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Relationships of Job and Some Individual Characteristics to Occupational Injuries in Employed People: A Community-Based Study

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Abstract: Relationships of Job and Some Individual Characteristics to Occupational Injuries in Employed People: A Community-Based Study: Ashis BHATTACHERJEE, *et al.* **Department of Mining Engineering, Indian Institute of Technology, Kharagpur, India**—This study assessed the associations of job and some individual factors with occupational injuries among employed people from a general population in north-eastern France; 2,562 workers were randomly selected from the working population. A mailed auto-questionnaire was filled in by each subject. Statistical analysis was performed with loglinear models. The annual incidence rate of at least one occupational injury was 4.45%. Significant contributing factors for occupational injuries were job category (60.8%), sex (16.2%), regular psychotropic drug use (8.5%), age groups (7.5%), and presence of a disease (7.0%). The men had higher risk than the women (adjusted odds-ratio 1.99, 95% CI 1.43–2.78). Compared to executives, intellectual professionals and teachers, labourers had the highest risk (6.40, 3.55–11.52). They were followed by farmers, craftsmen and tradesmen (6.18, 2.86–13.08), technicians (3.14, 1.41–6.70), employees (2.94, 1.59–5.48) and other subjects (3.87, 1.90–7.88). The young (≤29 yr) showed an increased risk. Similar odds–ratios were observed for regular psychotropic drug use (1.54, 1.16–2.05) and the presence of a disease (1.50, 1.11–2.02). Univariate analysis showed that smoking habit, overweight and excess alcohol use were also associated with injuries. The loglinear model results showed that there were associations between some of these independent factors. It was concluded that job, sex, young age, smoking habit, excess alcohol use, overweight, psychotropic drug use, and disease influenced the occupational injuries. Preventive measures concerning work conditions, risk assessment and job knowledge should be conducted in overall active population, especially in men, young workers, smokers, alcohol users, overweight workers and in individuals with a disease or psychosomatic disorders.
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Occupational injuries have severe consequences for workers and society (disabilities, lost of working time, medical care, etc.)[1–3]. In France, the annual incidence of occupational injuries with sick leave was about 4.4% in 1996 to 2000 for the "Régime général de sécurité sociale". There are many hazards and causes,[4] and their roles have been hardly documented. The severe consequences of the occupational injuries pointed out the importance of epidemiological knowledge for determining appropriate preventive measures.

First, there have been only a few statistics on the incidence of occupational injuries for the overall active general population. In France, the available statistics concern only the "Régime général de sécurité sociale" and some specific systems (agricultural system for example). It is useful to know the incidence for the overall active population, the differences amongst various job categories, sexes and other characteristics of the subjects.

It is known that occupational injuries are mainly caused by work conditions[5, 6], especially the environment, tasks, work organisation, and lack of training which result in lack of know-how and job knowledge. Nevertheless, certain individual factors which concern many employed people such as young age[7–11], body weight[12, 13], lack of training[14], lack of experience[9, 15], smoking[14, 16–19], alcoholic drink consumption[18, 20], sleep disorders[11, 13, 21–26], and some disabilities[27], have been identified as risk factors for occupational injuries. Although prevention measures are mainly concerned with the work conditions, the knowledge of jobs at risk and the related risk factors could help occupational physicians to make workers, who are exposed to higher risk, more sensitive to the injury risks during the yearly medical examination. In this context, a limited number of investigations have been conducted which were concerned with some particular populations (construction workers, railway employed people, drivers, etc.). It was not certain whether these factors play a role only for certain jobs or professional activities or, on the contrary, they also play a role in the overall active population. Such knowledge is important because it shows that preventive measures concerning these factors can be carried out for all professional activities and not limited to certain sectors only. It is also important to investigate psychotropic drug use and the presence of diseases as they could increase the risk of occupational injuries by decreasing physical and mental abilities, especially at work[26].

The present study aimed at assessing the relationships of job, sex, young age, smoking habit, alcohol use, psychotropic drug use (for headache, tiredness, anguish and sleeping pills), and diseases to the incidence of occupational injuries in the overall active population from the Lorraine (north-eastern France). In addition, we would like to show that the loglinear model can be used to compute the odds ratios and the contributions of various factors, and to assess the multiple interactions between these variables.

