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Effective Causes of Work-Related Accidents Among Mashhad Workers in a 3-Year Period (2004-2007)

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ABSTRACT

Background: Accident is an event that occurs suddenly, unexpectedly and inadvertently under unforeseen circumstances. Accidents can have individual, social and economical effects 2080 injury cases including labor-law workers were studied in Mashhad city, Islamic Republic of Iran. Their data were collected from the labor office archive.
Objectives: This study was conducted to determine the effective causes of inducing of accidents among labor-law of Mashhad in Iran.
Materials and Methods: In this cross-sectional analytic study, data on accidents related to labor-law workers for a period of three years (2004–2007) were collected from the labor office archive, in Mashhad. All recorded accidents were investigated and analyzed by SPSS 13 software.
Results: This study was conducted in Mashhad and results showed that Accidents were more common in married rather than single workers (71. 8% *vs.* 28. 2%) and men rather than women (%97. 3 *vs.* %2. 7). Bone fractures (68. 2%), followed by injuries of maimed (18. 5%) and death (9. 9%) and burn injuries (3. 5%) were the most common results. Accidents were more prevalent in 20-30 year-old range. There were statistically significant relationships among result of accident and age, marital status, insurance status, minimum wage, educational level and work history ($P < 0.05$). The greatest level of accident was among workers with the minimum wage.
Conclusions: Proper accident investigation and cause identification found to be helpful for accident prevention or reduction. Therefore, appropriate decision should be made regarding holding training courses for all workers as part of pre-employment training and before starting the work.

▸ *Implication for health policy/practice/research/medical education:*
The study discusses the influence of causes and effective agents of accidents among labor-law workers of Mashhad in Iran. Reading this article is recommended to the specialists in the field of safety, occupational and environmental health, health policy makers as well as industrial management, Labor inspectors and workers.

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1. Background

Accident is defined by the health and safety executives as any unplanned event that results in injury or ill-health of people, or damage or loss to property, plant materials or the environment , or loss of a business opportunity (1). The total number of work-related accidents each year has grown amounting 125 million world-wide (2). Along with cardiovascular diseases and cancers, accidents currently form the third leading cause of morbidity and mortality in the developed and developing countries (3). In 2000 about 5. 1 million people died due to injuries worldwide, accounting for 10% of deaths due to all causes. It is estimated that more than a quarter of injury-related deaths in the world occurred in the South-East Asia Region in 2000 (4). Williamson *et al.* stated that each accident could be described in terms of a causal sequence of events and factors , (5). Chi and Chen emphasized the analysis of aggregated accident data rather than single-case analysis as the only way of discovering any unifying and common causes of accidental events (6). There is a common belief that a high proportion of accidents are attributable to human error (7) and the findings show that a large proportion of accidents are experienced by a relatively small percentage of the workforce (8). This study was conducted in Mashhad, north east of Iran. This region contains both urban and rural areas, about 950 kilometers from the capital, Tehran, and has had a total population of 2427000 in 2007. This study aimed to investigate the influence of causes and effective agents of accidents among labor-law workers of Mashhad in Iran in a 3-year period (2004-2007). Another objective of this study was to determine relative influence of workers insurance status, age, Experience, kind of shift, gender, and education,

2. Materials and Methods

The present survey was a" cross-sectional analytic "study conducted on male and female workers. In this study, data on accidents were collected from the labor office archive, in Mashhad . Data were collected from accidents recorded on labor-law workers in Mashhad who had accident from Jan 2004 to Jan 2006. A structured questionnaire was used to collect information on the accident. The questionnaire contained questions on name, sex, age and marital status of the worker, results of the accident, minimum wage, education status, and place of accident, insurance status and cause of accident. The accidents were divided into seven categories: 1) Machinery (power and lift, (2) excavation, (3) scaffolding and lift (4) falls from a height or on the same level and striking objects, (5) exposed to, or in contact, with a harmful substance, (6) Hand tools, (7) others. Also the accident results were grouped into four categories, fatal, maimed, fracture and burn injuries. The information on the files was transferred to a pre-designed questionnaire and then, the SPSS 13 software was employed to analyze the data. Statistical analysis: Chi-square test was undertaken to examine differences in qualitative analysis. A $P < 0.05$ was taken as the level of significance.

3. Results

This retrospective study was conducted in a 3-year period among workers under Mashhad labor bureau. A number of 2080 cases with different types of injuries were included in the study, mainly 908 (43. 7%) cases occurred among the construction works. 757 (41. 2%) in industry, 255 (12. 3%) in services, 46 (2. 2%) in agriculture and 14 (0. 7%) occurred in mining workplace. Burning injuries were found in 53 cases (2. 54% of the total injuries), 366 (%) bone fractures 1467 cases (68. 2% of the total injuries), followed by injuries of maimed 366 (18. 5%), 194 (9. 9%) and burn injuries 53 (3. 5%) were the most common results. The most common injured organs were fingers 467 (22. 4%) hands 409 (19. 7%), legs 387 (18. 6%), organs compound 374 (17. 9%) and face 200 (9. 6%) eyes 40 (1. 9%) with the remaining involving the back and 110 other organs. Most of the workers were among local and males workers (96. 4%). There was a significant relationship between result of accident and minimum wage ($P < 0.05$), there were more fatal accidents among workers with minimum wage. Accidents were common in the first year of work history and There was a significant relationship among accident rates in shifts of work ($P < 0.05$). The distribution frequency of work-related accidents and significance levels of variables to results of accidents were respectively explained in *Figure 1* and *Table 1*.

