accidents (9, 18, 19). In a study by Gulhan et al. in the metal industry of Ankara, the most important cause of accidents was the failure to use personal protective equipment (20). In a study entitled “Epidemiology of occupational accidents in insured Iranian workers” performed by Bakhtiari et al., the failure to maintain workshop cleaning was the main cause of accidents (21). In the conducted studies on occupational accidents in Iran, unsafe acts and unsafe conditions were reported suggesting that a wide variety of work activities and differences in the technique of studying accidents after their occurrence are significant causes in a variety of immediate causes (22,23,24). Various studies on the type of accidents

[DOI: 10.18502/jchr.v9i2.3407]

have presented different results. Such a difference is caused by the difference in the nature of the studied industries. The results of the present study showed that most accidents were related to sharp objects and obstacles. The above result is in line with the results of the study by Unsar et al. on Turkish occupational accidents (16). Numerous studies have reported the occurrence of falls and slips (9, 18, 19, 21). In the studies by Khodabandeh et al., and Mehrdad et al., on the accidents which led to death in the construction industries and occupational accidents in Iran, most accidents mostly included fall from a height (25, 26). Based on the results obtained from the present study and previous studies, falling and hitting sharp objects and obstacles have been among the common causes of many accidents in different workplaces (27). The results of this study indicated that bruising was the most reported injury due to occupational accidents. Studies by Macedo et al. on occupational accidents in Portugal and the studies by Sabeti Motlaq et al. in Qazvin have obtained similar results (9, 11). The review of studies in the concrete industry indicated that most injuries were reported as superficial injuries (16, 19). Furthermore, in the study by Halvani et al. being conducted on Yazd construction workers, most injuries were of fracture type (18). It seems that working processes and methods in manufacturing and industrial companies lead to accidents and firstly the probability of bruising is the most probable injury caused by occupational accidents. In the present study, most of the accidents caused an injury to the upper limb. This result is similar to the results of Mehrdad et al. in Iran and a study by AkboĞA in the concrete industry (19, 26). In a study by Gulhan et al. in the metal industry in Turkey, the most recorded injury was reported as eye injury (9). In another study on fatal accidents in the construction industry of Iran, the head and neck had the highest frequency of injured organs (24). Thus, different studies on occupational accidents showed that due to the nature of the studied industry and the presence of different risk factors, the consequences caused by the accident such as the injured organ and the type of injury caused by the accident are different. In the present study, the number of accidents that occurred during the study period has had a declining trend while the number of accidents in Portugal in the period 1992-2001 has decreased (11). Since the system of reporting and recording accidents in different regions of Iran is various, no opinion can be stated with certainty in the prediction of positive or negative growth of accidents. In addition, only the number of accidents cannot show the positive or negative safety status in industries and requires to calculate accident analysis indices in this field. Based on the results of this study, most accidents occurred in the metal industry. In a study by Macedo in three sectors of agriculture, industry, and services in Portugal, the manufacturing industries allocated the highest number of accidents (10). In general, there are many different processes and working practices in the manufacturing industries which increase occupational stress leading to an accident and finally an increase in accidents. Then, we may observe differences among the accident investigation indices in various industries. Most injured individuals of this study were in the age range 24-45 years. Similar studies were carried out in Turkey and Portugal (11, 16). In the studies by Bakhtiari et al., and Sabeti Motlaq et al., the age of 25-29 years had the maximum statistics of accidents (9, 21). Also, the same results were obtained in several studies in the construction industries that most injured individuals were at the age group of 20-29 years (17, 27, 6). In the studies by Khodabandeh et al., Mehrdad et al., most of the injured individuals were at the age group of 30-39 years and less than 34 years (25, 28).

