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Original

Prevalence of Occupational Accidents and its Related Factors in the Qom Province Industries

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Abstract

Background: Analysis of accident data based on social and economic factors can be useful in determining injury patterns and establishing operational policies to improve safety and health. The purpose of this study is to investigate the effect of socio-economic factors in accidents. **Methods:** This descriptive-analytical study was conducted based on information obtained from the Labor Inspection Office of Qom Province in 2017. In this study, the required information was extracted from recorded accident forms of 1048 accident cases occurred among victims who were over 18 years old. In this study, the dependent variables include the outcome of accidents divided into two groups of accidents leading to death and injury. Data were analyzed using Stata Software version 23 (Stat Crop. USA). **Results:** Based on the results, the presence of a safety officer in the industry reduced the risk of accidents leading to injury (AOR = 0.87, 95% CI: 0.72-0.91, P<0.05), people who had received safety training were 0.0009 times less likely to experience accidents leading to injury compared to the other group (AOR = 0.009, 95% CI: 0.0-0.16. P<0.05), and people with undergraduate education were 1.98 times more likely to experience accidents leading to injury (AOR = 0.009, 95% CI: 1.25-2.2. P<0.05). It was further found that people who have experienced the accident beforehand are less likely to have accidents leading to injury than the other group (AOR = 0.05, 95% CI: 0.005-0.72. P<0.05).**Conclusions:** Therefore, as indicated, many factors have domino effects on different social damages and problems. Accordingly, to lower accidents and modify workforce culture, multi-faceted strategies should be applied properly.

Keywords: Accident; Injury; Socio-economic factors; Occupational death

Introduction

One of the most important consequences of globalization, especially in developing countries, is occupational accidents; therefore, occupational health and safety issues remain a significant public health issue.[1] Hamalainen *et al.* (2006) estimate occupational accidents. The results of their study show that 48,000 people die every year due to occupational accidents in India. Besides, 37 million occupational accidents occurred cause at least three days absence from work.[2] Although fundamental and necessary steps have been taken to protect workers from occupational injuries and diseases, recent progress has not been enough.[3] According to the International Labor Organization (ILO), every 15 seconds, 153 work-related accident occur, and one worker dies from an occupational accident or illness.

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The economic burden of poor occupational safety and health measures is equivalent to 4% of the gross national product (GDP) [3]. According to the researches of the Forensic Medicine Organization of the Islamic Republic of Iran, 9625 people died as a result of work accidents in the country for ten years (2002-2010). The highest record was 1507 deaths in 2011, and the lowest was 411 deaths in 2002.[4] The International Labor Organization has proposed the concept of "decent work" to member countries to improve the quality and safety of workers, thus measure sensitive indicators such as injury rates, illness and occupational mortality can provide a complete epidemiological perspective on the safety and health of workers.[5]

However, recorded accident data cannot be completely reliable because many of the world's workforces are not covered by insurance and protection organizations, and data on this part of the workforces is not entirely accurate.[6] Besides, many studies show that the overall consequences of work-related injuries are not just deaths and injuries, but also it can lead to reduced productivity and increased use of medical and welfare services.[7-9] Therefore, analysis of accident data based on social and economic factors, type of job and industrial units can be useful in determining injury patterns and creating an operational policy to improve safety and health.[7] In general, according to the ministry of cooperatives labor and social welfare of the Islamic Republic of Iran, 43% of all annual occupational injuries occur for workers covered by this ministry, and these injuries are mainly due to working conditions and some personal characteristics.[10] Various studies have shown that accurate documentation of occupational accidents based on the recommendations of the International Labor Organization and statistical analysis of these data is one of the essential tools for implementing preventive strategies.[11]

In addition to accurate documentation, another issue is the rate of accidents and the factors causing them.[12] Occupational accident rates vary significantly between countries due to differences in social, religious, gender, the age distribution of the working population and type of industry.[13]According to Smith et al., work-related injuries account for a significant proportion of all injuries in the United States, and some age groups experience about 50% of these injuries.[14] Also, the study of Gonzalez-Delgado et al. showed that factors such as age, sex and type of job (operational versus administrative) affect occupational accidents leading to death.[6] The results of a study done by Camino et al. in Spain revealed that some factors such as the age of the injured worker, duration of work, company size, cause of the accident, type of accident, time of the accident as well as the geographical area were among influential factors in the occurrence of accidents.[15]

