Statistical Analysis of Occupational Safety Management in Jordan

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ABSTRACT

Occupational safety is one of the most challenging difficulties that face the developed countries. The lack of national statistical data about work injuries originates a confrontation with globalization. With the progress and development of industrial cities, Jordan is one of the developed countries that break the chain. Governmental agencies to monitor the occupational safety have been established and new laws and safety procedures have been legislated. In this paper, a guide line is proposed for an occupational safety management based on statistical analysis. The subjected approach outlines a sequence of steps to decrease work injuries and increase employees' performance accordingly. The observed trend of statistics can be implemented to develop a general policy that targets the most frequent injuries and their causes.

Keywords: Occupational safety, Safety management, Work injuries, Statistical data.

1 INTRODUCTION

These days, the confused world economy and the plummeting sales brought the reduction of hidden cost into picture. During crises, companies downsize their budgets and the failure to maintain proper safety procedures will increase risk levels. The fear of loosing jobs will put a severe stress and distractions among employees. On the mean while, workers' compensation will intensify the unexpected costs on the overwhelmed organizations. As results, the latest global recession has an influential impact on the developed countries. The migration of the global companies towards different geographical locations around the globe, the needs for new markets, or less expensive labor force will make these countries a target to minimize the manufacturing cost. The presence of statistical records, laws, and procedures will stimulate global organizations to invest in these countries. On the other hand, absent of effective legislations related to safe work environments will develop a serious obstacle for the economic growth. (USAID 2003). The need for a strategic safety management has raised a flag about the necessity of data gathering of work incidents. The stochastic scenario of the occupational accidents and the management by fact principle will set the rule for a long-term and reality- base strategic planning for a safe work environment. In most developed countries, workers are under a heavy pressure of low market demand and their safety has not been given a great attention (USAID 2005; ACILS 2005). In some instant, a safe work place has been considered a luxury

and nonessential gratuity (Zacharatos, et al 2005). The idea of a hazards free place has not been developed yet by top management and official policies. (FIAS 2008). Some local cultures influence occupational safety practice, since few workers deal with machines as heroes and the "accident-proof" believes are still dominant behavior. (AFL-CIO & NTA 2006; WHO 2003).

2 JORDAN BACKGROUND

Jordan is an Arab country with an estimated population of 5.5 million in 2005, and an overall population density of 57.5 per square kilometer. About 82.3% of population is living in urban areas. The declining mortality rate and the high total fertility rate have contributed to an overall population growth that averaged 3.4% per year from 1995–2005. The population growth rate for 2005 was 2.8%. Based on 2005 figures, 37.2% of the population falls under 15 years, 59.6% between 15 and 64 years and 3.2% over 65 years. Life expectancy is 73.8 years for females and 70.3 years for males.(HDR 2009).

Jordan is considered as a lower middle income country with few natural resources. The per capita GDP of Jordan was US$ 2,324, in 2005. The Government has identified both unemployment and poverty as two of its most important challenges. Unemployment is estimated at up to 15% and reaches 26% if underemployment is included, and according to many studies; between 15% and 35% of the population falls below the line of poverty. However, the percentage of urban poor is three times that of rural poor.(HDR 2009)

Economic growth in Jordan has been unpredictable over the past years. Despite a short-term increase in real growth rate of 8.2% registered in 1990–1995 (due to Jordanians returning from the Gulf countries), since the mid-1990s economic growth has been declining. The real annual growth rate was 1.6% from 1990 to 2005.(HDR 2009)

3 STATISTICAL REVIEWS

Benefits of statistical data gathering and recordkeeping are countless. The main objective of these data is to develop a strategic safety system by pinpointing the most hazards scenarios. The cost of work accidents and tragedies associated with them affect the national economy. Standard measures should be developed to investigate the performance of the safety programs and make the necessary adjustment, if the need arise. According to these statistics, safety programs must be directed to address these problems more intensively and in details to disseminate awareness and explain the proper procedures to prevent such injuries. The statistics and accident reports will steer managements and decision-makers towards the right approach in order to achieve a safe work place. Therefore, statistics used for prevention of accidents must contain full information about the cause and effect. (IRIN 2009)

4 STATISTICAL ANALYSES

This research will consider the accident statistics in Jordan from year 2001 to 2006 with respect to different industrial sectors. The statistics have been obtained from Department of Statistics and Social Security Corporation-Jordan (JDOS 2007; SSC 2007). According to Social Security Law No. 19 for the year 2001, Chapter Four: Insurance Against Work Injuries & Occupational Diseases, Article 27-Part B. "The employer shall be committed to notify SSC of the occurrence of the injury, in writing, within seven working days of the date of its occurrence" (SSL 2001). At present, the insurance at SSC is obligatory on all establishments that hire five laborers or more. According to Social Security, the number of effective insured workers for the years 2002 and 2006 was 27.2% and 40.8% of the total work force in Jordan (SSC 2007). The distribution of work injuries according to sectors, causes, body part, ages, occupations, and outcomes will be investigated in the following subsections.

