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Epidemiology of occupational accidents among Iranian insured workers

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ABSTRACT

Work-related accidents are considered as a major health problem worldwide. The aim of present study was to determine the epidemiological pattern of occupational accidents among workers insured by the Iranian Social Security Organization (ISSO) between 2001 and 2005.

Subjects consisted of all workers and drivers who had a work-related accident during 2001–2005 and were registered in the Iranian Social Security Organization (ISSO) database according to the inspection reports. An ordinal logistic regression model (proportional odds regression model) was used to assess the concurrent effects of independent variables on accident outcomes.

Overall, 86,437 work-related accidents were investigated. The accidents were more frequent in metal workplaces and electrical industries, respectively. More than half of the accidents were due to incautious activities. Workers' age (age at the time of accident) (OR = 0.99, CI: 0.989–0.994), gender (OR = 1.3, CI: 1.191–1.683), marital status (OR = 1.25, CI: 1.143–1.675) as well as accident setting (OR = 1.88, CI: 1.728–1.975) had significant effect on accident outcomes. Pattern of occupational injuries in Iran was consistent with the global pattern for accident outcomes.

1. Introduction

Work-related injuries are considered as a major health problem worldwide and about 14 per 100,000 deaths is occurred due to occupational accidents annually (Takala, 1999). The occupational injuries are leading to serious socioeconomic disadvantages such as disability, loss of working time, and increased health care (Larsson and Björnstig, 1995). Personal characteristics such as young age (Cloutier, 1994), lack of academic education, lack of safety training (Wong, 1994) and inadequate work experience (Salminen, 1994), as well as personality, risky behaviors (Chau et al., 1995), and smoking (Ryan et al., 1992) can increase the risk or accidents.

Work-related injuries have been reported as an important cause of morbidity and disability among adolescents in the United States (Halperin et al., 1983). Majority of these accidents are preventable. Occupational health policies in many developed countries has lead to decrease the rate of death from work accidents (Kletz and Publishers, 2001). In Iran, unintentional accidents are the second leading cause of death (Naghavi et al., 2009). Developing countries provide about 60% of global labors, and from these, 80% are working in small businesses and professions that inherently are hard and dangerous (Takala, 2002). A recent study in Turkey, has found that the average occurrence of work accidents was about 2.8 accidents per 100,000 people during a tree-year period since 1995 (ERGöR et al., 2003).

Basically data collection and logical analysis, is the initial key for programming and preventive implementations in occupational accidents. These events have not been reported appropriately so far due to legal reasons, unawareness about the compensation system, probability of the workers' claim rejection, damage not being serious and social stigma (Shannon and Lowe, 2002).

The present study aimed to investigate the individual's characteristics associated with work related accidents, occupational accidents outcomes and their effects on accidents outcome among Iranian insured workers during 2001–2005.

2. Methods

The study population includes all insured workers who were faced an occupational accident between 2001 and 2005 and their

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recorded information were available in the mechanized system of ISSO based on inspection reports, which are published annually. In the present study, the term of occupational accident was defined as the occurrence of an unpredicted accident in the workplace during the course of employment, but not while driving to and from workplace caused by the hazards that are inherent in, or is related to it. Job-related injuries registry in Iran is done by different organizations such as; hospitals, job and social affairs office, and social and welfare organization. However, all mentioned sources have some limitations in data gathering due to their official policies. In this research the required data has been gathered from annual reports of statistics bureau of the social & welfare organization and socioeconomic accounts.

Inclusion criteria were having an occupational accident between 2001 and 2005 and availability of the events' records. Those workers, whom their accidents in that period were not due to occupation, were excluded from the study. Annual incidence rate (in 1000 persons) for job related accidents is calculated by considering all of the workers who insured by the Iranian Social Security Organization (ISSO) as denominator (workers with a job) during the studied years separately and nominators includes all insured workers who were faced an occupational accident at the same time.

2.1. Definitions

2.1.1. Total disability

Any damage other than death, which permanently and generally makes workers incapable of doing a useful job, or leads to loss of function of a body organ or its complete loss of either as follows both eyes, or an eye and hand or foot. Workers with 66% disability or more, are called total disabled (orginaization, 2000).

2.1.2. Permanent partial disability

Consist of any damage other than death or permanent total disability, which lead to loss of functional abilities or complete/partial body organ amputation. Workers with between 33% and 66% disability due to occupational accidents, are called permanent partial disabled (orginaization, 2000).

2.1.3. Wage compensation during illness

Refers to the funds, which are paid during illness, pregnancy or temporary unemployment according to the Social Security Act (Tirgar et al., 2007).