According to a study conducted in Australia, it was concluded that the number of accidents happening in the morning shift is more than the afternoon.[16] The study of Ramin Mehrdad et al. (2008) showed that the highest share of accidents recorded in Iran was related to the age group of 25-34 years and the highest frequency of accidents was related to metal and construction industries.[17] Other similar studies have been conducted in this field, which emphasizes the prevalence of accidents based on the type of activity and industry or other risk factors of individual, functional, and managerial.[18, 19] In most of the previous studies, the causes of accidents have been investigated with conventional techniques. However, the relationship between social and economic variables of the accident with the accident has not been considered. So, the purpose of this study is to investigate the effect of socio-economic factors on accidents occurrence.

Methods

This descriptive-analytical study was conducted based on information obtained from the Labor Inspection Office of Qom Province in 2017. The study population were all occupational accident

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occurred among victims who were more than 18 years old. In this study, the required information was extracted from 1048 accident cases recorded in the accident forms sent to the inspection office. The accident report form is for registering work-related accidents and is completed in the first place of referral of the injured person to receive health services. The questions in this form are divided into several general categories, including the characteristics of the workshop, the demographic characteristics of the victim, the type of accident and its characteristics, the outcome of the accident and the analysis of the accident. More detailed information about the stated categories was collected in accordance with Table 1 in the questionnaire.

One part of this questionnaire is related to the victim referral place and also the time of reference in terms of date and time. In the following, the details of the accident regarding geographical location, number of personnel and the unit of activity of the victim are determined. Then the demographic characteristics of the person such as age, gender, and education are determined. In the next part of the questionnaire, related to the characteristics of the accident, the outcome is determined in addition to the date and time of the accident. Then, followed by the cause of the injury, services provided to the person is completed by the desired health care center. In this study, the dependent variables, including the outcome of accidents, were divided into two groups of accidents leading to death and injury. In this study, age, gender, marital status, educational status, work experience, insurance status, citizenship, type of employment, work experience and education were considered as independent variables.

Age was classified into three groups: under 30 years, 31 to 50 and over 50 years. Educational status was divided into three groups: illiterate, diploma and academic. Gender, marital status, insurance status, type of industry ownership, type of employment, work experience and education were also binary variables. The presence of a safety officer in the workshop, workers' insurance status, safety training, specialized job training and occupational accident history were among the variables recorded in the accident form, and its yes/no information was collected. Data were analyzed using Stata Software version 23 (Stat Crop. USA). Two types of analysis were performed. First, univariate analysis was performed to determine the relationship between potential factors and occupational accident outcome using Chi-square and Fisher tests. Then, multiple logistic regression test was performed for the variables that were significant in the univariate test (P<0.01). In multiple logistic regression test, the first group of each variable was selected as the control group.

Results

Table 1 shows the demographic and social characteristics of injured people compared to fatal accidents as well as results of Fisher tests.

Out of 1048 recorded accidents, the highest frequency of accidents occurred in men (98%), in the age group of less than 30 years (81%) and single people (72%). The accident incidents were three times higher in educated people with higher than diplomas. Most of the victims had less than ten years of experience, 55% of them had no safety training, and 66% of them were working in industries without a safety officer. 96% of accidents occurred in sectors with less than 50 employees, and more than 85% of accidents occurred in private sectors.

Based on the results of Table 1, the frequency of fatal accidents in the following groups are higher compared to other groups of deadly accidents: Less than 30 years (81% vs 0.95%, P = 0.001), single (53.3% vs 1.3%, P = 0.001), higher education diploma (74% vs 0.28%, P = 0.001), lack of safety responsibility (66% vs 1.8%, p = 0.003), lack of safety training (56.4% vs 1.04%, P = 0.001), job relationship with accident (76.5% vs 0.47%, p = 0.001), occurrence of accident in the workshop (79% vs 0.95 %, P = 0.001) and temporary contract (78.4%

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vs 0.19%, P = 0.001). Finally, using a multiple regression model, the variables related to the reduction of accidents leading to injury were determined. Table 2 shows the results of multiple regression analysis.

