

Original Article

Burden of Occupational Accidents in Tehran during 2008-2011

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Abstract

Background and purpose: Work-related accidents are causing distress and economic losses. This study was conducted to estimate the burden of occupational accidents by the use of disability-adjusted life year (DALY) calculation in Iranian Social Security Organization (ISSO), Tehran province, between 2008 and 2011 time frame.

Materials and Methods: This descriptive analytical study was conducted based on the provided data by the Social Security Organization. Subjects consisted of all workers who had a work-related accident during 2008-2011 and were registered in the ISSO database. In order to maintain the comparability of the methodology for the calculation of years lost due to premature mortality and years lived with disability and DALYs, the global burden data of diseases were collected.

Results: The rate of DALY was 399.552 years; 63% and 37% of which were due to premature mortality and disability, respectively. About 29% of life which accounted for the highest frequency was lost between the ages 25 and 34. In terms of gender, 99% frequency DALY was related to male workers. The most common type of accident was injury and fracture with 119.609 years lost. The most affected organs were hands and legs with 112.46 and 102.48 years lost, respectively. Fall recognized as the season with the highest DALY burden (108.85 years).

Conclusion: Since majority of the incidents observed were preventable, accidental preventing programs, by the use of physical protection, training and oversees of workshops and are known to be effective in injuries reduction.

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Key words: Burden of Accident, Years of Life Lost, Disability-Adjusted Life Year, Tehran

1. Introduction

Occupational accidents and occupational diseases have been of interest in many countries for over a hundred years. Mainly industrialized countries have prescribed different laws and regulations to prevent occupational accidents and occupational diseases and to protect workers from them (1). Work-related diseases are an increasing problem that countries are just becoming aware of. Occupational problems are considered as one of the most important problems of developed and developing countries. The proportion of traditional occupational accidents from all work-related hazards is decreasing in developed countries, where workers are working and living longer (2). The number of occupational accidents and work-related diseases are needed because reliable official figures are missing or lacking. Some estimates of occupational accidents for developing countries can be found, but usually they are based on information obtained from developed countries (3). According to statistics released by the Iranian Social Security Organization (ISSO) among 14,114 accidents occurred in the workshops in 2003, 268 died (4). The first global estimates of occupational accidents and work-related diseases were published by Takala. He estimated that annually 1.1 million work-related deaths happen, comprising occupational accidents, commuting accidents, and occupational and work-related diseases. It was estimated that approximately 100,000,000 occupational injuries and 700,000 fatal occupational diseases happen annually (5). Newer global estimates have been published by Concha-Barrientos et al. They estimated that annually approximately 312,000 fatal unintentional occupational injuries happen. However, the estimates give the total number of occupational accidents and work-related diseases – country-based estimates are not given (6). A specific criterion which index all the dimensions and variables of work-related

accidents is the disability-adjusted life year (DALY) index (7). The DALY is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. The DALY has become increasingly common in the field of public health and health impact assessment. It “extends the concept of potential years of life lost (YLL) due to premature death to include equivalent years of “healthy” life lost by virtue of being in states of poor health or disability”. In DALY, mortality and morbidity are combined into a single, common metric. The DALY is a health-gap measure that extends the concept of the potential YLL because of premature death to include equivalent years of “healthy” life lost by virtue of being in a state of disability or poor health (8). It combines YLL because of premature death and years of life lost with disabilities (YLD) into a single indicator, allowing an assessment of the total loss of health from different causes. One lost DALY can be thought of as one lost year of “healthy” life, and the total number of DALY (i.e., the total burden of disease) as a measurement of the gap between the current health of a population and the ideal situation, where everyone in the population lives into old age, in full health. YLL are calculated from the number of deaths at each age multiplied by global standard life expectancy for the age at which death occurs. To estimate YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by the mean duration of the disease and a weight factor that reflects the severity of the disease, on a scale from 0 (perfect health) to 1 (dead). DALY also helps the priorities and health impact of interventions to be identified (9). In a joint project conducted by the World Health Organization (WHO), World Bank, and Harvard School of Public Health the global burden of disease was calculated in 1998 (10). The calculation method in this study included: YLL due to

premature mortality, YLL due to disability, and DALY (10). In a survey done by WHO 60% of global DALY was due to premature death. Overall, occupational disease and injury burden estimated as 1,467,257 DALYs in 2000. This value obtained 13,124 DALYs for occupational injuries in the same year (10). The present study aimed to investigate the burden of occupational related accidents among Iranian workers insured by the ISSO between 2008 and 2011. WHO has introduced three DALY calculation in 2001 (11). One of the methods for DALY calculation assumes that with age-weighting, the altering levels of dependency with age should be taken into account, meaning that years lived at youngest and oldest age are given less weight. The term "discounting" in this field means that future life years are assigned less value than those lived today. This is based on the economic concept that immediate profits are generally preferred over benefits later in time (8). According to 3% discount rate reported by the WHO (11). This reduction was applied for the calculation of YLL.

