**Occupational and work-related disease underestimated and linked to temporary disability through Primary Health Care Services**


## ABSTRACT

**Background.** The objective of this study was to estimate possible occupational disease undeclared linked to the processes of temporary incapacity (TI) carried out by Public Health Service Primary Care.

**Methods.** Cross-sectional study conducted in Spanish adult population using periods of TI recorded in primary care during 2015. Rates of occupational disease were estimated using the García & Gadea study.

**Results.** 130,771 episodes of temporary incapacity were studied from 91,448 people and 56,092 were women (61.3%). The overall prevalence rate was 2,096 and was higher in women (2,504) than in men (1,665) ($p < 0.001$). It was estimated that 6,580 (7.2%) could be suffering from an occupational disease. Musculoskeletal complaints were the commonest, affecting 75,165 people (82.2%). For the Binary Logistic Regression, the dependent variable was the existence or lack of incapacity due to a musculoskeletal pathology. Age acts as a protective factor (adjusted OR = 0.978). The periods off work due to musculoskeletal complaints are lower in the first quarter of the year [OR> 1; $p < 0.001$].

**Conclusions.** 7.2% of the population was estimated to be off work due to an occupational disease. This estimate reflects the well-known under-reporting of occupational diseases which are dealt with by the Public Health System instead of specialized clinics.



**Keywords:** occupational disease, Primary Care, temporary incapacity, musculoskeletal pathology, occupational health

## INTRODUCTION

Both the World Health Organization (WHO) and the International Labour Organization (ILO) concur that an occupational disease is any illness that is contracted as a result of carrying out work (International Labour Organization, 2013; World Health Organization, 2001).

The health and safety of workers is a priority issue in the European Union (EU). Recommendation 2003/670/EC presents a European list of occupational diseases and stresses the need to improve the prevention of occupational diseases and to sensitize September health personnel to make a suitable diagnosis (European Commission, 2003). Most European countries have a similar list of occupational diseases as those in this Recommendation.

Although the structure of the international and European lists is very similar, the depth of detail varies from country to country. For example, Switzerland has a short list of illnesses, while Sweden has no list at all, although it does have specific insurance for occupational hazards; neither Holland nor Iceland have a list or insurance, since occupational diseases are dealt with in the same way as common illnesses. On the other hand, other countries, such as France, Italy, Portugal and Spain have a list of illnesses with obligatory criteria or criteria used to identify them (European Commission, 2013).

In the case of Spain, Occupational Disease is defined legally in the General Law of the Social Security, which established a system of a closed list of those illnesses which are considered occupational. This list is based on Commission Recommendation of 19

September 2003 concerning the European schedule of occupational disease (European Commission, 2003). The last modification was in 2015.

The under-reporting of occupational illnesses is a recognized problem. The study carried out by García & Gadea (2008) considered that around 2 million workers in Spain suffered from some illness or health problem related to work, which contrasts with the official line, according to which, in Spain, only around 26,000 occupational diseases were reported (Hernandez Martin, 2017).

As regards Primary Health Care, due to the lack of objective findings, it is tricky to differentiate when a patient goes to their doctor for a common illness or for an occupational disease. In addition, specific experience and knowledge are required to diagnose occupational diseases (Ikonen et al, 2013; Nicholson & Gration, 2017).

In this sense, the role of nursing for improving the quality of care has been discussed (Trail, 1976). In Australia, managers and directors valued very positively the role of work nurses in relation to health education and prevention (Strasser et al, 2009). Other authors have pointed that the interdisciplinary role of the work nurse (Roloff et al, 2016) makes it an adequate professional to detect these cases of occupational diseases in primary care settings.

According to the most conservative estimates, two out of every three occupational diseases are treated in public health centres and hospitals, instead of in mutual insurance companies or other authorized centres (Declos et al., 2012). The treatment of occupational or labour-related diseases by the National Health System not only does not comply with the legally-established rules, but it also represents an additional cost and

leads to a loss of information about the real number of occupational diseases, which therefore partly limits any possible prevention measures.