Materials and Methods

Subjects

The sample consisted of all the people aged 15 or more from 8,000 households (family or person living alone) randomly selected from the Lorraine community (north-eastern France, 2.3 millions inhabitants). The selection of the households was made from those possessing a telephone.

Study design

Before the survey, a campaign was conducted for a period of three months with the help of the media (television, journals, radio) to make the population sensitive to the survey. The investigation had received a favourable view from the "Commission Nationale

Table 1. Distribution (%) according to gender and age of the sample studied and of the Lorraine general population[30]

	The sample studied	The Lorraine general population
No. of subjects	6,214	1,848,579
Percentage of women	52.4	51.5
Men		
No. of subjects	2,962	896,683
Age (yr)		
15–19	6.4	10.2
20–29	17.3	20.5
30–39	22.0	19.8
40–49	17.2	16.1
50–59	12.8	13.7
60–69	14.6	11.8
70–79	8.9	5.2
80 or over	2.0	2.6
Women		
No. of subjects	3,252	951,896
Age (yr)		
15–19	5.7	9.1
20–29	20.2	18.5
30–39	19.4	18.6
40–49	15.4	14.4
50–59	12.0	13.1
60–69	14.9	13.0
70–79	9.4	7.5
80 or over	3.2	5.8

Only people aged 15 or older were considered.

d'Informatique et des Libertés", and written consent from the participants.

The study protocol included: (1) a request of participation by means of a questionnaire to ascertain the number of people in the household, then (2) sending out standardised auto-questionnaires with a covering letter and a pre-paid envelope for reply, then (3) sending a solicitation letter without a questionnaire, and finally (4) sending questionnaires with a covering letter and a pre-paid envelope. These communications were addressed to the households at one month intervals. When the number of individuals was unknown, two questionnaires were sent first, and a complementary one was sent later. The standardised auto-questionnaires were filled in by the subjects themselves. Adolescents were free to ask their parents or tutors if they did not understand some questions. The questionnaires included: sex, birth date, height, weight, job coded according to the INSEE classification[28], smoking habit, excess alcoholic drink consumption with the DETA questionnaire (including four items: (i) consumption considered as excessive by the

subject himself/herself, (ii) by people around the subject, (iii) wish to reduce consumption, and (iv) consumption on waking; excess consumption was defined by at least two positive responses out of these four items)[29], various diseases diagnosed by the physician, regular psychotropic drug consumption (for headache, tiredness, anguish, sleeping pills), and the presence of at least one occupational injury during the two-year period before the survey (the questionnaires were filled in by the subjects between May and July 1996). Occupational injury was defined as damage to the body, whatever may be its severity, which resulted from an accident at work with sick leave of at least one day in addition to the day when the accident occurred and for which the subject got compensation. A two-year period was chosen to have a sufficient number of occupational injuries.

Among the 8,000 households included in the sample, 193 (2%) commnications were lost (due to wrong address or death). Of the 7,807 households contacted, 3,460 (44.3%) participated (one subject at least), out of which in 86% of cases every member of the family participated. Altogether, 6,214 subjects filled in a questionnaire. The distributions of the sample gathered according to age and sex are close to those of the Lorraine population[30] (Table 1). This study only concerned the individuals who had been employed at the time of the survey, that is 2,833 subjects out of 6,214.

Statistical analysis

The variables studied were: sex, job, age, body mass index, smoking habit, excess alcohol use, regular psychotropic drug use, presence of a disease, and presence of at least one occupational injury during the two-year period considered. Age was categorised into 4 groups: ≤29, 30–39, 40–49, ≥50 yr; body mass index (BMI) into three groups: ≤19, 20–24, ≥25 kg/m²; jobs into six groups: executives, intellectual professionals and teachers; labourers (salaried persons with manual jobs in production for an employer); employees (salaried persons who work in offices, administration, shops, or for private individuals, without management responsibility); farmers, craftsmen and tradesmen; technicians and others. All other variables were dichotomised: smoking habit (smokers including current and ex-smokers, non-smokers), excess alcohol use (yes, no), regular psychotropic drug use (yes, no), all diseases combined (at least one disease, no disease), and occupational injury (presence, absence).

