

Session: 8. Hazard identification I

267 OCCUPATION AND MULTIPLE SCLEROSIS: AN ITALIAN CASE-CONTROL STUDY

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Objectives The aim of the study is to explore possible relationships between occupational exposures and Multiple Sclerosis (MS), whose etiology is not well defined yet. To date, only few literature data are available on this subject. A more detailed study on this topic will be proposed as research theme to the Italian Ministry of Health.

Methods We carried out a case-control study, where cases were MS patients included in the MS Register of the Province of Pavia, Northern Italy, and controls, 1:4 matched by sex and age (5 years classes), were randomly selected from the National Health Service population files.

The occupational histories were obtained from Italian Institute for Social Security (INPS) archives by automatic linkage using Italian Occupational Cancer Monitoring (OCCAM) method that estimates the risk of specific occupational cancers, by geographic area and industrial sector.

OR adjusted for sex and age and corresponding 90% confidence intervals were used to estimate the association between exposure and disease.

Results We included in the study 183 MS patients (106 (57,9%) female, 77 (42,1%) male) and 769 controls. Our results suggest an increased risk for men in mechanical manufacturing industry (OR 2.37, 90% CI 1.23–4.58, $p = 0.031$, 22 cases) and agriculture (OR 4.05, 90% CI 1.20–13.69, $p = 0.059$, 4 cases). Women show an increased risk in mechanical manufacturing industry (OR 4.31, 90% CI 1.71–10.86, $p = 0.009$, 8 cases), agriculture (OR 13.18, 90% CI 2.91–59.61, $p = 0.005$, 3 cases) and leather/shoe industry (OR 7.75, 90% CI 2.49–24.07, $p = 0.003$, 6 cases).

Conclusions Our preliminary findings indicate that solvent exposures could be related to the risk of MS, as both shoe/leather workers and mechanical manufacturing industry workers are exposed to organic solvents. Interestingly, a major risk of MS was also found among workers engaged in agriculture, suggesting a role of pesticides, whose neurotoxic effect is well known.

268 THE MORTALITY EXPERIENCE OF UK WORKERS OCCUPATIONALLY EXPOSED TO LEAD

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Objectives Although the worldwide occurrence of lead in the environment has decreased greatly due to the elimination of most leaded petroleum, occupational exposures continue primarily via the lead battery industry and manufacture of lead pigments in paints. Around 7,000 workers are currently under surveillance for lead exposure in Great Britain. The most recent evaluation by the International Agency for Research on Cancer working group described the evidence in humans for the carcinogenicity of inorganic lead compounds as “limited” and for organic lead compounds as “inadequate”. The evidence for carcinogenicity in workers

exposed to inorganic lead is most consistent for stomach cancer, with lung, kidney and brain cancer showing elevated mortality in some but not all studies. Additional studies to investigate the carcinogenicity of lead are therefore of international importance.

Methods We will present the mortality analysis of some 10,000 workers who were included in a lead worker cohort established by the UK Health and Safety Executive (HSE) in the late 1970s/early 1980s, and which has never previously been analysed. Blood lead summaries are available for the workers, from around the time of cohort recruitment. Exposure will be characterised by these measurements and by exposure assessment groupings based on process codes and other data.

Results Individual mean blood lead levels ranged from 2 to 492 $\mu\text{g}/\text{dl}$. As well as estimating relative risks by calculating standardised mortality ratios for the range of causes of *a priori* interest, we will examine whether risks increase with increasing level of lead exposure.

Conclusions Many of the cohort studies carried out to date have been small and have suffered from methodological problems, but this study has the power to add substantially to the epidemiological evidence on this important issue.

269 VALIDATION OF A PRACTICAL MEASUREMENT TOOL FOR INJURY PREVENTION AT WORKPLACES: THE PREVENTION INDEX (PI)

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Objectives Prevention Index (PI) is a practical measurement tool which is currently used in Germany to monitor prevention activities at workplaces. The 12-item scoring system has 3 subscales rating technical, organisational and personnel-related internal safety conditions of a company. Each item has a rating value from 1 - 9, with higher values indicating higher level of safety conditions. The reliability and validity of this instrument were evaluated in a survey in 128 companies in the German metal industry during the time between December 2011 and May 2012.

Methods The Inter-rater-reliability of this instrument was examined by 2 trained safety engineers of the German Social Accident Insurance. One engineer is responsible for safety consulting of the rated company while the other one is responsible for other firms and less informed about the conditions in the rated company. The agreement of double ratings was quantified by inter-class correlation coefficient (ICC) and absolute agreement of the rating values.

Construct validity of the score was examined by principle component analysis (factor analysis) while content validity was evaluated by quantifying the association between PI-values and 5-years injury rates of the corresponding companies. Poisson regression analysis was performed to assess the association between PI-values and 5-years injury rates adjusted for company size and related industrial sectors.

Results Our analysis indicates a moderate to good inter-rater-reliability (ICC = 0.46 - 0.75) of PI-values with an absolute agreement between 72% and 81%. Factor analysis identified three component subscales which meet exactly the structural measure theory behind the score. The Poisson regression analysis demonstrates that higher technical and personnel safety conditions (PI-value ≥ 7) are associated with decreased injury rates, while less association was found between organisational conditions and injury rates.