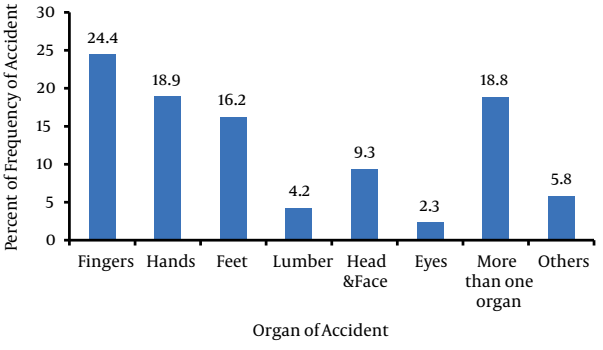

Figure 1. Organ of Accident

4. Discussions

Accident analysis is an important source of information to develope prevention strategies and making decisions. This study was conducted on work-related accidents among Mashhad workers (Iran) in a 3-year period (2004-2007). Though not covering all events because the data were collected based on workers` complaints. Among these cases, the three groups with high risks were the below 30 years old group (62. 3%), with experience level

Table 1. Frequency Distribution of 2080 Work-Related Accident and Significance Levels of Variable to Results of Accidents (Fatal, Maimed, Fracture and Burn) in Mashhad (Iran, 2004-2007)

	Frequency Distribution (2004-2007), No. (%)	Result of Accident	
		P value	$\chi 2$
Gender			
Male	2026 (96. 4)	0. 0002	24. 1
Female	54 (3. 6)		
Age, y			
< 24	744 (35. 8)	0. 006	16. 4
25-34	759 (36. 5)		
35-44	344 (16. 5)		
> 45	233 (11. 2)		
Experience			
< 30 day	857 (41. 2)	0. 0007	34. 28
> 30day–1 year	736 (35. 4)		
1-5 years	331 (15. 9)		
> 5 years	156 (7. 5)		
Kind of Shift			
Morning	1439 (69. 2)	0. 08	11. 2
Evening	546 (26. 3)		
Night	95 (4. 6)		
Nationality			
Domestic	2006 (96. 4)	0. 0003	18. 4
Foreign	74 (3. 6)		
Education			
Illiterate & elementary school	985 (47. 4)	0. 007	17. 89
High & Secondary school	702 (33. 7)		
Diploma and up	393 (18. 9)		
Insurance			
Yes	900 (39. 5)	0. 002	15. 03
No	1180 (51. 7)		

less than 30 days group of unskilled workers (41. 2%) and with experience level of 30-360 days group (35. 4%). These results indicated that most events took place among unskilled workers in the first days of work when they had little experience. Therefore Training can be probably a key factor to prevent accidents, since knowledge is a prerequisite to understand the needs and regulations of organization and helps to obtain information about suitable technical solutions.

According to the results indicated in *Table 1* one, the effective agent of accident causes was educational level. The results indicated a negative relationship between educational level and accident frequency. The rate of accidents in this study among illiterate and elementary school level workers was 47. 4% (985 cases). This rate among higher level of education (diploma and higher) was 18. 9%. There was a statistically significant relationship between education levels and results of accidents ($P = 0. 007$). Explanation for the positive association between educational level and compliance with safe work could be gleaned from Reciprocity Theory (9). According to these theories, workers who perceive a high level of organizational support tend to feel a sense of indebtedness and a need to reciprocate in terms that benefit their organizations. It can be perceived from this theory that the higher the educational level, the lower the risk of exposure was, and vice versa. In the current study bone fracture was found to be a common type of injury among workers, and also the upper extremities and the lower extremities injuries were most common among other body organs. The injured body parts were investigated by Leigh *et al.* (10), Studies showed that the trunk (especially the back), the upper limbs and the lower limbs were affected the most (10, 11). Therefore, it is necessary to protect these organs with measurements of engineering and personal protective equipment. It has been acknowledged that the risk of accidents occurring in farming is high (12-14). In the current study, accident rate was low in agriculture (n = 46, 2. 2%) and mostly occurred in mining workplace (n = 14, (0. 7%), The fatal accident frequencies given for farm work vary between 7. 5 (15),and 19. 4 (16), The Swedish death accident frequency for farm work 9. 3 and 32. 8 (17) per year per 100,000 workers. In spite of the fact that, Working condi-

tions in agriculture are hazardous in the current study the accidents of agriculture were less than other kinds of accidents reported (2. 2%). This is related to the fact that a very great proportion of the people working on the farm or employed work on small operations, which are often owned by one man, and as they aren't insured, there is no accident report or complaint, also no access to occupational health services therefore agriculture accident reports cannot be accurate in this study.

Accidents on construction sites are a major cause of morbidity and mortality in Hong Kong (18). Also in the current study results indicated that most events occurred in the construction workers 908 (43. 7%). The evidence obtained from some researches indicate that the injury rate for temporary workers is constantly higher (from 2. 6 to 3. 8 times) than the one recorded for permanent employees (19). Records, for the period 1997–2002, show that the rates of both fatal and major construction accidents are consistently higher in Scotland than in Great Britain. proportionally , Scottish fatal accident rates are, on average, 50% more than the rest of Britain; and major accident rates 15% more (20). Therefore, the risk of occupational accidents in the construction industry is far greater than in a manufacturing based industry (21). Generally, Frequency distribution of work-related accidents is variable in different countries and societies, for example a report from Honk Kong (22) revealed that the annual accident rate in 1991 was 374 per 1000 workers, which is 25 times worse than Japan and Singapore. About half of the accidents in Italy are related to labor environment (23) and they could be prevented by a rather simple lay-out and protection measures, which however prove extremely difficult or even unfeasible in small workplaces, because of operating, economic and/or space constraints (24). Therefore Accident analysis is an important source of information to developed prevention strategies and making decisions that must be conducted in societies according to data, results and conditions. It is also important to determine how education, access to occupational health services and specific social conditions affect the risk of being involved in an accident.

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Authors' Contribution

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