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Musculoskeletal disorders assessment using sick-leaves registers in a manufacturing plant in Spain

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ABSTRACT

The incidence rates of sick-leave caused by musculoskeletal disorders (MSDs) were registered in 2013 in a Spanish manufacturing plant of electrical appliances applying a detailed analysis to the sick-leave data using Poisson regression considering the gender, age and working area.

The adjusted incidence rates estimated using Poisson regression show a higher incidence for workers over age 50, and a higher incidence of neck-related MSDs sick-leave for working area of presses and veneers. As for back injuries, workers over age 50 and of assembly induction working area present the highest risk of sick-leave.

Relevance for the industry: The results obtained in this study could be a reference to manufacturing plants of electrical appliances or similar to design MSDs' prevention policies, with the aim of reducing sick leaves and its associated costs. This information allows us to detect the working areas with higher incidence, more susceptible subjects as well as more sensitive areas of the body in order to target interventions towards those.

1. Introduction

Work-related musculoskeletal disorders (MSDs) include all musculoskeletal disorders that are induced or aggravated by work and the circumstances of its performance (Luttmann et al., 2003).

Every year millions of European workers in all types of jobs and employment sectors are affected by MSDs owing to their work. MSDs are the most prevalent occupational diseases at a European level. According to Eurostat figures on recognized occupational disease (EODS), musculoskeletal disorders are the most common occupational diseases with 39% of the total occupational diseases (Douillet, 2001). The Fourth European Survey on Working Conditions (ESWC) showed that 35.4% of respondents in European Union countries consider that their work affects their health (Parent-Thirion et al., 2007). In Spain, the percentage is very similar, 36%. The most prevalent health problems include back pain, lower and upper limb muscular pains, overall fatigue and stress (Schneider and Irastorza, 2010).

The ESWC survey shows that in European countries the manufacturing sector is the second in terms of the incidence rate of MSDs after fishing (Schneider and Irastorza, 2010). In Spain, after construction and public administration, the manufacturing sector presents the highest incidence rate of musculoskeletal disorders (Tejedor and Fernández, 2010).

In Spain in 2013, 23656 work-related sicknesses were notified, 16796 were occupational diseases (1905 in the manufacturing sector caused by a forced posture or repetitive movements at work) and 6860 were non-traumatic pathologies. The most common non-traumatic pathologies were MSDs, among them 1792 were related to the spine. The majority of them were caused in the manufacturing sector. In the region of Aragón (Spain), in 2013, the industrial sector comes second in terms of the number of workers, following the service sector with 17.17% of active workers. Companies that manufacture metallic products such as cars, electrical appliances and derivative products from these markets employ more than one third of the workers in industrial sector (Secretaría

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de Estado de la Seguridad Social, Dirección General de Ordenación de la Seguridad Social, 2014).

Apart from the health effect on workers, musculoskeletal disorders also generate an important economic impact on the companies and the social costs in European countries. The cost of MSDs includes direct costs such as insurance, medical and administrative costs. The indirect costs can be attributed to sick leave costs (Schneider and Irastorza, 2010; Itoh et al., 2013). In France in 2005, sick-leaves caused by MSDs led to a loss of 6.5 million workdays and an expense of 650 million euros (Ministère de l'emploi, du travail et de la cohésion sociale, 2005). In Germany the estimation of costs of musculoskeletal diseases established 95 million lost days and 23.9 billion euros (Bundesministerium für Arbeit und Soziales, 2008). A study conducted in the Netherlands showed total yearly costs of 2.1 billion euros (Blatter, 2005) owing to MSDs. The productivity loss as well as the sickness absence generate a similar number of expenses.

Our aim in this study is to describe the sickness absence on account of MSDs among line-workers of an electrical appliances manufacturing plant in Spain, studying its incidence rates. The results of this study will help to develop action strategies in order to reduce the sickness absence caused by MSDs in this manufacturing plant, identifying the most incident pathologies and the working areas where the highest number of episodes was registered.

2. Methods

2.1. Study design

The workers of an electrical appliances manufacturing company from Zaragoza, Spain were selected for this study. The research was developed in a plant of the company that manufactures ovens and induction stoves with 1368 workers, who work in different eight-hour shifts with 38 min break time divided in two. The workers change the workplace and the task each hour.

The main working areas of the plant are administration, stock and supplies, quality, development, enameling, assembly, assembly ovens, assembly induction, presses and veneers, maintenance and other work areas grouped together.