In Spain, different initiatives have been carried out on a regional level aimed at improving the coordination between Primary Care services and the relevant departments in Occupational Health, although their implementation has been patchy and incomplete (Hernandez Martin,Meneses Monroy,Martin Casas & Pacheco del Cerro, 2016).

For this reason, the aim of this study is to approach the problem through the data from temporary incapacity forms issued in Spanish population over a period of one year in the city's Primary Health Care centres, and to estimate the percentage of work-related illnesses attended by primary care public services instead of by specialized entities for occupational or work-related illnesses.

The geographical area studied (middle of Spain), at the time of the study, had a population of 6,385,298 inhabitants, 3,389,000 of which were currently in employment (National Statistics Institute of Spain, 2018)

## METHODS

### Study design. Population. Sample.

This prevalence study was carried out in 2015 on the Spanish general population (Autonomous Community of Madrid) using the episodes of temporary disability or temporary incapacity (TI) registered in the Primary Health Care section of the Public Health Service. The population consisted of subjects aged 16-65 (N = 4,363,315 people, 2,123,066 men and 2,240,249 women).

The registration period was from March 1, 2014 to February 28, 2015, inclusive, and all existing cases of TI which met the inclusion criteria during this time period were included; no sampling was carried out.

When selecting the sample, the following criteria were applied:

Inclusion Criteria: Subjects who are off work due to TI, authorized by their Primary Care doctor, during the study period, aged 16-65 and with diagnoses including musculoskeletal (injuries that affect tendons, nerves, muscles, joints, etc., such as back pain, osteoarthritis, tendonitis…), skin or respiratory pathologies, certain cancers, pathology of sense organs (sight and hearing), linked to non-traumatic pathologies that could be related with work and connected to an Occupational Disease.

- Exclusion Criteria: All individuals who were off work due to an illness not included in the list of occupational diseases (e.g. psychiatric, cardiovascular, digestive illnesses, etc.) were ruled out.

Thus, the final sample consisted of 91,448 subjects, and for a population of 4,363,315, a precision of 0.09% was obtained.

**Variables and measurements.**

a) Sociodemographic variables: age and gender.

b) Diagnosis of the TI episode: these were codified according to the International Classification of Primary Care (ICPC), which is part of the World Organization of National Colleges, Academies (WONCA). The diagnoses were sorted into seven categories or pathology groups: auditory, musculoskeletal, voice, neoplasms, dermatology, respiratory and ocular.

c) Time variables: date of the TI episode, duration of the sick leave (days), day of the week and day of the month for the start and end of each episode.

To make an estimate of the illnesses which have a possible work origin, the criteria established by García & Gadea (2008) were used, taking the prevalence estimates (per 100 workers) obtained in this study as a reference, based on the information from the National Labour Conditions Survey and the European Labour Force Survey (Eurofound, 2017).

**Ethical considerations**

All the information was provided by the Primary Care department of the Public Health Service and the confidentiality of the personal data was respected at all times. The study also complied with all the articles of the declaration of Helsinki on biomedical research and the research protocol was approved by the commission of the bioethical commission for primary care and the nearest major hospital.

**Statistical analysis.**

The statistical analysis was carried out using the SPSS V.22 and EPIDAT V.4.2 programs. The quantitative variables were presented as mean and standard deviations, and the qualitative variables as absolute and relative frequencies. The prevalence ratio (PR) between the different comparison groups was calculated.

The Kolmogorov-Smirnov test was used, with the Lilliefors correction, to test the goodness of fit to a normal distribution, together with Q-Q and P-P plots. The Levene test was used to test homoscedasticity.

The comparison of means was carried out using Student's T test (two independent groups) or ANOVA (three or more groups), together with the Bonferroni and Tukey posteriori (post-hoc) contrast test. Pearson's $Chi^2$ test was used for the comparison of prevalences.

