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Analyzing Work-related Accidents during 2009-2011 in Mazandaran Province

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ABSTRACT

Background Accidents are one of the biggest health issues worldwide. According to the World Health Organization, accident-related injuries have claimed 3.5 million lives annually. Financial burden of the accidents is remarkably high. Caring about the health of human capital in particular and of course other financial resources in general with the purpose of elimination and reduction of work-related accidents is a significant issue to be taken into consideration. Therefore, analyzing accidents of previous years, can obtain precise data to reduce them. **Methodology**: in this retrospective, descriptive-analytic study, the total of 1317 registered and confirmed data in due organization from the 3 years period has been gathered and went under analysis using Stata 10 software. **Results**: The mean age for victims was 33±6.5. The study shows that most of the accidents relate to private workshops and age range of 20 -29 (% 39.93). The number of male-involved accidents was higher than female-involved ones with $p<0.001$ representing a significant difference. Hands and feet occupy the highest percentage of accidents respectively and pick of the accidents is between 10 -13 o'clock (% 28.14). The rate of accidents among the married is higher than the single with $p< 0.001$ representing a significant difference. Also, the number of accidents among low literacy individuals is higher than high literacy ones. Most statistics relate to fractures with relative frequency of % 39.76. The rate of total accidents has been 12.03 individuals per 100000 people over three years. Employer's lack of supervision, lack of guards or technical malfunction and indiscretion of workers had the highest percentage of factors for accidents respectively. **Discussion**: The results suggest high rate of accidents in the province, 143.58 among male and 24.98 among women per 100000 people. Moreover, the rate of mortality caused by accidents (12.03 individuals) is higher than countries such as Australia, Japan, Germany, etc. and lower than Turkey. Thus, higher supervision of workers' performance by the employer and installing guards on machinery as well as using of personal protective devices can largely prevent the occurrence of accidents.

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INTRODUCTION

The risk of work-related accidents threatens the country's economy and the staff, because temporary and permanent disability of a skilled labor resulting from the accidents hits the economy and amount of the workshop's production. Accidents are of the biggest health problems worldwide. According to the world health organization, accident -related injuries have claimed 3.5 million lives annually. Financial burden of accidents and occupational disease holds a higher Table than cancer and cardiovascular disease [1]. The international labor organization estimates that more than 2.34 million people died from work-related accidents in 2008 among which 2.02 million people died of various diseases and 321000 individuals by work-related accidents. Thus, an average over 63000 death happen daily due to work-related accidents covering %4 of world's gross product [2]. America's published estimations show that about 177.2 billion dollars damage and 35 million working day loss are all results of work-related accidents in 1991 [3]. Berd J. r. AND George Jermaine in their book entitled "leadership of loss control" used the same metaphor of iceberg theory to describe the costs of the accident. They argued that the expenditures of medical indemnity insurance made visible part of the iceberg, the bottom of which is invisible. For every dollar of direct costs of an accident, 5-50 dollars are spent indirectly [4].

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Events are much more costly than estimated by executives due to lots of hidden expenditures, not easily understood. Some expenditures are obvious and some are invisible [5]. OSHA holds a conservative attitude and guess that the minimum amount of direct costs results in the highest proportion of indirect costs to direct ones. In many cases, we don't know how to calculate these expenditures [5, 6]. According to studies of industrialized countries, 90% of occupational accidents are caused by human sources. Unpleasant environmental conditions and equipment cause only 10% of these events [7]. In 1996, over 6112 individuals were killed by the effects of accidents in the U.S.A, from which a large bulk of occupational accidents are due to constructional and agricultural work [8]. According to International Labor Organization, %98 of the work-related accidents is preventable. Statistics of occupational accidents show that %20 fall in Japan and Sweden, %62 in Finland over the last 20 years which is quite impressive. The major reason behind this plummet is to change the working environmental condition from unsafe to safe. In many countries, work-related accidents are not thoroughly reported and registered. Therefore, the global Tables can be taken as estimates lower than real values [2].

