

## PREVALENCE OF RHEUMATIC OCCUPATIONAL DISEASES – PROUD STUDY

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**Abstract**

**Introduction:** Work related musculoskeletal diseases (WRMSDs) have a huge social and economic impact being a public health problem.

**Objectives:** To determine the prevalence of WRMSDs in Portuguese active workers.

**Methods:** A questionnaire was sent by regular mail to the occupational physician of 822 large dimension companies in Portugal (over 250 employees). This questionnaire was addressed to the physician and contemplated data on file from the occupational medical doctor of clinically relevant WRMSDs (rather than addressing workers complaints). A reply form and a telephone reminder were used to assure a higher number of respondents.

**Results:** Of the selected 822 companies, 515 responded (response rate of 62.3%) involving a total population of 410 496 workers.

The prevalence of clinically relevant WRMSD was of 5.9% (24 269 cases). The more prevalent WRMSD were back pain with a prevalence of low back pain of 2.27% (n=9310, 38.4% of total WRMSD). Dorsal pain 0.82% (n=3379, 13.9% of total WRMSDs) and cervical pain 1.13% (n=4651, 19.2% of total WRMSD). Back pain accounts for 4.22% (n=17340) and a total of 74.9% of all WRMSDs.

Regarding the upper limb we found a prevalence of 1.61% (n=6493). From this total, shoulder tendonitis was 0.59% (n=2398, 9.9% of total WRMSDs), carpal tunnel syndrome 0.29% (n=1170, 4.8% of total WRMSDs), elbow tendonitis 0.29% (n=1202, 5% of total WRMSDs) and hand tendonitis 0.44% (n=1823, 7.5% of total WRMSDs). A lower prevalence

was observed in the lower limbs with lower limb tendonitis of 0.08% (n=336, 0.01% of total WRMSDs).

**Discussion/Conclusion:** Our work was representative of 11% of the working Portuguese population. We have found a prevalence of clinically relevant WRMSD of 5.9%. If we extrapolate for the total of the working population we would have 220 467 workers with WRMSDs.

Our data are in conflict with national social security services regarding these diseases with much lower reported diseases that proves the inefficacy of the national reporting system.

There are clear differences in our data when compared with the literature. We found a higher number of back pain, and in proportion of cervical pain, and lower numbers of upper and lower limb WRMSDs. In the upper limb we found a higher level of hand tendonitis and a decrease of elbow tendonitis and carpal tunnel syndrome.

This work was a first effort to characterize WRMSDs in Portugal. Due to the study design we believe that further studies aimed for higher risk populations should be performed.

**Keywords:** Occupational Health; Work Related Musculoskeletal Diseases (WRMSDs); Tendonitis; Back Pain.

**Introduction**

Currently, work related musculoskeletal diseases (WRMSDs) are a worldwide problem, constituting a public health issue with remarkable social and economic impact.

As stated before, WRMSDs have a worldwide economic impact. For example, in 2002, in Canada, the costs were over 16 billion dollars in medical expenses and reduction in incomes and productivity, numbers surpassed only by cardiovascular diseases. The increase of figures from 1991 to 2001 was progressive, with more than 500,000 cases reported

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Trabalho realizado no Âmbito do Plano Nacional de Luta Contra as Doenças Reumáticas da Direcção Geral de Saúde

from 1996 to 2001 (representing a 2% increase)<sup>1,2</sup>. In 1994, 332,000 WRMSDs were reported in the United States, which represents 65% of all occupational diseases. The associated costs were of 2.1 billion dollars in wage costs and of 90 millions in indirect costs per year<sup>3</sup>. In United Kingdom, occupational rheumatic diseases are the most frequent in the workplace. In 1995, 1 million workers believed that the muscle skeletal diseases had been caused or aggravated because of the working conditions<sup>4</sup>. In 2003, the WRMSDs in France represented 2/3 of the occupational diseases; the incidence rate was higher than 1 per 1,000 workers<sup>5</sup>.

WRMSDs cover a wide range of inflammatory and degenerative conditions affecting muscles, tendons, nerves, joints and vessels. These diseases include clinical syndromes, such as tendinopathies and related conditions (tendonitis, tenosynovitis, epicondylitis and bursitis), compression of nerves (Carpal tunnel syndrome, sciatica) and osteoarthritis. These also include myalgia, low back pain and other regional painful syndromes with an unknown aetiology.