In order to determine simultaneous effect of different independent variables on the result of the event, and with respect to order of dependent variables, an ordinal logistic regression analysis (a model with appropriate odds) was conducted. *P* values equal or less than 0.05 was considered as significant. SPSS version 18 was used for all statistical analysis.

3. Results

Data of 86,437 injured victims including 85,279 males (98.7%) and 1161 females (1.3%) obtain for analysis. The mean age ± standard deviation was 33.2 ± 9.9 years. The most frequent occupational injuries occurred in workers aged between 25 and 29 years. In terms of accident settings, the most frequent work-related

Table 1
Distribution of work-related injuries.

Occupational activity	Years of study									
	2001		2002		2003		2004		2005	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Agriculture, forestry, hunting and fishing	497	3.5	637	4.1	683	4.0	722	3.9	956	4.5
Mining	641	4.5	627	4.0	610	3.6	549	3.0	634	3.0
Food and tobacco industries	959	6.8	997	6.4	1122	6.6	1080	5.8	1157	5.5
Textile, clothing, and shoe making industries	1029	7.3	729	4.7	789	4.6	871	4.7	898	4.2
Wood, furniture, paper, printing, wood cotton, leather	670	4.7	718	4.6	711	4.2	747	4.0	823	3.9
Chemical and Rubber products industries	1786	12.7	1934	12.4	1808	10.6	2018	10.9	2247	10.6
Basic metal, electronic and non electric machinery	3137	22.2	3541	22.8	3901	22.8	4710	25.5	5053	23.8
Other industries	35	0.2	48	0.3	43	0.3	44	0.2	58	0.3
Building	494	3.5	479	3.1	595	3.5	607	3.3	681	3.2
Electricity, water, gas, steam, machine service	114	0.8	196	1.3	185	1.1	133	0.7	234	1.1
Business, bank, insurance, real estate	209	1.5	272	1.7	374	2.2	312	1.7	393	1.9
Transportation, warehousing, communications	670	4.7	679	4.4	606	3.5	814	4.4	938	4.4
Service	522	3.7	559	3.6	573	3.4	579	3.1	553	2.6
Other activities	436	3.1	300	1.9	232	1.4	178	1.0	296	1.4
Unknown	2915	20.7	3836	24.7	4858	28.4	5121	27.7	6271	29.6
Total	14,114	100	15,552	100	17,090	100	18,486	100	21,195	100

Table 2
Annual incidence rate for job related injuries among the Iranian insured workers (in 1000 person).

Years of study		2001	2002	2003	2004	2005
Injured workers	Men	13,969	15,357	16,860	18,206	20,884
	Women	145	195	230	280	311
	Total	14,114	15,552	17,090	18,486	21,195
Insured workers	Men	4881,051	5067,285	5291,825	5474,712	5686,961
	Women	468,874	523,980	586,422	649,127	702,883
	Total	5349,925	5591,265	5878,247	6123,839	6389,844
Incidence rate	Men	2/862	3/031	3/186	3/325	3/672
	Women	0/309	0/372	0/392	0/431	0/442
	Total	2/638	2/781	2/907	3/019	3/317

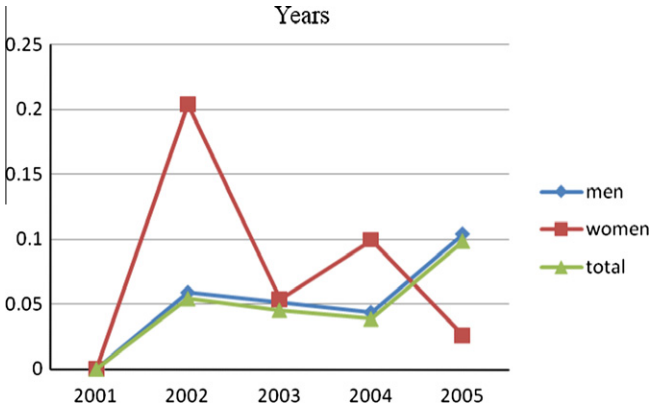

Fig. 1. Annual increase in accident rate among the Iranian insured men and women during 2001–2005.

accidents occurred in basics metal, electric and non-electric machinery job settings, respectively (Table 1).

Considering job-related injuries, regardless the number of injured in each state, it was found that Tehran (12.14%) and Isfahan (8.8%) provinces had the most and Sistan & Baluchestan (0.42%) and South Khorasan (0.22%) provinces had the least rates job-related injuries. Regarding the number of insured and injuries in each state, Qom (3.9), Ilam (3.85), Hamedan (2.94) and Kurdistan (1.61) provinces have had the most job-related injuries in every 1000 insured.