The occupational injury data were cross-classified according to the variables of interest. The data presented in the form of a multidimensional contingency table were analysed by examining all the two dimensional tables which can be arrived at by summing up the other variables, but this may lead to misleading conclusions that could be drawn about the data. The analysis of a multidimensional contingency table was primarily aimed at investigating the statistical associations of the variables of interest. In addition, the strength of association between two or more variables can also be measured. While explaining a contingency table the variations in the observed cell counts can be attributed to main and interaction effects of the different variables. In this study, the log-linear model was investigated as a statistical representation of the contingency table to quantify the relative importance of various factors and to detect occasions where the effects of these factors could be presumed to be real or merely random variations[31–34]. The loglinear model for the contingency table is expressed as follows:

Log (expected cell frequency)
=Grand mean + Main effects parameters
+ Second and higher order interactions.

As the number of dimensions of a contingency table increases the number of possible models also increases, so that some procedures are clearly needed to indicate which models may prove reasonable for the data set and which are likely to be inadequate. One such procedure is to examine the likelihood-ratio Chi-square values of all effects in the saturated loglinear model. The other approach is to examine the standardised parameter values in the saturated loglinear model. These values may indicate which parameters may be excluded and consequently which unsaturated models may be worth considering. The odds ratios of different factors were computed based on the second order interaction parameters of the significant factors[34]. All statistical tests were made with significance level $p=0.05$. All the analyses were performed with the SPSS program[35].

Results

The annual incidence rate of at least one occupational injury was 4.45%. Table 2 provides the incidence rate according to various factors. Significant differences were observed between men and women, various job categories, body mass index groups, smokers and non-smokers, excess alcohol users and limited users, the people suffering from a disease and the healthy subjects, and between the individuals who regularly used a psychotropic drug and the others.

Table 3 presents the effects of the main and second order interaction terms of the saturated loglinear model run and the partial association of each of the effect terms, the third order and higher order interaction terms being non-significant. Further, the model run showed that the second order interaction parameters INJURY*ALCOHOL, INJURY*BMI and INJURY*SMOKE were not significant and the interaction term INJURY*AGE was close to significance ($p=0.07$). As it is a saturated loglinear model, the goodness of fit statistic revealed that the value

Table 2. Annual incidence of at least one occupational injury-according to various risk factors

	No. of subjects	Incidence of at least one injury (%)	Comparison of various groups
All the sample	2833	4.45	
Sex			$p<0.0001$
Male	1604	5.8	
Female	1229	2.7	
Job category			$p<0.0001$
Executives, intellectual professionals, teachers	539	1.2	
Labourers	752	8.3	
Employees	1003	3.2	
Farmers, craftsmen, traders	119	7.1	
Technicians	142	4.6	
Others	278	4.0	
Age (yr)			NS
≤29	620	5.5 (1)	
30–39	1011	4.2	
40–49	787	4.2	
≥50	388	4.0	
Body mass index (kg/m^2)			$p<0.01$
≤19	310	2.6	
20–24	1355	4.3	
≥25	919	5.4	
Smoking habit			$p<0.002$
Non-smokers	1101	3.4	
Smokers	1732	5.1	
Excess alcohol use			$p<0.001$
No	2582	4.2	
Yes	251	7.3	
Regular psychotropic drug use			$p<0.001$
No	1982	3.9	
Yes	851	5.9	
At least one disease diagnosed by a physician			$p<0.001$
Absence	1123	3.4	
Presence (2)	1710	5.2	