The body regions more frequently affected are the lumbar area, cervical spine, shoulders, elbows, hands and also, with a lower incidence, the lower limbs.

Incidence and prevalence indicators of the muscle skeletal injuries present discrepancies among different geographic areas. This fact seems to be related with the definition given by each country to what is legally considered a professional disease and, within this one, what is understood by occupational muscle skeletal disorders. Therefore, there are several classification of occupational disorders. This fact does not allow to accurately assessing the real dimension of the problem and it makes the evaluation of the impact on the active working population harder to achieve.

Effectively, workers' compensation statistics are probably showing only one part of the occupational muscle skeletal injuries, not only because its clinical definition is not perfectly clear (i.e. of what is considered an acceptable complaint), but also because other mechanisms may be involved and may have an impact on the number of disorders registered (e.g. high turnover or the "healthy worker effect").

In Portugal there are few data on the prevalence of occupational muscle skeletal disorders, as the responsible organizations, namely Social Security and insurance institutions, do not treat them system-

atically. The pathology is frequently unidentified and included in a wider undifferentiated group.

Social Security data points out to an increase in certified occupational rheumatic diseases without incapacity that includes tendonitis, tenosynovitis and chronic myotendosynovitis, humeroscapular periartthritis among others. From 296 cases in 2003, 662 in 2004 we achieved 1,274 in 2005 and 1,103 in 2006.

If we consider the certified occupational diseases with occupational incapacity within the same period, we can find 321 in 2003, 751 in 2004, 201 in 2005 and 164 in 2006. This evidences that, unlike in other countries, there are no sustained results. These are extremely variable in each year, with an increase of around 100% from 2003 to 2005 in the diseases without incapacity followed by a reduction in 2006. Even less understandable was the increase of diseases with incapacity in 2003 and 2004 (increase of 2.3 folds) followed by a reduction in 2005 and 2006 (to values 4 to 5 folds lower to the ones from 2004).

A better strategy to assess WRMSDs in Portugal would be the use of a method similar to the one used in the United Kingdom, where there are two different methods to report WRMSDs: one is focused on the rheumatologist (MOSS musculoskeletal occupational surveillance scheme) and the other one on the occupational physician (OPRA – occupational physicians reporting activity).

Although there are two different methods of data collecting we still can find some discrepancies. The annual mean/million rate of this diseases reported by the occupational physicians was of 1,643 and rheumatologists reported an annual mean rate/million of 94 mean rate/million. This difference may demonstrate that only a minority of patients is seen by a rheumatologist. Many are assessed by primary health care providers or do not seek for any medical help apart from the occupational physician<sup>6</sup>.

Several active population self-questionnaires have reported a prevalence of upper limbs symptoms of approximately 20 to 30%<sup>5</sup>.

Low back pain and wrist injuries have received a major attention in literature because of the high prevalence and the high costs associated to injuries affecting these body segments<sup>7-16</sup>.

Cervical pain prevalence has been increasing in the last years. This contributes to a higher demand for health services and resources and it also has an impact in work absenteeism and reduced working

capacity<sup>17</sup>. In 1998, in United Kingdom, the cost associated to low back pain was calculated in 12 million pounds. From these costs the higher percentage was due to lower productivity and health costs.

This concurs to the wide increase in subsidies due to disease and disability associated to low back pain. If we consider that only low back pain is a huge burden to society we can see however that this disease is just a fraction of the total burden of WRMSDs<sup>18</sup>.

In recent years there is an increase of work-associated injuries involving the shoulder joint that are currently the second site most frequent for injury, because of that there is a growing need to concentrate efforts to conduct epidemiologic studies, as well as of developing ergonomic and correspondent validation of ergonomic interventions in this specific area<sup>19-22</sup>.

This work has the purpose of assessing the Portuguese prevalence of occupational muscle skeletal disorders within the active population in general and by economic activity sector and also trying to understand the best surveillance strategy for these injuries.