Caring about the health of human capital in particular and of course other financial resources in general with the purpose of elimination and reduction of work-related accidents is a significant issue to be taken into consideration. Therefore, analyzing accidents of previous years, can obtain precise data to reduce them. In our country, there is no exact statistics on the field of work-related accidents due to a wide variety of insurance systems and instability of accidents of free jobs. The most important reason for analyzing work-related accidents and gathering their due data is to identify the required programs and guidelines in order to stop them from happening again. The prevention of work-related accidents is the responsibility of official authorities, employers, occupational medicine specialists and occupational health engineers working in organizations, institutions, factories, inspectors of labor office and workers.

Because of the significance of consequences of accidents for workers, employers and country's national production, we attempt to determine the cause of work-related accidents so the obtained data can be delivered to the authorities and serious actions could be taken to reduce them.

Methodology:

In this retrospective, descriptive- analytic study, the total of 1317 confirmed and registered accidents available in Mazandaran's General Office of Cooperative, Labor and Social Welfare during a three year period (2009_2011) analyzed. The required data to review were extracted based on report papers of accidents resulted in serious body injuries or death. We referred to the province' s social insurance organization to obtain the number of individuals insured over the last three years (the insured individual is meant to be someone who has paid the premium of only one single day over a year). Then, the required data were analyzed using Stata 10 software.

Results:

Table 1 shows the frequency of the insured individuals in terms of gender and age. Men make up 86% of insured individuals and the province's workers. The average age of the victims was 33± 6.5. According to table 2, the highest number of accidents occurred in the age group of 20-29 years old. The obtained data (table 3) represents that the rate of accidents is 143.58 among men and 24.98 in women per 100000 people. T-test of gender showed the difference ($T=6$ and $p<0.001$) is significant. Also, based on the T-test between married and singles, it turned out that the rate of accidents among the married is higher than singles and the difference ($T=-5.59$ and $p<0.001$) is significant.

Table 1: Number of Insured People between 2009-2011 in Mazandaran Province.

Gender / Year	Man	Women	Total
2009	287824	44704	332528
2010	300381	50262	350643
2011	298359	49102	347461
Total	886564	144068	1030632

Table 2: Number of Accidents based on Age Range between 2009-2011 in Mazandaran Province.

Age Range / Year	lower than 20 years old	20-29 Years old	30-39 Years old	40-49 Years old	Over 50 years old	Total
2009	26	195	120	63	33	437
2010	25	180	144	87	54	481
2011	21	151	123	66	38	399
Total	72	526	387	207	125	1317
Percentage	5.47	39.93	29.38	15.72	9.5	100

Table 4 represents that the number of accidents among sub-diploma individuals is higher so using the administered test, frequency of accidents based on education isn't significant. Table 5 shows the number of accidents based on the result of accident in which the highest estimation is related to fractures with the relative

frequency of %39.76, Injury with %23.76 and amputation with %11.72 come at later stages. Table 6 shows the cause of accident, including lack of supervision of the employer (%31.57), lack of guard or technical failure (% 26.82) and worker's indiscretion (% 25.2) held the highest percentage of accident's factors respectively.

Table 3: Number of accidents based on gender and marital status between 2009-2011 in Mazandaran Province.

Parameter	Gender		Marital Status		Total
Year	Male	Female	Single	Married	
2009	413	17	111	319	430
2010	464	16	113	367	480
2011	396	3	95	304	399
Total	1273	36	319	990	1309
Percentage	97.25	2.75	24.37	75.63	100

Table 4: Number of Accidents based on Literacy Level between 2009-2011 in Mazandaran Province.

Literacy / Year	Under Diploma	Diploma	Associate	Graduate and Higher	Not Mentioned	Total
2009	278	102	11	13	33	437
2010	280	114	14	7	65	480
2011	247	105	8	11	28	399
Total	805	321	33	31	126	1316
Percentage	70.74	24.4	2.5	2.36	9.57	100

Table 5: Number of Accidents based on cause of Accident between 2009-2011 in Mazandaran Province.

