Direct impact of non-fatal occupational injuries

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ABSTRACT

Objectives: The objectives of this study were to describe the pattern of certain direct impacts of non-fatal injuries among workers insured by the General Organization of Social Insurance, admitted to hospitals in Al-Khobar City, and to determine factors influencing these direct impacts.

Methods: This cohort study consisted of 65, 915 insured male workers in various industries, followed to determine those who were admitted to 2 private hospitals selected randomly in Al-Khobar City. A data-collection sheet was used to collect the necessary data from patients and their medical records on admission to the hospital.

Results: The majority of admissions (78%) were for periods of less than a week. Absence from work was longer than 3 weeks in 35.5% and shorter than 1 week in 25% of admissions. The majority of the cases (65%) visited clinics from 2 to 7 times. Direct medical cost per admission was less than SR2,000 in 64% of the cases in one of the hospitals (one United States dollar = 3.75 Saudi Riyals). Multiple linear regression analysis for period of absence from work, length of hospitalization, and number of clinic visits showed these direct impact variables to be inter-related. Injury outside the work place (road traffic accidents), and the hospital which the injured worker was referred to, were the other main risk factors determining the direct impact of the injury. Multiple linear regression for direct medical cost was positively associated and predicted by the younger age of the worker.

Conclusions: The direct impact of occupational injuries in this study, though less than the same reported from Western countries, were responsible for significant medical charges, human suffering and loss of productivity. Efforts made by different industries to prevent occupational injuries should be encouraged and continued, and the General Organization of Social Insurance may monitor their success by conducting similar studies.

Keywords: Occupational injuries, hospital admissions, social insurance.

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Occupational accidents usually occur as a result of the increasing exposure to various potential occupational hazards. Such injuries are expected to climb due to the rapid increase in the labor force in the Kingdom of Saudi Arabia (KSA). Based on the 1995 annual statistics of the Ministry of Industry and Electricity and at that time, the number of factories in KSA has increased by a rate of 163% during the past 13 years.[1] As a result of this increase, more workers have been needed, and hence more injuries took place. Severe occupational injury often results in a recovery period requiring temporary or long-term absence from work. During this period, rehabilitation interventions may facilitate recovery, and prevent workers from becoming disabled or unemployed. Direct impacts of an occupational injury include burdens of the periods of hospitalizations, absence from work. Follow-ups in the hospitals and costs of direct medical care. In one study conducted in the United States (US), the total direct ($ 65 billion) plus indirect ($ 106 billion) costs were estimated to be $ 171 billion.[2] These may be

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under estimates, as they ignore costs of indirect impacts, which include suffering pain and within-home care provided by family members. Using multivariate analysis, factors influencing some of these direct impacts were suggested in current literature.[2-6] Generally, these influencing factors include a mixture of the workers' demographic and injury-related characteristics. Direct impacts may be lessened, by first identifying them and then, more importantly, trying to avoid these factors through formulation of suitable preventive measures. Judging from the few studies, which have been carried out, in Saudi Arabia[1,7-11] and to the best of the investigator's knowledge, there is no prior similar research in Saudi Arabia that was conducted with objectives similar to the ones in this study. The objectives of this study were to: (1) Describe the pattern of certain direct impacts of non-fatal injuries; namely the total period of absenteeism due to injury, period of hospitalization, number of clinic visits, and direct medical cost among General Organization of Social Insurance (GOSI) insured workers admitted to hospitals in Al-Khobar City. (2) Determine factors influencing these direct impacts.

Methods. This is a cohort study with one-year (1995) follow-up. The cohort consisted of 65,915 workers at work places where insurance arrangement ensured admission to 2 hospitals (A and B) in Al-Khobar City, in the Eastern Province of Saudi Arabia. These 2 private hospitals were selected randomly from a total of 6 private hospitals serving GOSI workers in Al-Khobar City. In Saudi Arabia, private sector workers are not permitted to be treated in governmental hospitals. Workers with occupational injuries are seen in private hospitals, which are able to provide suitable medical care and then are paid by GOSI. By law, establishments employing 10 or more workers must have their employees insured with GOSI. In this study, non-fatal occupational injury was defined as "any occupational injury that did not result or end in the death of the worker, but required admission to the hospital". General Organization of Social Insurance considers an injury as occupational if it is sustained during the course of work, or while travelling to or from work, or to the place where meals are usually taken, or while on an official assignment away from the usual place of work.[1] All GOSI-registered workers, who were admitted as in-patients to these hospitals due to occupational injuries during the study period, were included. Patients who were treated only at emergency or at outpatient departments, and were not admitted to the hospital, were excluded.