(1) The difference from subjects aged 30 or over was significant with $p<0.05$. (2) The prevalences of various diseases were: musculoskeletal disorders (44.9%), cardiovascular diseases (10.9%), scoliosis and cyphosis (10.8%), respiratory diseases (6.7%), mental disturbances (2.5%), diabetes (3.4%), nervous system diseases (1.5%), genito-urinary diseases (1.6%), carpal tunnel (2.8%), cancers (0.8%), other diseases (1.2%)

of the Chi-square statistic is as expected: always 0 with a significance level of 1. Finally, the model retained was the unsaturated model including all the main effects of the six variables INJURY, AGE, SEX, JOB, DISEASE and DRUGS and all their two-way interaction terms (Table 4). All terms were significant ($p<0.05$) except SEX*DISEASE. In the unsaturated model obtained, the goodness of fit statistic revealed that the resulting likelihood ratio (Chi-square value) of 316.97 has an observed significance level of 0.51. Since the significance level is large we can consider it to be an acceptable model for this study. Overall the factors job category, age,

disease, and psychotropic drug use were associated with each other. The job category appeared to be the major factor contributing to occupational injuries (60.8%) followed by sex (16.2%), whereas psychotropic drug use, age and disease had similar and much lower contributions (8.5, 7.5, and 7.0% respectively).

Table 5 shows the estimated parameter values of the final model as well as the adjusted odds ratios (OR) for the various risk factors. It was observed that, compared with the women, the men had an OR of 1.99 (95% CI 1.43 to 2.78). Amongst the various job categories, the labourers and farmers, craftsmen and tradesmen had the

Table 3. Saturated loglinear model run for occupational injury and various risk factors (n=2,562)

	Degreee of freedom	Partial likelihood-ratio Chi-square	*p*-value
Main Effects			
SEX	1	49.1	< 0.0001
JOB	5	1295.4	< 0.0001
AGE	3	291.2	< 0.0001
BMI	2	714.3	< 0.0001
SMOKE	1	124.3	< 0.0001
ALCOHOL	1	2018.1	< 0.0001
DRUGS	1	410.9	< 0.0001
DISEASE	1	127.9	< 0.0001
INJURY	1	2008.8	< 0.0001
Interactions			
SEX * JOB	5	505.8	< 0.0001
SEX * BMI	2	228.8	< 0.0001
AGE * BMI	6	146.6	< 0.0001
AGE * DISEASE	3	127.7	< 0.0001
SEX * DRUGS	1	77.2	< 0.0001
DISEASE * DRUGS	1	56.8	< 0.0001
INJURY * JOB	5	52.4	< 0.0001
SMOKE * ALCOHOL	1	52.1	< 0.0001
AGE * JOB	15	52.0	< 0.0001
SEX * ALCOHOL	1	46.9	< 0.0001
SEX * SMOKE	1	44.8	< 0.0001
JOB * DRUGS	5	22.0	0.0005
JOB * DISEASE	5	20.2	0.001
DISEASE * ALCOHOL	1	16.9	< 0.0001
BMI * DISEASE	2	13.3	0.001
SMOKE * DRUGS	1	10.5	0.01
JOB * SMOKE	5	9.2	NS
INJURY * DRUGS	1	8.8	0.003
AGE * SEX	3	8.3	0.04
SEX * DISEASE	1	8.1	0.004
BMI * SMOKE	2	7.4	0.02
AGE * DRUGS	3	7.2	NS
INJURY * AGE	3	7.2	NS
BMI * JOB	10	7.1	NS
INJURY * DISEASE	1	6.6	0.01
INJURY * SEX	1	6.4	0.01
AGE * SMOKE	3	5.1	NS
JOB * ALCOHOL	5	4.4	NS
AGE * ALCOHOL	3	3.0	NS
INJURY * BMI	2	2.7	NS
INJURY * ALCOHOL	1	2.1	NS
INJURY * SMOKE	1	1.7	NS
BMI * DRUGS	2	1.5	NS
SMOKE * DISEASE	1	0.2	NS
BMI * ALCOHOL	2	0.1	NS
DRUGS * ALCOHOL	1	0.1	NS

JOB: job category, BMI: body mass index, SMOKE: smoking habit, DRUGS: regular psychotropic drug use, ALCOHOL: excess alcohol use. The third order and higher order interactions are not shown as they were not significant. The subjects with at least one missing value (9.6%) were eliminated.