Based on the results of Table 2, the presence of a safety officer in the industry reduced the risk of accidents leading to injury (AOR = 0.87, 95% CI: 0.72-0.91, P<0.05). People who had received safety training were 0.0009 times less likely to experience accidents leading to injury compared to the other group (AOR = 0.009, 95% CI: 0.0-0.16. P<0.05), and people with undergraduate education were 1.98 times more likely to experience accidents leading to injury (AOR = 0.009, 95% CI: 1.25-2.2. P<0.05). It was further found that people who have experienced the accident previously were less likely to experience accidents leading to injury than the other group (AOR = 0.05, 95% CI: 0.005-0.72. P<0.05).

Table 1. Details of people involved in the accident in term of accident outcome

variables	Categories	outcomes				Total frequency	P-value
		Injured		Dead			
		Frequency	Percent	Frequency	Percent		
Gender	Man	1014	98	15	1.8	1048	0.001 *
	Female	19	2	0	0		
education	<High school	261	25	12	1.14	1048	0.001 *
	>High school	772	75	3	0.28		
Age (years)	<30	838	81	8	0.95	1048	0.001 *
	>30	195	19	7	0.83		
Work experience (years)	<10	994	94.8	15	1.43	1048	0.98
	> 10	39	3.72	0	0		
marital status	Married	559	53.3	14	1.33	1048	0.001 *
	Single	447	42.6	1	0.095		
Does the workplace have a safety officer?	Yes	353	34	0	0	1048	0.003 *
	No	680	66	15	1.8		
Does the worker have social security insurance?	Yes	786	93.1	14	1.65	844	0.433
	No	43	5.1	1	0.11		
Number of Staff	<50	1001	96	10	1.18	1048	0.001 *
	> 50	32	4	5	0.6		
Type of industry ownership	public	108	12.8	1	0. 11	844	0.078
	Private	721	85.4	14	1.65		
Type of employer	Private person	263	31.1	1	**0.11**	844	0.001 *
	Legal person	566	67.1	14	1.65		
Safety training	Yes	442	42.1	4	0.38	1048	0.005 *
	No	591	56.4	11	1.05		
Job-spesific training	Yes	465	44.3	12	1.14	1048	0.001 *
	No	568	54.2	3	0.29		
contract type	Permanent	201	19.1	13	1.24	1048	0.001 *
	Temporary	832	79.4	2	0.19		
Location of the accident	Inside Industry	825	78.7	10	0.95	1048	0.001 *
	Outside Industry	183	17.5	5	0.47		
Relationship between job and accident	Yes	802	76.5	5	0.47	1048	0.001 *
	No	231	22	10	0.95		
History of the relevant accident	Yes	396	37.8	3	0.28	1048	0.067
	No	637	61.8	12	1.14		
Type of Work shift	Fixed shift	546	0.52	10	0.95	1048	0.693
	Rotating shift	488	0.46	5	0.47		

* Significance at 5% level

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Discussion

This study aimed to determine the relationship between the outcome of accidents with work-related demographic, occupational and social factors. The results of multiple logistic regression analysis showed that the level of education was associated with the occurrence of accidents. As expected, the probability of accidents resulting in injuries was higher in employees with undergraduate education than in the upper diploma group (1.98%). Education level seems to have a preventive effect on accidents. In the study of Javadi *et al.*, a negative relationship was observed between accidents leading to injury and the level of education.[20] Also, the study of Ching et al. showed that the incidence rate of accidents is inversely related to the level of education and training.[8] Various studies have been conducted around the world that confirms the effect of education level on accident reduction.[21-24] One of the questions that can arise after these results is how the level of education can be effective in reducing accidents. This issue can be due to the increase in knowledge related to the burden of occupational factors in people with higher levels of education. Another important and intervening factor is the low risk of the labor force activity with a high level of education due to the nature of their work. On the other hand, increasing the level of knowledge raises the level of awareness, and this issue plays a preventive role in reducing the occurrence of accidents.[25-27]