Two multivariate logistic regression models have been carried out. Firstly, a binary logistic regression was calculated, using as outcome variable the presence or absence of incapacitating musculoskeletal pathology (qualitative dichotomous). Secondly, a multinomial logistic regression was estimated, re-coding the outcome variable as nominal polychotomy (musculoskeletal pathology, respiratory pathology and other diseases) for determining regression models of musculoskeletal pathology vs. other diseases and respiratory pathology vs. other conditions causing temporary disability. The Hosmer-Lemeshow (binary) and Pearson and Devianza (multinomial) goodness of fit tests were calculated; in addition, the adjusted OR values were calculated with a 95% CI.

The level of statistical significance for the contrast tests was set at an alpha error of below 5% and the confidence intervals were set with 95% confidence.

## RESULTS

### Description of the sample

A total of 91,448 people were in a situation of TI during the study period, of which 56,092 were women (61.3%). The total number of TI processes was 130,771, which represents an episode ratio per person of 1.43, which was higher in women (1.44) than in men (1.41) $p < 0.001$. The overall prevalence rate was 2,096 (cases per 100,000 people in the general population aged 16-65), which was again higher in women (2,504) than in men (1,665) ($p<0.001$). Table 1 shows the TI prevalence rates by gender, age and duration.

The mean age was 41.8 (10.7) years, which was lower in women than in men, with 41.5 and 42.4 years, respectively ($p<0.001$). By age group, the highest global prevalence of TI was found in the population aged 26 to 35, where the prevalence rate was 2,881 cases per 100,000 people, 3,692 for women and 2,029 cases for men ($p<0.001$).

The overall average duration was 24.1 (36) days, which was lower in men than in women, with 23.5 and 24.6, respectively ($p<0.001$). The highest prevalence rate of TI was found in the group lasting between 4-21 days, with a rate of 431.7 cases per 100,000 people.

**Diagnostics of the TI processes**

Tables 2 and 3 present the results according to the different pathology groups included in the study. Musculoskeletal complaints were the commonest clinical pathology, affecting 75,165 people (82.2%) out of the total study subjects, and leading to 107,485 TI processes, with an average duration of 26.1 days and with an overall prevalence rate of 1,723 (1,710-1,735) cases per 100,000 people in the general population aged 16-65. Diseases of the respiratory system were the second commonest group with 146 (142-151) cases per 100,000 people, and an average duration of 10.4 days. Finally, the pathology group of Neoplasms showed a prevalence rate of 20.1 (18.8-21.5) and the highest average duration, at 39.8 days.

As regards the prevalence ratios (PR) between men and women, it should be noted that the highest PR was found for voice pathologies 3.7 (34.4-4) $p<0.001$, in women; and neoplasms had a PR of 0.49 (0.4-0.56), with a higher prevalence in men (27.3) than in women (13.7) (cases per 100,000 people).

**Time Scale**

Figure 1 (supplementary material) shows the temporal evolution of TI processes for each day of the week and every month of the year. Figure 1.a shows the day of the week on which the episode of incapacity started and finished. It can be seen that in both lines (series) there is a constant fall from Monday to Sunday with the exception of Friday, when the highest number of incapacity periods finish (30.8%), even higher than Monday (23.9%) $p<0.05$. In addition, Figure 1.b. shows how frequency of the starting and finishing dates for periods of incapacity evolve according to the month of the year. It can be noted how from February to April there are the greatest variations between starting and finishing dates, with an inverse relationship. Thus, in February, the figure for episodes of incapacity starting and finishing reached 10% and 5.4%, respectively; in March, the opposite occurred, with the finishing and starting figures at 10.3% and 5.4%, respectively; finally in April, the figure for finishing dates for periods of incapacity was 7.5% compared with 3.4% for starting dates.

**Estimation of the rates of Occupational Diseases and multivariate analysis.**

The OD rates were estimated according to Garcia & Gadea (2008). Of the 91,448 people in a situation of IT, it was estimated that 6,580 (7.2%) could be suffering from an OD. In this way, we obtained an overall rate of PI of 1.5 (1.47-1.51) per 100,000 people in the general population aged 16-65, which was higher in women (1.86) than in men (1.13), with a PR=16 and $p<0.001$.