Table 4. Final unsaturated loglinear model with six retained variables (n=2,562)

	Degree of freedom	Partial Chi-square	*p*-value
Main effects			
SEX	1	49.5	< 0.0001
JOB	5	1371.4	< 0.0001
AGE	3	307.3	< 0.0001
DRUGS	1	459.7	<0.0001
DISEASE	1	119.9	<0.0001
INJURY	1	2194.6	<0.0001
Interactions			
SEX * JOB	5	629.2	< 0.0001
AGE * DISEASE	3	158.5	< 0.0001
DISEASE * DRUGS	1	67.2	< 0.0001
SEX * DRUGS	1	64.5	< 0.0001
INJURY * JOB	5	63.9	< 0.0001
AGE * JOB	15	54.5	< 0.0001
JOB * DRUGS	5	23.8	0.0002
JOB * DISEASE	5	18.9	0.002
INJURY * SEX	1	17.1	< 0.0001
AGE * SEX	3	10.6	0.02
INJURY * DRUGS	1	8.9	0.003
AGE * DRUGS	3	8.0	< 0.05
INJURY * AGE	3	7.8	< 0.05
INJURY * DISEASE	1	7.4	0.01
SEX * DISEASE	1	1.8	NS

JOB: job category, DRUGS: regular psychotropic drug use, ALCOHOL: excess alcohol use.

Table 5. Relationships between presence of at least one injury and various risk factors: estimated parameter values, adjusted odds ratios, and 95% CI calculated with loglinear model (n=2,562)

	Estimated parameter	Odds ratio, 95% CI	
Male vs female	0.69	1.99‡	1.43 – 2.78
Job category[1]:			
Labourers	1.85	6.40‡	3.55 –11.5
Employees	1.08	2.94‡	1.59 – 5.48
Farmers, craftsmen, tradesmen	1.81	6.18‡	2.86 –13.1
Technicians	1.14	3.14†	1.41 – 6.70
Others	1.35	3.87‡	1.90 – 7.88
Age[2]:			
≤29 yr	0.53	1.70*	1.07 – 2.72
30–39 yr	0.13	1.14	0.73 – 1.78
40–49 yr	0.08	1.08	0.68 – 1.72
Psychotropic drug use vs the others	0.43	1.54†	1.16 – 2.05
Diseased vs the others	0.41	1.50†	1.11 – 2.02

*: $p < 0.05$, †: $p<0.01$, ‡: $p<0.001$, (1) vs executives, intellectual professionals and teachers, (2) vs ≥50 yr.

highest risks (OR of about 6) in reference to the executives, intellectual professionals and teachers. People aged 29 or younger were found to be prone to occupational injuries (OR 1.70, 95% CI 1.07 to 2.72, compared with those aged 50 or more). Subjects who regularly consumed psychotropic drugs and those who suffered from a disease had ORs of 1.54 (95% CI 1.16 to 2.05) and 1.50 (95% CI 1.11 to 2.02), respectively.

Discussion

The present study shows that although the occupational injuries affected all categories of workers, the men, the young subjects, the smokers, the workers with excess alcohol use, individuals who regularly used psychotropic drugs, and workers suffering from a disease had increased risk of occupational injuries. Labourers, farmers, craftsmen and tradesmen had a six times higher risk and employees and technicians had a three times higher risk than executives, intellectual professionals and teachers. This is an original study on workers from a large geographic area.

This study shows that a loglinear model can be used for analysing cross-tabulated data due to the multifactorial nature of the causes of occupational injuries[6, 31–34]. It shows that it is appropriate to begin the analysis with the saturated model, then with unsaturated models by eliminating the non-significant terms. It may be noted that the adjusted odds ratios found were similar to those observed with logistic regression models[36]. Nevertheless, we preferred to use in this study the loglinear model as it gives valuable results and also provides information on multiple interactions between various factors which are useful for understanding the overall problem.