4.1 Injuries verses sectors

The number of casualties for the year 2001 to 2006 and their distribution in sectors are shown in Table 1. Public services, engineering industries, and construction sectors are the most frequent work injuries, respectively. Two thirds of work accidents belong to these divisions as shown in Figure 1. Also, the data shows stability in numbers of the reported accidents over this period. The total number of injuries during this period was 79,655 injuries with an average of 13,276 injuries per year.

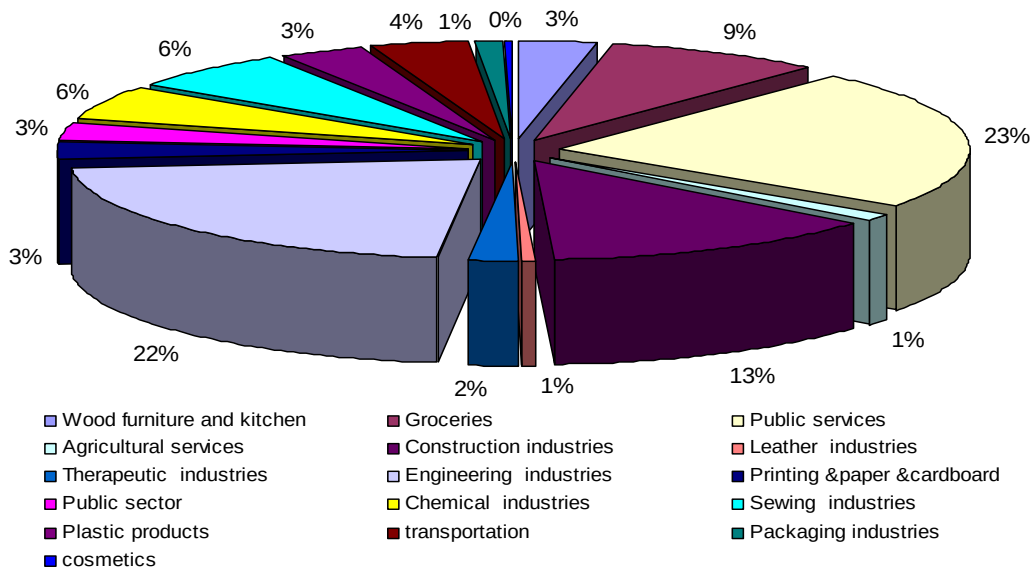

Figure 1. The contribution percent of sectors to the total number of injuries during years 2001-2006

4.2 **Injuries verses causes**

Falling, manual tools, and industrial machines are the major causes of accidents as illustrated in Table 2. The uneven contributions of unsafe acts, conditions, and causes are the major reasons for these accidents. Proper safety procedures have not been taken effectively. Unqualified people are operating machines and personal protective equipments have not been worn. Unsafe and/or salvage machines and manual tools might be used.

4.3 **Injuries verses body part**

Since most of work injuries in Jordan belong to public services, engineering industries, and constructions, the most expected body parts to be injured are hands and feet. These body parts are mostly wounded due to falling, machines and manual tools. According to the statistics shown in Table 3, hands and feet are recoding 70 % of the total injuries. Some accidents could cause injuries to more than one part of the body which increase the total number of injuries compared to other distribution criteria. Effective safety precautions should be taken to protect body parts especially those most injured.

4.4 **Injuries verses age**

Despite that most workforces in Jordan fall between 20 and 39 years old group, lack of experience and training make them subject to work accidents as illustrated in Table 4. Horseplay, fail to follow safety procedures, and insufficient training are another factors that inflame work accidents among young workers. These statistics should provoke officials to take affirmative safety policies.

4.5 **Injuries verses occupation**

Due to the fact that labor forces and technicians are the most people who are subjected to hazards situations, it's not surprising that they are forming around 85 percent of work injuries. These two categories must be the focus of any safety programs. Statistics in Table 5 confirmed the relationship between numbers of injuries and nature of work.

4.6 **Injuries verses outcome**

The tragedies associated with each injury are represented in Table 6. Temporary defect, permanent defect, diseases, and fatal injury are the expected outcomes of work injuries. On average, there is a severe accident every two days and a deadly accident every week.