Table 4 shows the prevalence rate for OD in the general population for the seven pathology groups, divided by gender. The highest rates were obtained in the musculoskeletal pathology group with a prevalence rate of 92.7 (89.8-85.6), followed by the pathology of headache and ocular fatigue with 0.76 (0.52-1.06) cases per 100,000

people. As regards the prevalence ratios, it should be noted that the OD estimated for musculoskeletal pathology scored an RP of 2.2 ($p<0.001$), higher in women; in pulmonary diseases, RP=2 was also higher in women; and finally, in hypoacusia, the PR was 0.94, and higher in men.

Finally, two multivariate analyses were carried out, using regression techniques (Table 5, supplementary material) adjusted for age, gender, duration and time. For the binary logistic regression, the dependent variable was the presence or absence of TI due to a musculoskeletal pathology. It should be noted that age acts as a protective factor (adjusted OR=0.978) and episodes of mild musculoskeletal illness are less frequent in the first quarter of the year, since the three other quarters produced values of $OR>1$ and $p<0.001$. The gender variable was, however, not significant.

A multinomial logistic regression was also performed, where the dependent variable was made up of three categories: musculoskeletal pathology, respiratory pathology, and other pathologies (reference category). As can be seen in Table 5.b, in which the musculoskeletal pathology is compared with other pathologies, the results are very similar to the binary logistic regression (Table 5.a). Age, duration and time scale were shown as significant variables as well as gender, which was also significant here (OR=0.92 for men).

In contrast, when respiratory pathologies were compared with other pathologies (Table 5.b), it was seen that men obtained an even lower adjusted OR (0.8); the duration produced an adjusted OR=0.98 (0.978-0.982) $p<0.001$, and the situation with the time scale was the opposite of that for musculoskeletal pathology, with values of $OR<1$ obtained for the second, third and fourth quarters, compared to the first quarter.

## DISCUSSION

A prevalence study was carried out into the episodes of temporary disability (TI) recorded in the Primary Care network of the Public Health Service of Madrid (Spain), with the aim of estimating the prevalence of undiagnosed OD among the cases of temporary disability due to common illnesses.

This research confirms a well-known reality. The big number of diseases caused in workplace, must be attended in public health service better than a specialized entity. This situation causes extra costs to the public system and makes difficult to establish adequate prevention systems for these diseases in the workplace, since they are classified as common diseases (not linked to work).

Detection systems in primary care could adequately refer these patients for proper registration and treatment. As it has been recognized by the managers (2), nurses at work are the most suitable professionals to carry out this screening because they have received specific training.

The category of 'musculoskeletal pathology' was used to describe all musculoskeletal disorders (MSDs), and all the studies and official sources reviewed coincide that they have a high prevalence, both in Spain and in the rest of Europe (EUROGIP, 2016; Hernandez Martin, 2017; Moar, Alvarez Campana, Gonzalez & Ramos, 2015). These data agree with those obtained in our study where the musculoskeletal pathology was the most prevalent.

The second most prevalent episodes of TI, in our study, were those belonging to the 'respiratory pathology' group. This also concurs with findings in the literature we consulted, and it should be noted that occupational asthma is the most frequent respiratory

disease in industrialized countries (Quirce et al., 2016, Cullinan et al., 2017). It is estimated that 10-25% of all cases of bronchial asthma occur in the workplace (Dao & Bernstein, 2018; Kogevinas et al., 2007)