The bias of selection of the sample would be small. Indeed, the households with a telephone represented 96% at the time of the study. The households for whom the addresses were kept confidential represented only 16%. According to our discussions before the survey, for example, with several associations for persons with disabilities, this list would not be related to health status and life conditions. The participation rate was similar to that habitually reached in surveys with mailed questionnaires in France[37]. It should be noted that the distributions according to age and sex of the sample gathered are close to those of the Lorraine population[30]. The quality of the filling in of the questionnaire was very good. The non-responses for each of the various items represented less than 4%. As the number of the subjects with one or several missing values was small (9.6%), we preferred not to consider them in the loglinear models. Although this study was conducted on a large sample, the interpretation of the results needs caution due to the presence of a possible bias of selection and the use of an auto-questionnaire, but it should be indicated that the incidence rate of at least one injury in the sample was close to that of all the French "Régime général de sécurité sociale" (17.2 million working people, 4.4%)[1]. A study analysing the non-response bias in a mailed health survey on 1,424 respondents and 398 non-respondents showed that the two groups were of similar sex and age distributions and the proportion of persons who had health care expenditures greater than zero francs was only slightly higher in respondents (75% vs 69%, p=0.03)[38]. Note that the incidence rate of at least one injury in the sample was similar to the directly standardized adjusted rate[39] computed in reference to the Lorraine population[30]. This is due to the fact that, as quoted above, the distributions according to age and sex of the sample are close to those of the Lorraine population.

It should be noted that the investigated factors studied concerned the living conditions and lifestyle for a long period. Only the body mass index was determined at the time of the survey and not at the time of the injury for the subjects with an injury. We believe that it did not greatly vary between the two periods for most workers as nearly all the injured subjects were at work at the time of the survey and they did not experience any disability due to injury.

For age groups, we considered the four following groups: ≤29, 30–39, 40–49 and ≥50 yr. In another study a significant increased risk of occupational injury was also found for the ≤29 yr age group only[11]. It was not suitable to divide the ≤29 yr group into several groups as these groups contained too small a number of subjects and this results in a lack of power for statistical tests.

In the present study which was conducted on all categories of employed people from the general population, the job categories were used to define working conditions. The strength of this choice was that they represented main homogeneous working conditions. It had the weakness that it was not concerned with other occupational hazards. It should be noted that it is difficult to assess the working conditions for all categories of workers, especially through a self-questionnaire. In addition, this approach would introduce many variables, so that a greater sample would be necessary.

Our study points out that among the factors considered, the job played a major role (60.8%) in occupational injury, whereas the other factors (sex, age, regular psychotropic use and disease) had significant roles. This is consistent with a study by our team on railway workers which reported that most occupational injuries were caused by work conditions (physical environment, organisation, technical problems, etc.) and lack of job knowledge and know-how[40]. The differences between various job categories concern several types of factors which can increase the risk of injury. First, the task, work environment, work organisation and other hazards are different. Work conditions can have an impact on health status and physical and mental ability[41–44] which can also

increase the risk of injury. For example, night shift workers would be more common among labourers than among other job categories; and it was reported that, for a similar job, the risk of sleepiness was 6–14 times higher in the night shift and about twice as high in the morning shift than in the day shift[45]. Labourers, farmers, craftsmen and tradesmen experienced more musculoskeletal disorders than other workers[46]. These findings highlight that improvement in work conditions and training should be carried out[4] for all workers, but especially for workers with higher risk i.e. labourers, farmers, craftsmen, tradesmen, employees, and technicians.

Regarding age groups, a higher risk was only found in subjects younger than 30 yr. This fact was also reported by other investigators[11]. Young age is associated with a lack of experience which predisposes to the occurrence of injuries[9, 15]. It could also be associated with a lack of job knowledge and know-how. A study on railway workers emphasised that occupational injuries in young subjects were more due to lack of job knowledge and know-how than in other subjects, and no significant differences were noted for environmental factors, technical problems, work organisation or other factors[40]. But training and experience cannot eliminate injury when the level of hazards is high and when the use of reliable techniques and safe work organisations are limited[47]. The difference between the two sexes is well known[25]. This would be explained in part by the differences in jobs and tasks for the same job category, and possibly by the differences in the perception of risks and in behaviour.

Our study shows that regular psychotropic drug use and the presence of a disease made a similar contribution to occupational injury. This was expected as they are health-related factors which result in decreased physical and mental ability. It should be mentioned that the psychotropic drugs considered include sleeping pills. The effect found in psychotropic drug use was consistent with that of sleep disorders observed for some specific populations[11, 13, 21–24, 26]. Sleep disorders affect the ability to maintain wakefulness[23], concentration, performing duties, and health status[26].