Conclusions This analysis indicates that PI is a valid and reliable instrument which can be effectively used to monitor safety conditions at workplaces.

270 HEALTH AND SAFETY EXPERIENCE OF COMMERCIAL JANITORS

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Commercial janitors are an important group of low wage, largely immigrant workers who face significant potential risks at work, and yet have only been minimally studied for occupational injury and illness. Anecdotal reports from a local union representing commercial janitors in the Seattle area suggest pressures on the industry have produced a dramatic increase in workload over the past few years, raising the possibility of increased injury and illness. A cross sectional survey was designed to assess a range of exposures among commercial janitors including both union (n = 275) and non-union (n=75) sectors, and using a group of security guards (n=75) as controls. A novel participatory approach to data collection was developed, utilising workers to recruit subjects and conduct interviews in three languages, using electronic data collection tools linked to an internet-based database. Further, a novel subjective workload scale was adopted, and changes in workload and injury and illness rates over the past three years were assessed. Exposures assessed include general workload, musculoskeletal stressors, chemical use, as well as psychosocial risks such as work stress, safety climate, discriminatory management practices and work-life balance. Outcomes included acute injury, musculoskeletal pain, pulmonary and dermatological symptoms, and sleep disturbance. Initial results indicate a significant increase in workload with 28.5% reporting >7 on a 10 point scale two years ago, up to 35% in the current year. A concomitant increase in injuries was similarly observed. The paper describes the approach to data collection and describes rates of exposure and health and safety outcomes by group. Measures adopted to validate the self-reported conditions are also described.

271 CADMIUM EXPOSURE AND ANEMIA RISK IN AN ELECTROPLATING INDUSTRY AREA WITH METAL CONTAMINATION

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Background and Objective Cadmium (Cd) exposure, like Itai-itai disease, may present with erythropoietin (EPO) hypoproduction, and associated erythroid abnormalities. Anemia may be associated with toxic metal (Cd and lead) poisoning with interaction with essential trace elements (iron, zinc, copper) in humans. We aimed at assessing the relationship among erythrocyte parameters (EP), anemia (hemoglobin < 12 g/dL) and blood Cd (B-Cd) among adult residents in an environmentally high-exposed community near electroplating industry area.

Methods A total of 1,062 residents were included through stratified random sampling by three age groups (35–44, 45–54, and

55–64 years) and gender from an electroplating-related metal contaminated area located in central Taiwan during 2002–2005. B-Cd levels were measured by an ELAN 6100 inductively coupled plasma-mass spectrometer (ICP-MS). Multiple logistic regression models were used for test the association between anemia and B-Cd with serum ferritin taken into account.

Results B-Cd levels was negatively associated with the red blood cell (RBC) count, mean cell hemoglobin (MCH), and mean cell hemoglobin concentration (MCHC) (all $p < 0.01$). Odds ratio (OR) of anemia was 2-fold higher (OR = 2.03, $p < 0.05$) for females with elevated B-Cd (> 1.5 µg/L) in logistic regression with adjustment for age, ferritin, estimated glomerular filtration rate, and 2-microglobulin (B2MG). Females with B-Cd > 1.5 µg/L and B2MG > 80 µg/L were associated with the highest risk of anemia (OR = 6.69, $p = 0.001$) as compared to those at lower levels. We observed a positive association between log-scale B-Cd and hemoglobin among female with serum ferritin ≥ 50 µg/L.

Conclusions Our findings suggest that low Cd exposure from environmental contamination may have negative impacts on RBC indices, particularly among females. We hypothesised that Cd might induce erythrocyte dysfunction locally on peritubular interstitial cells of renal cortex responsible for EPO production possibly through iron-related oxidative stress. Further studies are needed to elucidate the pathophysiologic mechanism between Cd interacting with body iron on erythropoiesis.

Session: 9. Asbestos and mesothelioma

272 ESTIMATING HEALTH EFFECTS OF ASBESTOS EXPOSURE IN THE CONSTRUCTION INDUSTRY

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Objectives The use of asbestos in the construction industry stopped in mid 1970s in Sweden, but is still in use in some countries. The exposure may vary depending on time, country and occupation. We studied the occurrence of malignant pleural mesothelioma as a marker of asbestos exposure and compared it to the workers own estimation of asbestos exposure.

Methods The incidence of malignant pleural mesothelioma was studied among men in a Swedish cohort (N = 367,568) between 1972 and 2009. They reported the exposure to asbestos in early 1970s during a health examination.

Results Insulators and plumbers had the highest incidences (39 and 16 cases per 100,000 person-years respectively) and constituted 21% of all cases. Electricians and sheet metal workers had and incidence around 10 cases per 100,000 persons-years, while concrete workers and wood workers had an incidence of around 5 cases per 100,000 person-years. The correlation was poor between the incidences and reporting any previous exposure to asbestos among men in these occupations, e.g. in the early 1970s only 7% of the concrete workers but 50% of the wood workers reported any previous exposure to asbestos. The corresponding figure for insulators was 34%.

Conclusions The study shows that construction workers constituted a considerable proportion of the malignant pleural mesotheliomas in Sweden (30–40% in 2000–2009). The analysis indicates that many workers were unaware of their exposure to asbestos. Reports of previous asbestos exposure from workers in this industry are uncertain measures of exposure which is