On the other hand, since the estimated Safe-T score was between +3 and -3, it indicates that the changes in AFR over the 3-year studied period were not significantly different and the calculated deviations were also random (29). Therefore, the obtained finding can be interpreted as the safety status of Semnan industries was constant during the studied period and no change was made for improving or worsening it. In general, this study indicated that the establishment of a coordinated

[DOI: 10.18502/jchr.v9i2.3407]

and integrated occupational accident registration system is required in the province. Accident preventive actions should focus on the etiology results and risk factors of the identified accident factors. In order to achieve this goal, it is suggested to provide the necessary trainings to occupational safety and health experts to conduct an accident investigation process in the workplace to be able to analyze accidents and their risk factors accurately (30).

Conclusion

Estimating the safety indicators in this study showed that the occurrence of occupational accidents trend has been constant during 2013-2015.

Therefore, establishing of integrated management systems including health, safety, and environmental issues in workplaces is recommended for the prevention and reduction of frequency and severity of occupational accidents in different industries.

Strength and limitation

The strength point of this study was easy access to data at Social Security Organization.

This study had two limitations. First, the counts of accidents and injuries probably underestimated the true problem because Social Security Organization only registers accidents and injuries treated at workplace health units. Thus, it is likely that some minor accidents at work were missed in the social security safety records. Second, the present study was based on a 3-year period of accidents and injuries in the workplace, which limited the assessment of trends in the rates.

Acknowledgments

The authors would like to thank Semnan Social Security Organization for its assistance in data collection. Semnan University of Medical Sciences is appreciated for its funding and professional-administrative affairs. The Ethics Committee of Semnan University of Medical Sciences approved this study (IR.SEMUMS.REC.1395. 98).

Authors' contribution

BZ and HK collected data and contributed to entering data into dataset. FF and AD analyzed data and wrote the manuscript. All authors read and approved the final manuscript.

Conflict of interest

There is no conflict of interest.

References

1. Melchior C, Zanini RR. Mortality per work accident: A literature mapping. Safety Science. 2019; 114: 72-78.
2. Ghasempouri SKH, Pourhossein M, Mirmohammadi SM, et al. The Frequency and Pattern of Injuries in Occupational Accident Victims Referred to Sari Legal Medicine Center During Year 2012. Iranian Journal of Forensic Medicine. 2014; 20(3): 127-132. [persian]
3. Hosseini SSH. Check organizational factors in reducing work-related accidents in the workplace. Business and Society Magazine. 2012; 140: 80-91.[persian].
4. Nowrouzi-Kia B, Nadesar N, Casole J. Systematic review: Factors related to injuries in small- and medium-sized enterprises. International journal of critical illness and injury science. 2019; 9(2): 57-63.
5. Cagno E, Micheli GJL, Jacinto C, et al. An interpretive model of occupational safety performance for Small- and Medium-sized Enterprises. International Journal of Industrial Ergonomics. 2014; 44(1): 60-74.
6. Alali H, Abdel Wahab M, Van Hecke T, et al. Work accident victims: a comparison between non-standard and standard workers in Belgium. International Journal of Occupational and Environmental Health. 2016; 22(2): 99-106.
7. Van der Klauw M, Hengel KO, Roozeboom MB, et al. Occupational accidents in the Netherlands: incidence, mental harm, and their relationship with psychosocial factors at work. International Journal of Injury Control and Safety Promotion. 2016; 23(1): 79-84.
8. Lund J, Bjerkedal T. Permanent impairments, disabilities and disability pensions related to accidents in Norway. Accident Analysis and Prevention. 2001; 33(1): 19-30.