As in some surveys on specific populations[11, 18, 19] we also observed that smokers had a significantly higher incidence of injuries than non-smokers, but the difference did not remain significant in a multivariate loglinear model. This could be explained by the interdependence of smoking habit with sex, regular psychotropic drug use, excess alcohol use and BMI; some of these being related to injury. In the same way, our study shows that workers with excess alcohol use also had a higher risk than other subjects, but the differences did not also remain significant in a multivariate loglinear model. As for the smoking habit, this factor was related to several other factors (sex, smoking habit and disease). This is an interesting finding considering that, in our experience, it is difficult to show the role of alcohol use in all occupational injuries combined[11, 19]. Indeed, the risks induced greatly vary with the activities at work. A study on occupational injuries due to imbalance in railway workers stated that the individuals who consumed alcoholic drink nearly every day did not have a higher risk for all injuries combined, but only for descending from a vehicle which is a complex locomotion activity that needs coordinating function by the cerebellum in orientation and stabilization mechanisms[19].

As for body weight, we observed that the incidence of at least one occupational injury increased significantly with increasing BMI ($p<0.01$), but the loglinear model did not show significant differences for under-weight workers (BMI$\leq$19 kg/m^2) or for over-weight individuals (BMI$\geq$25 kg/m^2) compared with the other subjects (20$\leq$BMI$\leq$24 kg/m^2). And no significant role was found for all occupational injuries combined in construction and railway workers[11, 19]. In fact, the risk greatly varies with the activities. The people with a BMI over 30 kg/m^2 were found to have an increased risk for falls to a lower level in construction workers[11] and for traffic injuries in truck drivers[13]. It was stated that BMI influences the rate of industrial injuries[12]. Body weight could be associated with health status. Among truck drivers, hypertensive subjects were more overweight, slept more restlessly, took more naps, and woke up more frequently during the night[48]. In our study, BMI was significantly associated with the presence of a disease ($p<0.001$) and smoking habit ($p<0.02$).

Relationships between various risk factors

Even though the objective of this study was assessing the relationships between occupational injuries and various risk factors, a knowledge of the relationships between these factors allows better understanding of the mechanism of occupational injury. This investigation shows that job category was associated with regular psychotropic drug use and disease, and these two factors were linked. In addition, age was related to sex, BMI, disease and job category; sex was linked to BMI, smoking habit, excess alcohol use, psychotropic drug use, disease and job category; and most of the factors: disease, smoking habit, excess alcohol use and psychotropic drug use, were related to each other. The relationships between smoking habit, sleep disorders and sick leave have been reported[49, 50]. In the present study, occupational injury was significantly linked to psychotropic drug use but not with smoking habit based on the loglinear model runs. This interdependence of the different risk factors pointed out the need for loglinear model in investigating these relationships. Although theoretically the loglinear model can be used to explore all order interactions, in practice it is difficult to interpret higher order interaction terms. A model should fit the data and be substantively

interpretable and as simple as possible. If models with and without higher order interaction terms fit the data well, the simpler models are usually preferable[35]. In this study, as all the third and higher order terms were not significant, the model selected includes the main effects and all second order interaction terms of the significant variables.

In conclusion it can be mentioned that valuable results were obtained with loglinear models, and that the factors job, sex, young age, regular psychotropic drug use, and diseases influence the occupational injuries for overall active population. Separately, the smokers, the overweight subjects, and the excess alcohol users also had increased risk. The job category made the highest contribution to injury involvement. Labourers, farmers, craftsmen and tradesmen had the highest risk, and employees and technicians also had greater risk than executives, intellectual professionals or teachers. Preventive measures concerning work conditions, risk assessment and job knowledge should be conducted in overall active populations, especially in men, young workers, smokers, excess alcohol users, overweight workers and in individuals suffering from a disease or psychosomatic disorders. A campaign could be devised to make these workers, who are exposed to higher risk, more sensitive to occupational injuries, particularly by the occupational physician during the medical examination.

Lorhandicap Group

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