2. Materials and Methods

This cross-sectional study was done based on data provided by the social security organization. The study population includes all insured Tehranians' workers who were faced an occupational accident between 2008 and 2011 and their recorded information were available in the mechanized system of ISSO based on inspection reports, which is published annually. Job-related injuries registry in Tehran is done by different organizations such as, hospitals, job and social affairs office, and social and welfare organization. In order to eliminate the effect of duplication, especial codes, which were provided by social organization, were used. The effects of important variables, including age, sex, type of event, affected organs, and seasons were investigated. WHO method was

used to estimate the burden of premature mortalities, burden of the YLL due to mortality, burden of the YLD through illness or injury, and the total burden of death and disability in terms of DALY. For the calculation of years lost due to premature death resulting from occupational accidents, the following formula was used (10):

$$YLL = N/0.03(1 - e^{-0.03L}) \quad (1)$$

In which N represents the death and L is the standard life expectancy for the specific age and gender. To calculate the YLD, non-fatal consequences of accidents should be specified. For the calculation of years lost due to a non-fatal outcome, the number of disabled patients besides its severity and duration is required. The severity of disability is expressed as weight and determines what portion of a period of time with a non-lethal outcome need to be considered as the years lost. The number of YLD were calculated according to the following formula (10):

$$YLD = I \times DW(1 - e^{-0.03l})/0.03 \dots (2)$$

In which I is the number of people suffering from specific injuries during a given time, DW is disability weight (in the range of 0-1) and l is the injury duration

3. Results

Data of 8742 injured victims including 8547 males (97.8%) and 195 females (2.2%) obtain for analysis. The mean age \pm standard deviation was 32.9 ± 8.3 years. The most frequent occupational injuries (52.9%) occurred in workers aged between 25 and 34 years. The work-related injuries were 399.552 years. Lack of appropriate classification of the causes of occupational accidents resulted in either missing data or misclassifications. Number of years lost due to death and disability associated with age and gender is shown in figure 1.

Most injuries have occurred between 9:00 and 12:00 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 broken and fractured organs (34.04%), slip and fall (25.95%), vehicle accident (11.00%), and objects entering the eye and body (12.17% or 87.68 DALY). Figure 2 shows the distribution of DALY by the type of the work-related accidents over the 4-year period. The most frequent injured limbs due to mentioned accidents were legs (32.66%) and hands (49.88%), respectively. Figure 3 shows the

distribution of occupational accidents outcomes. In the majority of work-related accidents (91.69%), the injured victims were recovered completely. Annually between 8.31% of occupational accidents leads to disability (either partial or total) or even death of injured victims.

In terms of the seasons, the most frequent rate of occupational accidents observed during the fall and spring season with 108.85 and 105.96 years, respectively (Figure 4).