Parameter / Year	Lack of Supervision	Lack of Sufficient Education	Lack of Preparing Protective Tools	Lack of Existence of Guard or Technical Malfunction	Worker's Indiscretion	Total
2009	211	42	72	172	160	657
2010	218	27	82	194	183	704
2011	188	32	66	158	149	593
Total	617	101	220	524	492	1954
Percentage	31.57	5.16	11.25	26.82	25.2	100

The findings show that hands and feet include the highest frequency of accidents with %33.57 and %19.2 respectively. The highest number of accidents happened in morning shift between 10 to 13 and 7 to 10. However, based on the administered statistics test, the difference isn't significant. The highest number of accidents had happened in private workshops with relative frequency of %91.50. Frequency percentage of accidents based on working activities: %48.43 construction, % 27.36 industry and production, %8.05 public services and activities and %6.97 agriculture. The findings obtained from the factors of accident show that slip and fall %36.23, suck between cars % 21.9, hitting objects %18.68 and falling objects %9.45 and other factors come at later stages.

Discussion:

The results suggest that the highest number of accidents relate to private workshops because these places have employed more people than public workshops and it was quite expected. Rate of accidents among men is (143.58) and among women (24.98%) per 100000 people. Also, T-test on the basis of gender shows that the difference ($T= 6$ and $p <0.001$) is significant. The main reason why is the higher number of employed men than women's as well as employing men in hard jobs. This finding is in agreement with Samadi's study in Arak (9), Rezvani& et al study in Tehran [10] with a slight difference. Also, analyzing the single and married groups, it turned out that the rate and accidents among the married is higher than the single and T-test represents a significant difference ($T= - 5.59$ & $p < 0.0001$). The major reason is the high number of married employees through some other secondary factors might also be involved. The average age of the injured was 33±6.5 which was consistent with Mohammad Fam's study in aluminum producing company. Most accidents happened in age group of 20-29 with relative frequency of (%39.93) which is not consistent with Samadi's study (9) in which the highest number of accidents lie between 30-39 but consistent with that of Rezvani [10]. So, one can draw this conclusion that age alone can not be a major factor. The number of accidents among under-diploma individuals is higher (%70.74). However, the administered test didn't show any significance between frequency of accidents and level of literacy which is consistent with Rezvani's study [10], but inconsistent with Heidary's study [12] in Petrokaran Company.

The results show that the highest rates relate to fractures with relative frequency of %39.76, injury and poising come next, which is slightly different with that of Mohammad Fam [11]. Hand and feet with %33.57 and %19.2 hold the highest relative frequency of accidents respectively. The main reason is high involvement of upper parts. The highest number of accidents happened in morning shift between 7-10 and 10-13, confirmed by most of the studies done in this field. The reason is the high number of individuals deployed during day and active working shift. However, the T-test didn't show a significant difference for the time of accidents. Accident 's frequency percentage for working activities is % 48.43 construction, %27.36 industry and

production and agriculture activity come at later stages, which is inconsistent with Soleimanpour et al [13] reporting accident frequency within industry. The main reason is the difference of activities and occupations between two provinces' residents.

Moreover, the findings represent that the rate of accidents among men is 124.58 and 24.98 among women for per 100000 people. Also, the rate of accidents resulting in death was 12.03 per 100000 people. This rate is higher than the rate of outbreak of fatal accidents based on ILO [2] in 2008 (10.7 individuals), in Australia, Switzerland and Belgium (7 people), European Union except for Netherlands and the U.K. (6 people), Portugal and Austria [6], Canada and Japan [4], the Netherlands [3] and several other countries but lower than Turkey (14 people). However, the recent study showed that lack of employer's supervision, lack of guard or technical malfunction, workers' indiscretion make up the highest percentage of factors for accident. With proper planning and management, securing working environment and installing guards on machines as well as using personal protective devices can reduce the community's suffering.

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