The investigator collected the relevant information, at the time of admission to the hospital, using a data-collection sheet, specially designed for this purpose. The sources of data were the patient himself and his medical record. Data included age, nationality, cause of injury, place of injury, the treating hospital and the anatomical body part injured. Data also included the direct impact variables, namely: number of days staying in the hospital, total period of absenteeism, number of clinic visits, and direct medical cost (carried out only for one hospital due to administrative constraints). Subjects were followed up after discharge from hospital to determine some of the variables, such as the period of absenteeism, the number of clinic visits and the cost of the injury. Data was cleaned and entered into a personal computer. Data analysis was performed using the SPSS/PC+ statistical package. Frequency distribution tables were generated. Using the multiple linear regression analysis, the direct impact variables, namely the total period of absenteeism (sick leave in days), period of hospitalization (in days), number of clinic visits, and direct medical cost in one hospital, in Saudi Riyals (SR) were regressed. The independent variables analyzed were age (in years), nationality (coded as 0=Saudi, 1=others), place of injury (coded as 0=outside workplace, 1=inside work place), the treating hospital (coded as 0=B hospital, 1=A hospital). Period of absenteeism (sick leave in days), period of hospitalization (in days) and the number of clinic visits were also included as independent variables for different other direct impacts. The stepwise method was used to determine the final multiple linear regression models. A test was considered statistically significant at p-value < 0.05.

Results. ***Pattern of direct impacts of occupational injuries.*** The majority of admissions (78%) were for periods of less than one week, while only 7% of admissions stayed in hospitals for periods of more than 3 weeks. More than one third of admissions (35%) resulted in subsequent absence from work for a period of more than 3 weeks, while 25% of admissions resulted in absence from work for periods lasting less than one week. Following discharge from hospitals, 65% of the injured persons visited out-patient clinics from 2 to 7 times, 18% visited from 8 to 14 times, 9% visited clinics more than 15 times, while 8% visited only one time. In Hospital A, the cost of medical care for about two-thirds of the admissions (64%) was less than SR 2,000 per admission, while the cost for 22% was between SR 2,000 and 4,000 per admission, and for the remaining 14% the cost was more than SR 4,000 per admission.

Multiple linear regression models. Tables 1-4 show the multiple linear regression models for total period of absenteeism, period of hospitalization, the number of clinic visits and direct medical cost. The

Table 1 - Multiple linear regression model for total period of absenteeism.

Variable	Coefficient value (B)	SE (B)	95% CI	P-value
Constant	13.87	2.83	8.33, 19.41	0.00001
Clinic visits	1.99	0.17	1.65, 2.34	0.00001
Place of injury	-6.08	2.88	-11.74, -0.43	0.0357

Equation: Period of absence from work = 13.87 + 1.99 (number of clinic visits) - 6.08 (place of injury). $R^2 = 0.26$; P=value < 0.00001; SE - standard error; CI - confidence interval

Table 2 - Multiple linear regression model for total period of hospitalization.

Variable	Coefficient value (B)	SE (B)	95% CI	P-value
Constant	7.31	1.23	4.90, 9.73	0.00001
Period of absence from work	0.07	0.01	0.03, 0.10	0.00001
Hospital	-1.66	0.68	-3.01. -0.32	0.0156
Place of injury	-3.00	1.10	-5.18, -0.83	0.0070

Equation: Total period of hospitalization = 7.3 + 0.07 (period of absence from work) - 1.66 (hospital) - 3.0 (place of injury). $R^2 = 0.48$; P=value < 0.00001; SE - standard error; CI - confidence interval

Table 3 - Multiple linear regression model for total period of clinic visits.

Variable	Coefficient value (B)	SE (B)	95% CI	P-value
Constant	2.82	0.81	1.23, 4.43	0.0006
Hospital	-1.7	0.45	-2.61, -0.81	0.0002
Period of absence from work	0.12	0.01	0.11, 0.15	0.00001

Equation: Number of clinic visits = 2.8 -1.7 (hospital) + 0.12 (period of absence from work). $R^2 = 0.29$; P=value < 0.00001; SE - standard error; CI - confidence interval

Table 4 - Multiple linear regression model for direct medical cost.