[DOI: 10.18502/jchr.v9i2.3407]

9. Sabeti motlagh S, Panahi M, Mansouri NA. Economic assessment of damages and injuries due to occupational accidents amoungQazvin workers using DALY in period of 2011 to 2013. Human and Environmental Quarterly. 2015; 13(2): 1-15. [persian]
10. Aaltonen M, Oinonen K, Kitinoja JP, et al. Costs of occupational accidents-Effects of occupational safety on company business a research and development project.Scientific. 2006: 47-51 .
11. Macedo AC, Silva IL. Analysis of occupational accidents in Portugal between 1992 and 2001. Safety Science. 2005; 43(5-6): 269-286.
12. Hämäläinen P, Takala J, Saarela KL. Global estimates of occupational accidents. Safety Science. 2006; 44(2): 137-156.
13. Hämäläinen P. The effect of globalization on occupational accidents.Safety Science. 2009; 47(6): 733-742.
14. Gholamnia R. Introduction to occupational accidents and analyze. Tehran: Sobhan; 2015. [Persian]
15. Cioni M, Savioli M. Safety at the workplace: accidents and illnesses. Work, employment and society. 2016; 30(5): 858-875.
16. Unsar S, Sut N. General assessment of the occupational accidents that occurred in Turkey between the years 2000 and 2005. Safety Science. 2009; 47(5): 614-619.
17. Jeong BY, Shin DS. Characteristics of Occupational Accidents in Korean, Chinese, Japanese and Western Cuisine Restaurants. Human Factors and Ergonomics in Manufacturing & Service Industries. 2016; 26(3): 316-322.
18. Halvani G, Jafarinodoushan R, Mirmohammadi S, et al. A survey on occupational accidents among construction industry workers in Yazd city: Applying Time Series 2006-2011. Journal of Occupational Health & Epidemiology. 2012; 1(1): 1-8.
19. AkboĞA Ö, Baradan S. Safety in ready mixed concrete industry: descriptive analysis of injuries and development of preventive measures. Industrial Health. 2017; 55(1): 54-66.
20. Gulhan B, Ilhan MN, Civil EF. Occupational accidents and affecting factors of metal industry in a factory in Ankara. Turkish Journal of Public Health. 2012; 10(2): 76-85.
21. Bakhtiyari M, Delpisheh A, Riahi SM, et al. Epidemiology of occupational accidents among Iranian insured workers. Safety Science. 2012; 50(7): 1480-1484.
22. Mohammadfam I, Fatemi F. Evaluation of the relationship between unsafe acts and occupational accidents in a vehicle manufacturing. Iran Occupational Health Journal. 2008; 5(3): 44–50.[persian].
23. Nævestad TO, Phillips RO, Størkersen KV, et al. Safety culture in maritime transport in Norway and Greece: Exploring national, sectorial and organizational influences on unsafe behaviours and work accidents. Marine Policy. 2019; 99: 1-13.
24. Gomes SC, Caldas AD. Incidence of work accidents involving exposure to biological materials among healthcare workers in Brazil, 2010–2016. Revista Brasileira de Medicina do Trabalho. 2019; 17(2): 188-200.
25. Khodabandeh F, Kabir-Mokamelkhah E, Kahani M. Factors associated with the severity of fatal accidents in construction workers. Medical journal of the Islamic Republic of Iran. 2016; 30: 469.
26. Mehrdad R, Seifmanesh S, Chavoshi F, Aminian O, Izadi N. Epidemiology of occupational accidents in iran based on social security organization database. Iranian Red Crescent medical journal. 2014; 16: e10359.
27. Betsis S, Kalogirou M, Aretoulis G, et al. Work accidents correlation analysis for construction projects in northern Greece 2003-2007: A retrospective study. Safety. 2019; 5(2): 33.
28. Ghods AA, Alhani F, Anosheh M, et al. Epidemiology of occupational accidents in Semnan (2002-2006). koomesh Journal. 2009; 10(2): 95-99. [Persian]
29. Laal F, Pouyakian M, Madvari RF, et al. Investigating the Impact of Establishing Integrated Management Systems on Accidents and Safety Performance Indices: A Case Study. Safety and Health at Work. 2019; 10(1): 54-60.
30. Heras-Saizarbitoria I, Boiral O, Arana G, et al. OHSAS 18001 certification and work accidents: Shedding Light on the connection. Journal of Safety Research. 2019; 68: 33-40.

[DOI: 10.18502/jchr.v9i2.3407]