In addition, the group of neoplasms of possible origin in the workplace had the lowest prevalence, both in our study and in the other official sources consulted. In Spain, there were 23 diseases reported in 2015 as due to carcinogenic agents and 37 in 2016 (Hernandez Martin, 2017). Of these occupational cancers reported, men were the most affected, as they were in our results, too. Although the consequences of this group of pathologies are very serious, research into occupational cancer is still rare (Gonzalez Sanchez, 2011; Purdue, Hutchings, Rushton & Silverman, 2014) despite the data provided by the International Agency for Research on Cancer (IARC), which recognizes that there are around 150 physical or chemical agents which could possibly be carcinogenic present in workplaces (Lißner, Kuhl, Kauppinen & Uuksulainen,2014; Mattei et al, 2016 ). In our study, the prevalence rate of neoplasms was the lowest among all the illnesses studied, and these may not even be related to work**.**

As regards the date of starting and finishing the period of temporary disability according to the month of the year, most temporary disability periods start in March and October, while August, coinciding with the holiday period, has the least. These data also coincide with the official national report on occupational diseases (Hernandez Martin,2017). We have not found any study which shows a higher prevalence of starting periods of temporary disability on a certain day of the week, despite the fact that our analysis points to it being significantly higher on Mondays.

In terms of gender, the number of processes of temporary disability was greater in women than in men in all pathologies, except in ocular complaints and neoplasms, which coincided with other research (Hernandez Martin, 2017). However, unlike the results of other studies (Garcia Gomez & Castañeda Lopez, 2006; Gonzalez Gomez, 2011; Farioli et al, 2013) gender was not a significant variable in the binary logistic regression model. Although in women there is a higher prevalence and longer duration of TI, it is worth noting that this is not the case with musculoskeletal illnesses.

The two multivariate models obtained by logistic regression (binary and multinomial) showed that age plays a protective role in the prevalence of PI, a circumstance that disagrees with some of the publications which find that the greater the age, the longer the illness lasts (Manent Bistue, Ramada Rodilla & Serra Pujadas, 2016).

As Collins & O'Sullivan published in 2010, although the European Agency for Safety and Health at Work reported that women and older workers were more susceptible to musculoskeletal disorders, we found disagreements in the literature consulted on a causal relationship between these types of disorders and the variables gender and age (Collins & O'Sullivan, 2015; García Gómez, Castañeda López, Herrador Ortiz & Simon Soria, 2017)

The main limitation of the study is the lack of information about the subjects' workplace, since this variable is not systematically collected in the records of primary care services (Benavides et al, 2005 ; Cegolon, Lange & Mastrangelo, 2010; Ditolvi Vera, Benavides, Armengol & Barrionuevo-Rosas L, 2010). Therefore, if we do not know the occupation, it is impossible to establish links between episodes of disability and work relations. In addition, as it is a descriptive study, causality cannot be established between

the different variables. However, these limitations may be partly mitigated by the large sample size, although more experimental studies are needed in small populations to confirm some of our findings. In these studies, alerting systems based on sentinel cases could be used, which have been shown to be effective in helping primary care teams detect occupational diseases more easily (Hernández Martín et al., 2016; Bakusic et al., 2017).

To conclude, it should be highlighted that this research reveals a situation which is well-known but rarely studied, i.e. that the high percentage of occupational diseases which are treated by the public health system should be treated in specialized centres, which would make their prevention and follow-up easier. In our case, it was estimated that 7.2% of our population was in a situation of temporary disability due to some kind of illness. For this reason, primary care teams should be provided with the correct training and tools to be able to refer cases of suspected occupational diseases for a proper follow-up.

**FUNDING**

None

**CONFLICT OF INTEREST**

None

**ETHICAL APPOROVAL**

The Ethical Committee of Clinical Research of the Gregorio Marañon University Hospital of Madrid approved the research protocol of the study with code ENF001PROF.

**KEYPOINTS**

- Under-reporting of occupational diseases in primary care is greater than 7% in active population.
- The musculoskeletal disorders are the first cause of sick leave in population of Madrid and the age was a factor of protection in the occurrence of disease.
- This study reveals a situation which is well-known but rarely studied.
- Primary care should have the correct training and tools to detect all cases of suspected occupational diseases for a proper follow-up.
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