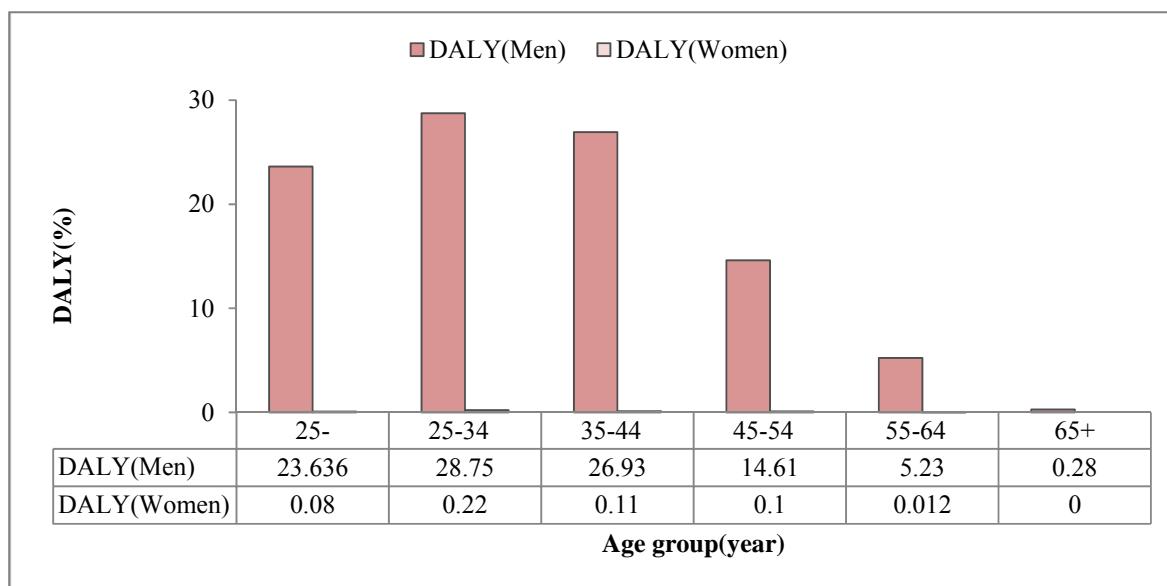


Figure 1. Number of years lost due to death and disability for each age and gender

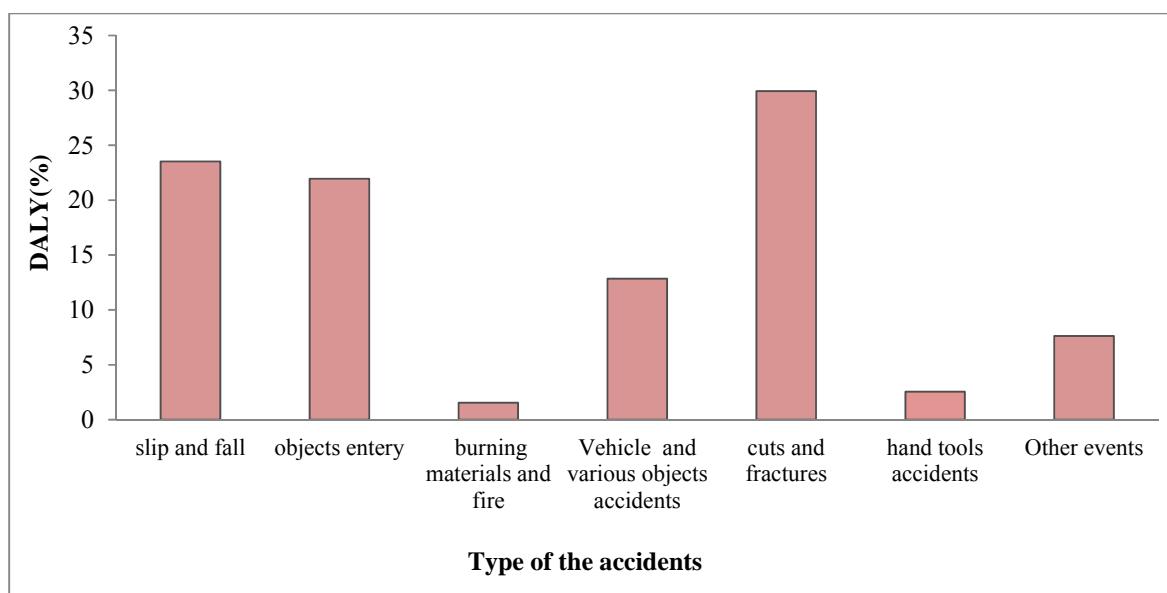
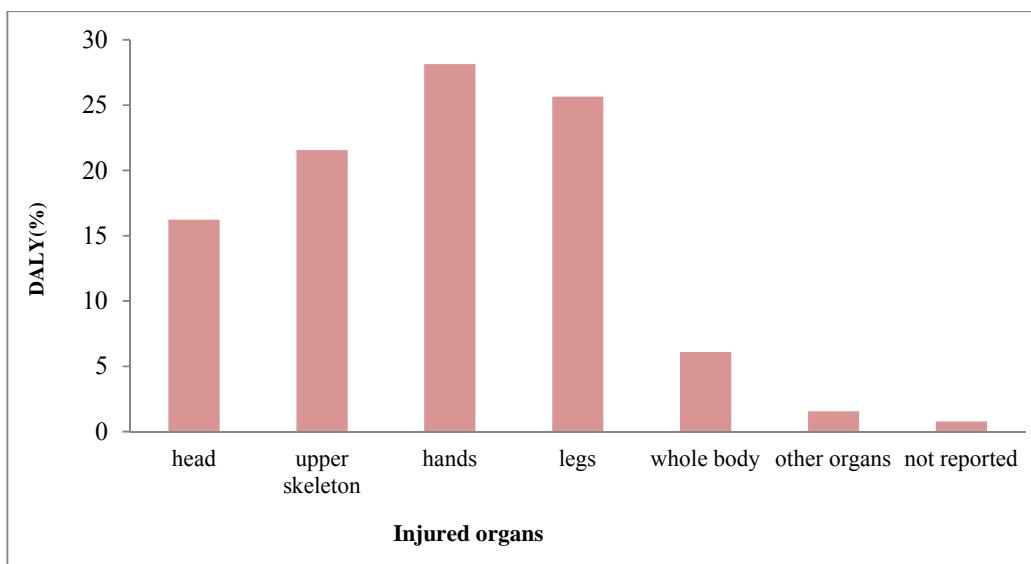
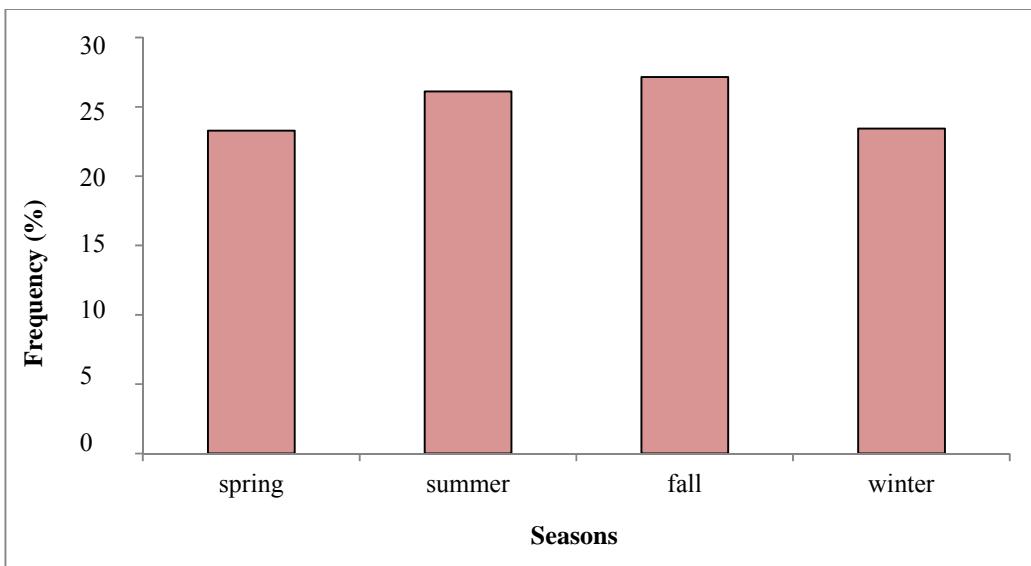