5 INCIDENT RATES MEASURES

The incident rates represents the number of incidents expected by a 100-employee in a full year. The calculations of incident rates are illustrated in Table 7. In Jordan, a full time employee works 50 weeks per year at rate of 48 hours per week. On average, the Injury incident rate is 2.68 injuries per 100 workers. While the fatality incident rate is 0.012 death per 100 workers, the average number-of-lost-workdays-rate is 12.88 days per 100 workers and the absent rate is 4.8 days per injury. Since most hazards are related to hands and legs, the incident rate for hands and legs are 1.26 and 0.95 injury per 100 workers, respectively.

6 DISCUSSION

The analysis of work injuries is limited to those who are registered at the Social Security Corporation - Jordan. In average, the statistics involve 30 % of the total labor force in Jordan for year 2001 to year 2006. This implies that the actual numbers of work injuries are higher. Costs of work injuries have a major contribution on the overall expensive and national economy. Work injuries may result in extra costs related to hiring and training new or temporary employee or due to decrease in co-worker morality that enlarge the turn over rate. Time lost from work, over time, and the administrative time of investigations will intensify the overhead costs. Work accident may cause damage to equipments or merchandise. Litigation expenses, legal penalties and citations have a severe impact on the total costs. On the other hand, the grief and the lost of pleasure due to work injuries set the need for strategic safety management programs that minimize the contribution of work injuries on the total costs.

7 CONCLUSIONS

For most developed countries, the importance of strategic safety programs based on statistical data is imminent. It's essential for any safety program to have measurable accountability systems that maintain the safety culture viable. Statistical safety parameters should be gathered to map out hazard situations through a clear safety measures. Risks involved with these hazards should be evaluated to pinpoint and prioritize the critical or potential risk consequences. By investigating the cause and effect of the most frequent hazards, formative actions should be taken in order to eliminate or mitigate hazards as possible. Once the desired level of safety has been achieved, a specific, measurable, attainable, realistic, and timely program should be legislated. Organizations should be committed and held accountable for the safety programs, goals, and standards. By analyzing the performance against the updated standards, goals, and legislations, the survey of the past events will provide an objective means to identify areas of progress as well as areas that need improvement.
The review process will make the standards of the safety program more specific, and as a result the safety policy will be more accountable. Since the review is a standard tool for measuring and maintaining or correcting behaviors, it is best to evaluate performance periodically.

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Table 1. The distribution of work injuries according to sectors from year 2001 to 2006.

Sector	Year						Total	Average
	2001	2002	2003	2004	2005	2006		
Public Serv.	2,444	2,297	3,089	3,117	3,398	3,982	18,327	3,055
Engineering Ind.	3,132	2,518	2,540	2,636	3,130	3,415	17,371	2,895
Construction Ind.	2,700	1,687	1,346	1,342	1,497	2,090	10,662	1,777
Groceries	1,467	1,043	942	1,087	1,173	1,343	7,055	1,176
Sewing Ind.	599	694	946	1,095	889	827	5,050	842
Chemical Ind.	743	659	781	794	718	731	4,426	738
Transportation	541	451	613	543	481	523	3,152	525
Plastic Ind.	459	445	431	482	462	434	2,713	452
Public Sec.	369	334	288	371	387	611	2,360	393
Printing Ind.	314	282	511	418	436	366	2,327	388
Wood Ind.	266	277	524	363	454	440	2,324	387
Therapeutic Ind.	264	245	252	248	283	266	1,558	260
Agricultural	93	130	158	143	161	164	849	142
Packaging Ind.	137	129	113	143	200	121	843	141
Leather Ind.	71	109	67	56	66	58	427	71
Cosmetics	83	46	27	21	17	17	211	35
Total	13,682	11,346	12,628	12,859	13,752	15,388	79,655	13,276

Table 2. The distribution of work injuries according to causes from year 2001 to 2006.

Cause of Injury	Year						Total	%
	2001	2002	2003	2004	2005	2006		
People Falling	869	1,441	1,486	3,525	3,926	4,636	15,883	19.94%
Manual Tool	2,619	2,147	2,212	2,269	2,249	2,960	14,456	18.15%
Industrial Machine	1,152	2,226	2,572	2,313	2,708	3,156	14,127	17.74%
Things Falling	3,071	2,423	3,090	1,430	1,687	1,773	13,474	16.92%
Transportation	108	673	855	913	964	1,102	4,615	5.79%
Chemical Material	1,787	276	291	340	418	320	3,432	4.31%
Explosions & Fire	2,139	186	212	249	297	223	3,306	4.15%
Collision	13	724	648	545	567	512	3,009	3.78%
Product Transport	246	413	316	401	390	297	2,063	2.59%
Electricity	893	80	78	89	122	95	1,357	1.70%
Collapse	120	17	37	15	22	34	245	0.31%
Other reasons	665	740	831	770	402	280	3,688	4.63%
Total	13,682	11,346	12,628	12,859	13,752	15,388	79,655	100%