Table 2. Multiple regression analysis and Adjust Odds Ratio (AOR) of factors associated with accident among workers

Variables	Categories	Injury		*P*-value
		AOR	(%CI95)	
Age (year)	<30 years >30 years	0.47 1	(0.09-2.45)	0.37
Marital status	Single Married	1.07 1	(0.08-12.96)	0.95
Education	<High school >High school	1.98 1	(1.25-2.02)	0.03 *
Employer	Private person Legal person	7.01 1	(0.25-190)	0.24
Safety supervisor	Yes No	0.87 1	(0.72-0.91)	0.04 *
Safety training	Yes No	0.009 1	(0-0.16)	0.002 *
Job-spesific training	Yes No	5.13 1	(0.9-29)	0.06
Number of employees	<50 >50	0.25 1	(0.04-1.43)	0.12
Insurance	Yes No	5.13 1	(0.9-29)	0.06
Job Experience	<10 years >10 years	8.199 1	(0.68-98.68)	0.097
Type of industry ownership	Private public	7.01 1	(0.25-190.8)	0.248
type of Contract	Permanent Temporary	0.83 1	(0.13-2.03)	0.001 *
location of the accident	Inside Industry Outside Industry	6.3 1	(1.78-123.4)	0.341
Relationship between job and accident	Yes No	4.43 1	(0.89-21.85)	0.068
History of the relevant accident	Yes No	0.05 1	(0.005-0.72)	0.027 *
Type of Shift work	Fixed shift Rotating shift	1.23 1	(0.073-1.26)	0.073

* Significance at 5% level

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Training is an essential component of the occupational health and safety management system (OHS-MS).[28] Many studies have been conducted on the role of training and development of employee competencies to improve ability, skills, and attitudes in terms of risk prevention and accident reduction.[29-31] According to the results of Table 2, another factor influencing the accident occurred is the presence of a safety supervisor in the industrial. These results indicate that safety supervisor is a preventive factor. The results indicated in Table 1 show that all the fatalities and 66% of injuries occurred in industries when safety supervisor was not available. In this regard, a study by Marcel Simard (1994) confirms the role of safety supervisor in reducing accidents and promoting safety climate.[32] Many studies conducted on the role of safety supervisor in improving the safety behavior of workers and the results show that safety supervisor and safety workshop by managers are effective in promoting safety climate and reducing accidents.[33-35] Also, the supervision element in health and safety management systems such as OHSAS 18001, 1LO-OHS-2001 and ISO 45001 is considered as an important component in monitoring and evaluating the performance of these systems. According to Labor Law of the Islamic Republic of Iran, all industries covered by the Labor Law are committed to establishing technical protection and occupational health committee. Therefore, strengthening the structure of health and safety of the industries and emphasizing the application of governmental laws and regulations can have a more significant impact on reducing occupational accidents and enhancing workplace safety.

The results of Table 2 show that having a similar accident experience is a significant factor in reducing the likelihood of accidents leading to injury. It is often expected that people who have an accident act with greater safety and caution after recovering and resuming their work, and this can reduce the probability of unsafe acts and in turn, the incidence of accidents in this group will be lower. The results of the study by Hewett et al. strengthen this claim.[36] However, some studies emphasize that individual and organizational characteristics can determine the impact of the experience of accidents on reducing the probability of its occurrence.[37]

Conclusions

In general, the results of this study, along with other studies, indicate that different factors contribute to injury accidents. The broad scope of these factors links accidents with other social subjects and consequence. Based on the findings, among the independent variables, education and training affected injury consequence. The other factor is the lack of a safety supervisor, which play a significant role in this regard. Therefore, it can be concluded that many factors have domino effects on different social damages. Accordingly, to lower accidents and modify workforce culture, multi-faceted strategies should be taken into consideration, and applied properly.

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