Table 2 shows the injury rate for every 1000 people among obligatory insured men and women during 2001–2005. The denominator was the total number of insured workers and the numerator was those who were injured during the mentioned years. The rate of job-related injuries was increasing and as there were more insured men workers than women, the overall rate also had the same pattern as the range of injuries for men. Fig. 1 represents a different data with respect to annual increase incidence rate of work related injuries among men and women insured by ISSO during the studied years. The rational for this faster increase in women is probably due to increase in reporting rather than true accidents because of obligatory insurance rule for workers who were covered by ISSO.

More than half of accidents were due to carelessness (54.5%). Lack of appropriate classification of the causes of occupational accidents resulted in either missing data or misclassifications (Table 3). Most injuries have occurred between 9:00 and 11:00 am.

The distribution of accident type in injured individuals during the studied years also shows that the most common type of accidents were related to slip and fall (18.5%), concussion and members sprain (12.76%), lacerations and amputations (11.1%) and broken organs (10.46%). The most frequent injured limbs due to mentioned accidents were legs (26.86%) and hands (22.26%) respectively. Table 4 shows the distribution of occupational accidents outcomes. In majority of work related accidents (90%), the injured victims were recovered completely. Annually between 3% and 5% of occupational accidents leads to disability (either partial or total) or even death of injured victims. The inferential aspects

Table 5
Proportional odds regression model fitted to occupational accident data.

Variable	Levels	OR	95%, CI
Age	Years	0.99	0.98–0.99
Gender	Male	Referent	
	Female	1.31	1.191–1.68
Marital status	Married	Referent	
	Single	1.25	1.143–1.67
Place of accident	Outside	1.88	1.72–1.97
	Inside	Referent	
Causes of accidents	Black equipments	2.59	1.15–5.34
	Faulty devices	3.25	1.43–6.67
	carelessness	1.98	0.98–2.15
	Improper light	4.27	1.74–6.35
	Other causes	1.30	0.33–1.66
	Dangerous clothes	1.66	0.28–1.40
	Lack of information	2.20	1.11–2.64
	Poor ventilation	Referent	

OR: odds ratio.
CI: confidence interval.

Table 3
Risk factors associated with occupational accidents.

Accident cause	2001		2002		2003		2004		2005	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Bleak devices	755	5.3	879	5.7	1181	6.9	1380	7.5	1840	8.7
Defective equipments	504	3.6	460	3.0	635	3.8	773	4.2	990	4.7
Carelessness	7664	54.3	8592	55.2	8631	50.5	9890	53.5	10,973	51.8
Improper light	34	0.2	27	0.2	36	0.2	41	0.2	98	0.5
Poor ventilation	19	0.1	22	0.1	20	0.1	30	0.2	37	0.2
Dangerous clothes	131	0.9	177	1.1	174	1.0	221	1.2	243	1.1
Lack of information	712	5.0	639	4.1	672	3.9	751	4.1	856	4.0
Other causes	4295	30.4	4756	30.6	5723	33.5	5400	29.2	6158	29.1
Total	14,114	100	15,552	100	17,090	100	18,486	100	21,195	100

Table 4
Annual distribution of occupational accident outcomes.

Accident results	2001		2002		2003		2004		2005	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Death	102	0.7	123	0.8	97	0.6	71	0.4	100	0.5
Total disability	159	1.1	206	1.3	257	1.5	208	1.1	219	1.0
Partial disability	195	1.4	278	1.8	292	1.7	255	1.4	370	1.7
Fixed compensation	922	6.5	815	5.2	1004	5.9	1039	5.6	1314	6.2
Complete recovery	12,736	90.2	14,130	90.9	15,440	90.3	16,913	91.5	19,192	90.5
Total	14,114	100	15,552	100	17,090	100	18,486	100	21,195	100

of discussed variables were also considered and a regression model was used to analyze the relationship between dependent and independent variables. In this regression analysis, the result of the accident (event) was considered as dependent variable (response), and gender, marital status, age, accident setting, accident cause and type of activity in injured victim were considered as independent variables. The odds ratios and their 95% confidence intervals were calculated and a class with best or worst possible state with
respect to dependent variable was chosen as the referent. Results showed a meaningful effect of age on response variable which was the results of the accident (OR = 0.99, 95%CI: 0.989–0.994). By increasing age, the risk of accident was decreased by about 0.8%. In the utilized regression model, gender variable in which the class of men was considered as the reference, the amount of chance was equal to 1.3, means that the chances of women exposure to injury in different classes is 1.3 times higher comparing to men. In other word, women's chance for complete recovery was 30% more than the same chance for injured men (Table 5).