Table 3. The distribution of injuries with respect to the body parts for the year 2001-2006

Body Part	Year						Total	%
	2001	2002	2003	2004	2005	2006		
Hands , Wrist	3,078	3,057	3,046	3,053	3,264	3,288	18,786	21.65%
Foot , Ankles	2,998	3,048	2,803	3,027	3,202	3,397	18,475	21.29%
Fingers	2,659	1,731	1,843	2,012	2,122	2,583	12,950	14.93%
Back , Abdominal	1,466	1,493	1,351	1,185	1,290	1,385	8,170	9.42%
Thighs, Legs	1,230	1,176	1,238	1,355	1,524	1,591	8,114	9.35%
Eyes	1,628	965	946	851	903	949	6,242	7.19%
Shoulder ,Forearm	1,091	756	924	670	790	1,055	5,286	6.09%
Head	972	635	742	731	721	767	4,568	5.26%
Face	1,028	445	344	281	274	454	2,826	3.26%
Toes	564	217	141	108	122	193	1,345	1.55%
Total	16,714	13,523	13,378	13,273	14,212	15,662	86,762	100%

Table 4 The distribution of injuries with respect to age for the year 2001-2006

Age	Year						Total	%
	2001	2002	2003	2004	2005	2006		
< 20	770	586	830	823	908	1,040	4,957	6.22%
20-29	6,741	5,335	5,892	5,767	6,344	7,107	37,186	46.68%
30-39	4,196	3,536	3,972	4,036	4,299	4,709	24,748	31.07%
40-49	1,384	1,337	1,421	1,541	1,669	1,943	9,295	11.67%
> 50	591	552	513	692	532	589	3,469	4.36%
Total	13,682	11,346	12,628	12,859	13,752	15,388	79,655	100%

Table 5. The distribution of injuries with respect to occupation for the year 2001-2006

Occupation	Year						Total	%
	2001	2002	2003	2004	2005	2006		
Administrative	2,041	1,775	1,900	1,605	1,918	2,173	11,412	14.33%
Labor	6,075	5,318	5,674	7,106	6,632	6,897	37,702	47.33%
Technical	5,566	4,253	5,054	4,148	5,202	6,318	30,541	38.34%
Total	13,682	11,346	12,628	12,859	13,752	15,388	79,655	100%

Table 6. The distribution of work injuries according to outcomes from year 2001 to 2006.

Outcome	Year						Total	%
	2001	2002	2003	2004	2005	2006		
Temporary defect	13,612	10,705	11,948	12,237	12,923	14,299	75,724	95.06%
Defect < 30%	25	566	571	545	710	952	3,369	4.23%
Defect > 30%	2	13	31	13	32	41	132	0.17%
Diseases	8	13	8	12	24	9	74	0.09%
Fatal Injury	35	49	70	52	63	87	356	0.45%
Total	13,682	11,346	12,628	12,859	13,752	15,388	79,655	100%

Table 7. Injuries measures and rates for year 2001-2006

Injury Measure*	Year						Average	Std. Dev.
	2001	2002	2003	2004	2005	2006		
Number of injuries	13,639	11,284	12,550	12,795	13,665	15,292	13,204	1,345
Illness	8	13	8	12	24	9	12	6
Number of fatality	35	49	70	52	63	87	59	18
Days of absent	68,319	54,861	49,685	60,282	63,769	87,186	64,017	13,104
Number of labor	381,896	416,347	467,044	519,372	592,230	661,651	506,423	106,581
Number of hands injuries	6,828	5,544	5,813	5,735	6,176	6,926	6,170	585
Number of Legs injuries	4,792	4,441	4,182	4,490	4,848	5,181	4,656	355
Injury incident rate	3.57	2.71	2.69	2.46	2.31	2.31	2.68	0.47
Illness incident rate	0.002	0.003	0.002	0.002	0.004	0.001	0.002	0.001
Fatality incident rate	0.009	0.012	0.015	0.010	0.011	0.013	0.012	0.002
Number -of -lost – workdays rate	17.89	13.18	10.64	11.61	10.77	13.18	12.88	2.70
absent rate (day/ injury)	5.01	4.86	3.96	4.71	4.67	5.70	4.82	0.56
Hand injury incident rate	1.79	1.33	1.24	1.10	1.04	1.05	1.26	0.28
Legs injury incident rate	1.25	1.07	0.90	0.86	0.82	0.78	0.95	0.18

* *Y* incident rate = Number of *Y* × 240,000 / Total hours worked by all employees during the period covered.

Total hours worked by all employees during the period covered = Number of all employees × 48 hours/week × 50 week/year.