Variable	Coefficient value (B)	SE (B)	95% CI	P-value
Constant	5011.99	1094.52	2866.73, 7157.6	0.00001
Age	-76.31	32.28	-130.59, -13.04	0.019

Equation: Direct medical cost (Saudi Riyals) = 5011.99 - 76.31 (age of worker in years. $R^2 = 0.31$; P=value < 0.00001; SE - standard error; CI - confidence interval

total period of absenteeism was significantly and positively associated with the number of clinic visits and injuries outside the work place, R^2 was 0.26 (Table 1). The period of hospitalization was significantly and positively associated with the total period of absenteeism, hospital B, and injuries outside the work place, R^2 was 0.48 (Table 2). The number of clinic visits was significantly and positively associated with hospital B and the total period of absenteeism, R^2 was 0.29 (Table 3). The direct medical cost per injury was significantly and negatively associated with the worker's age, R^2 was 0.31 (Table 4).

Discussion. Man-days lost due to occupational injury can be used as an index of case severity and economic impact for both the employee and employer.[12] In this study, 35% and 25% of admissions resulted in subsequent absence from work for periods of more than 3 weeks and less than one week. Frumkin reported that approximately half the respondents in his study had missed more than 3 days of work, with 15% missing more than one-month.[13] Others reported total absence of 111 days with a median of 45 days.[5] Road traffic accidents were found to be the most common cause of death and severe injuries among occupational trauma.[14] In this study, only 10% of the injuries occurred outside the work place, all of which were due to road traffic accidents, which ranked 4th and represented only 12% of the overall causes of injuries. However, injuries outside the work place were found to be an important determinant factor in predicting both the total period of absenteeism to injury and the period of hospitalization. Fortunately, most of the injuries sustained by the population under study were relatively mild, as judged by the length of stay in the hospital. However, the length of stay in this study was longer than the average length of stay of 4.4 days reported by Williams[15] but much less than the 29 days reported by others.[5] Many reports have shown that the severity of injury determines the duration of morbidity (total period of sick leave and hospitalization), length of time to return to work and the magnitude of future productivity.[3,5,16] The findings of this study support an earlier established positive association between period of absence from work and duration of hospitalization.[17] The average cost of inpatient management for the majority of the injured was less than SR 2,000. A figure close to this was reported for injuries managed in 1995 but much higher than the cost for the year 1983.[1] The increase over time in the Average Cost of Treatment (ACT) may be explained, among many other factors, by the increase in medical cost. However, in other countries the total cost was much more than the figure of SR 14,173,031 reported earlier from Saudi Arabia.[1] For example, in 2 studies, the average medical charges

incurred by patients injured at work who required hospitalization was US $10,802 and US $10,910 per patient.[15,18] The total treatment cost of work related injuries in 1986 in the US mounted to US $34.8 billion and almost doubled in 1991,[19,20] while it was estimated to be US $65 billion during 1997.[2] As it is the case in this study, cost due to sickness and absence is known to increase when the absence is paid.[5,16] In this study, direct medical cost was predicted only by age. Younger age was associated positively with direct medical cost, explaining up to 31% of the variation of the dependent variable in this model. Similar findings were reported from Taiwan in 1995.[5] Hospital B was an important variable, predicting outcome variables such as the length of stay in hospital and clinic visits in the multivariate analysis. Workers who visited hospital B may have been exposed to more risky jobs and subsequent serious injuries than workers who visited hospital A.

In conclusion, period of absenteeism, length of hospitalization, and number of clinic visits were generally less than, but comparable to, the same from other studies. These direct impacts were inter-related and can be successfully used as surrogates for severity of injury. Injury outside the work place (road traffic accidents), and the hospital which the injured worker was referred to, were the main other risk factors determining the direct impacts of the injury. Direct medical cost was positively associated and predicted by the younger age of the worker. Direct impacts of these injuries, though less than that reported from Western countries, were responsible for significant medical charges, human suffering and loss of productivity. Efforts by different industries to prevent occupational injuries, such as by education, adherence to safety procedures, protective equipment, and personal responsibilities are of critical importance. The GOSI can make use of studies, as the current one, to monitor indirectly the success of these preventive efforts. This study may be considered as a baseline and conduction of further applied researches in this field in general, and severe injuries in particular should be encouraged.

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