4. Discussion

Carelessness was the most significant risk factor for occupational injuries among Iranian insured workers in the present study. The appropriate sample size and the comprehensiveness of available work-related accidents data in Iran have made the present study representative and the findings can be generalized accordingly. A recent study in Kerman, Iran on occupational accidents of Copper industries between 2003 and 2004 has found a similar result in which, the most common cause of work accidents over the two consecutive years was carelessness (Vazirinejad et al., 2009). Similar studies in Persian Gulf have also shown that carelessness has always been the main cause of accidents at work (Esmaeili et al., 2006; Vazirinejad et al., 2006).

The distribution of job-related injuries in men and women during these years shows that about 98.5% of injuries occur for men. The reason behind this pattern could be due to the number of male workers and also women's care at work which results in significant decrease of job-related injuries for women. Meanwhile, more difficult and dangerous jobs are done by men. According to different studies the rate of job-related injuries in men is more than women (Coutinho et al., 2008).

Although the frequency of accidents in men was more than women (98.7% versus 1.3%), the point is women were exposed to occupational accidents had incomplete recovery comparing to men. Considering the fact that the most difficult and dangerous jobs are performed by men in Iran and developing countries in general, the odds ratio of these accidents in women was 30% more than the same odds for men. It is perhaps due to more vulnerability and susceptibility of women to occupational accidents. This finding implies the serious need for improving professional health policies regarding to women's working in the society.

Rate of job-related injuries in workers insured by the Iranian Social and Security Organization was 3.3 in 1000 during 2001–2005. However, there is a different estimate of 3.8 job-related injuries in 1000 for a 5-year period in Iran (Ghods et al., 2009). The corresponding data has been reported to be 9 in 1000 for Middle East countries in 2006 (Shafieian et al., 2007).

Single workers in the present study were more vulnerable to occupational accidents, which led to partial or total disability, comparing married workers (OR = 1.25, 95% CI: 1.143–1.675). This is perhaps due to less experience, low age, singles or more cautious behavior of married workers. A similar study in Iran in 2001 showed that occupational accidents in 25–29 years were significantly more than other age groups (Mosavi, 2003) and younger and less experienced workers were more exposed to occupational accidents due to professional stress. Also, low experience, inaptitude, less attention to safety issues and youth courage have also been known as the most significant risk factors for occupational accidents (Mohamdfam and Zamanpzrvar, 2003; Soori et al., 2006).

In this study, some professional terms such as partial or total disability and fixed compensation were used to show the results of occupational accident for each person and to estimate the costs imposed on community. Normally, a person suffering from partial disability (i.e., permanent, but minor defects such as finger being cut), continues his/her monthly working, while receiving a determined salary from the insurance organization appropriate to disability. However, those who are suffering from total disability (i.e., inability to perform assigned jobs), finishes his/her work period and receives a boss payment of damage blood money for impaired organ. People who receive fixed compensation are those without serious injury, but have to pay treatment costs. In such situations, the insurance organization should pay the incurred costs to the person. Work related accidents resulting in death, disability or fixed compensation have mostly (88%) occurred outside the workplace environment.

Job categorization in Iran is under policies of the Social Security Organization but not according to the global standards. As a result some categories are lost or their data is not recorded properly. As evident, about 20–30% of injuries are classified under unknown category leading to loss of important and valuable information.

One of the most important factors in epidemiology of occupational accidents is the cause of the incident. Unfortunately, due to improper classification of accident cause in forms and databases, many incidents are recorded under "other causes" which represents "unknown causes". For example, in this system a person who is disabled for heart attack, is classified under other causes class. This poor data record leads to loss of vital and necessary information about occupational accidents. Despite such problems, using these available data is still logical. Based on regression models with proportional odds and dependent variable, the most important risk factors in occupational accidents amongst Iranian workers are improper light (OR = 4.27, 95% CI; 1.742–6.35), faulty equipment (OR = 3.25, 95% CI: 1.43–6.672) and bleak devices (OR = 2.59, 95% CI: 1.152–5.346). These findings are consistent with the Mazaheri's study, in which the most important cause of occupational accidents was attributable to dangerous work methods including deliberately seeking risk and working pressure (Mazaheri et al., 2009). In the Quad's study, personal factors such as fatigue, multiple jobs and etc. constitute the most frequent causes of accidents (Ghods et al., 2009).

In developing countries despite some limitations on quality of information, typical data analysis can be important to disclose useful information's to relevant systems (Smith, 2001). Although due to a limited accessibility, more attention is required. It helps to determine priorities and provide preventive strategies (Lortie and Rizzo, 1999).

Patterns of occupational accidents in Iran were similar with the global pattern for accident outcomes in workplaces, in which workers' carelessness followed by being male, single, young and incautiousness were the primary results. Professional cooperation with global organizations such as World Health Organization and the World Labor Organization develop labor and safe work environments and improve workers' health in regional and extra regional levels. Applying these institution experiences and programs is an effective step toward implementation of policies related to occupational health and workers' health promotion.

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