A cross-sectional study was developed to assess the incidence rates of MSDs in 2013. The data were obtained from the company's sick-leave registry from 2013. Work-related illness, common disease and workplace accident cases were registered. In case of workers with several episodes of sickness absence in a year, a unique case was taken into account as the study was designed to discover the risk of suffering from MSDs, not the risk of recurrence. For this reason, only the healthy workers were taken into account for the study, the employees with a previous sick-leave from 2012 were not considered in the analysis. In order to calculate the incidence, only the sick-leaves which began during the year of study were collected.

This study respects the directives of Helsinki declaration and has been approved by the ethical commission of San Jorge University.

2.2. Statistical analysis

From every diagnosis, the number of lost workdays due to sick-leave was registered as well as the type of pathology, the working area of the manufacturing plant, the age and sex of the workers. With these data, the incidence rates were calculated by gender, age, diagnosis and working area.

The most incident pathologies were detected and the incident rates for MSDs were also estimated. A Poisson regression model was applied in order to calculate the incidence rates of the main MSDs previously detected, adjusting for age (in 4 categories: less than 30, 30 to 40, 41 to 50, more than 50), gender (male, female), working area (enameling, assembly, assembly ovens, assembly induction, press and veneers) and body regions (upper extremity, lower extremity, neck, back, other). The “unexposed group” was randomly selected from the different categories as female, aged 30–40 of assembly working area in order to interpret the results with respect to this group.

The mean and standard deviation of the variable under study were calculated. The incidence rate of MSDs episodes together with the confidence intervals were analyzed. Excel 2010 and R 3.1.0 package software were used to analyze the data.

3. Results

The study sample was composed of 1368 individuals (63.45% males and 36.55% females) The percentage of male workers per working area was significantly higher than female for all groups. 50.3% of the workers were between 30 and 40 years old, and the remaining age intervals were constituted by the rest of the workers (Table 1).

According to the working area, 60.54% of the workers were in assembly (assembly, assembly ovens and assembly induction), 7.89% in enameling, 7.97% in development department and the rest of the areas had less than 5% of the workers (Table 1).

Analyzing the sick-leave during 2013, 103 episodes were registered in the plant. The distribution of sick-leave among men and women shows 61.16% of male cases, the incidence rate value was 0.075 Person per Year (PY). This incidence was higher for female (0.08 PY) than for male workers (0.072 PY) (Tables 1 and 2). The mean number of lost working days was 19.84. The mean age of the workers suffering from sick-leave episodes was of 43.3 years old. In Table 2 the incidence rate by age is shown for the manufacturing plant. The highest incidence value is found for men aged between 41 and 50 (0.088 PY) and for women aged between 30 and 40 (0.088 PY).

The incidence rates of MSDs among workers per year in terms of working area (Table 3) were higher in areas of presses and veneers for males (0.18 PY) and females (0.5 PY) and assembly for males (0.12 PY) and females (0.11 PY).

Studying the different pathologies divided by body region, it can be seen that the back is the region with the highest incidence in the

Table 1
Workers distribution per working area in 2013 by gender and age.

Working area	No of workers (%)		
	Total	Male	Female
Administration	23 (1.68%)	14 (1.02%)	9 (0.66%)
Stockage and supplies	64 (4.68%)	47 (3.44%)	17 (1.24%)
Quality	59 (4.31%)	44 (3.22%)	15 (1.1%)
Development	109 (7.97%)	77 (5.63%)	32 (2.34%)
Enameling	108 (7.89%)	84 (6.14%)	24 (1.75%)
Assembly	171 (12.5%)	91 (6.55%)	80 (5.85%)
Assembly: ovens	295 (21.57%)	177 (12.94%)	118 (8.63%)
Assembly: induction	362 (26.47%)	186 (13.6%)	176 (12.87%)
Planning	26 (1.9%)	15 (1.1%)	11 (0.8%)
Production	11 (0.8%)	7 (0.51%)	4 (0.29%)
Press and veneers	63 (4.61%)	61 (4.46%)	2 (0.15%)
Maintenance	34 (2.49%)	31 (2.27%)	3 (0.22%)
Other	43 (3.15%)	34 (2.49%)	9 (0.66%)
Age			
<30	186 (13.58%)	138 (10.08%)	48 (3.5%)
30–40	689 (50.36%)	370 (27.04%)	319 (23.32%)
41–50	376 (27.56%)	256 (18.79%)	120 (8.77%)
>50	117 (8.55%)	104 (7.6%)	13 (0.95%)
TOTAL	**1368 (100%)**	868 (63.45%)	500 (36.55%)