Figure 2. Distribution of disability-adjusted life years by the type of the work-related accidents

**Figure 3.** Distribution of occupational accidents outcomes**Figure 4.** Frequency of work-related accidents in each month

4. Discussion

As it was shown in the present study and literature, DALY is the sum of the present value of future YLL by premature deaths and the present value of future life years adjusted for severity on any physical and mental disabilities caused by an illness or an injury. Therefore, the DALY is a measure of what is lost and not of what is gained and the goal is to reduce DALY. Pattern of occupational injuries in Iran was consistent with the global pattern for accident outcomes. The

distribution of job-related injuries in men and women during the years studied showed that about 98% of injuries occur for men. According to different studies, the rate of job-related injuries in men is more than women (12). In this case, two assumptions can be made: (a) number of male workers and also women's care at work, which results in a significant decrease of job-related injuries for women and (b) more difficult and dangerous jobs are done by men. The average age of occupational injuries was 32.90 years and

63% of accidents occur in workers under the age of 34 years. Results of other studies have confirmed the findings. A similar study in Iran showed that occupational accidents in 30-44 years were significantly more than other age groups (13). In another study conducted by Vazirinejad et al. in Iran, the most occupational accidents occurred in the age of 20-29 years (14). This could be due to the low experience, limited attention to safety issues, inaptitude and youth courage in this age group (15).

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 these shortages, slip, fall accident, cuts and fractures were known as the most common type of occupational injuries in our survey. Another survey showed that the most frequent type of injuries were related to the falls, cuts, and fractures of the members (16,17).

In our research, hands and feet were known as the most commonly affected organs due to the fact that most of the activities done by them. These results are similar to the findings of some studies (14,18).

The seasons with the highest rate of occupational accidents, observed in the fall and spring. Shafiee Motlagh in his study showed that most events occurred during the summer and fall (19). In another study, summer showed the dominant season with the highest accidents (20). Due to the fact that events depend on the different factors such as occupational activities, area's climate and type of fuel, a particular season would not generally attributed to the accidents. Although the frequency of accidents in men were more

than women (99% vs. 1%), 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.

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