## Material and Methods

A questionnaire was sent to the occupational physician from 822 large dimension companies in Portugal (with more than 250 collaborators), in accordance to the data supplied by the Ministry of Work. This instrument was elaborated for collecting data regarding the muscle skeletal injuries diagnosed by a specialist: cervical pain, shoulder tendonitis, wrist/hand tendonitis, carpal tunnel syndrome, thoracic pain, low back pain and lower limbs tendonitis – and included questions about demographic characteristics of the company workers, the sector of activity and complementary information concerning the diagnosis and prevention measures. The clinical questionnaire referred to clinically significant diagnoses, which required the occupational physician's intervention rather than complaints self-referred by the patient. The patient was maintained anonymous and only the global numbers of each company was considered.

The questionnaire was sent by the Direção Geral da Saúde (Portuguese Health Authority) by regular mail at the attention of the occupational physician of the selected companies. A one-month

deadline was established for the reply. The return of the questionnaire was also made by regular mail through a RSF envelope. This last stage took place between June and July 2006.

After the pre-established deadline, a contact by telephone was conducted to the companies that did not reply and the questionnaire was sent again, this time by e-mail. The data collection process was concluded in November 2006.

The statistical evaluation was conducted with the statistic analysis software SPSS, version 14.0®. Taking into consideration the information concerning the number of injuries diagnosed, the demographic characteristics and the type of activity, a descriptive statistical analysis was obtained as well as a Spearman bivariate correlation statistical analysis. A Kruskal-Wallis test for the analysis of the multiple and confirmatory comparison of the bivariate analysis was applied assuming the relevant results of the previous treatment.

## Results

From the 822 selected companies 515 replied to the inquiry. 3 companies were excluded because they did not fulfil the eligibility criteria. This resulted in a response rate of 62.3%. This corresponds to a total amount of 410,496 workers.

The relative frequency of responses was higher among the "Services" companies (34.8%), followed by "Other Industry" (25.2%) (Table I).

Among the studied companies, a balance in the distribution of the mean number of workers per sex, activity sector and mean age was observed (Table II).

From the 515 companies that replied, we had a total amount of 410,496 workers, which represents 11.1% of the Portuguese working population and 0.3% of the Portuguese companies. If we take the micro-enterprises (less than 9 workers) out of these figures, we observe that the universe of workers reaches 19.8% of the Portuguese working population, which corresponds to 11.1% of all companies in these conditions.

There is a predominance of man in our group with a mean age of 39,5 years. Workers are mostly from the production activity sector.

When we analysis by activity sector, it has been observed that the prevalence of male workers occurs mainly in the auto Industry, construction industry, Fishing and Mining. The production areas

**Table I. Absolute and relative frequency of the number of companies per economic activity sector**

	Company		Workers	
	N	%	N	%
Automotive Industry	29	5,66	16994	4,14
Assembling of electric or electronic components industry	14	2,73	10861	2,65
Building Industry	34	6,64	20799	5,07
Machinery Industry	32	6,25	12228	2,98
Fishing	1	0,20	596	0,15
Mining	1	0,20	821	0,2
Other Industry	129	25,20	64745	15,77
Services Company	178	34,77	224979	54,80
Others	89	17,38	52726	12,84
Total	507	99,02	404749	98,6
Did not reply	5	0,98	5747	1,4

**Table II. Description of the parameters of the demographic characteristics main trend**

Nr. of Workers	N	Mean	sd	Median	Min.	Max.
Sex						
Female	498	425	1524	165	1	22760
Male	497	3990,4	7060,8	233	3	9647
Sector						
Administrative	462	1440,4	402,9	60,5	2	5749
Production	408	478,5	642,4	294	3	5905
Age						
More than 45 years old	486	221,9	436,3	123	1	5605
Female mean	461	37,9	5,1	38	18	55
Male mean	462	39,5	5,7	40	18,5	60

with mainly female labour are the Electric and Electronic Components Industry and Services Companies (Table III).

If we consider the distribution of workers per age over 45 years, in relation to sex and activity sector we found that the Fishing and Mining sectors present workers with mean age higher than 49 and 42 years, respectively. All workers present a median value, for both sexes, higher than 35 years old. In other sectors of activity we found a relevant higher age (over 45 years) in construction industry and service industry (Table IV).

Globally, the higher prevalence of muscle skeletal injuries was reported for the three segments of the vertebral spine and shoulder.

The most prevalent injury was low back pain ( $X=18.2$ ), followed by cervical pain ( $X=9.1$ ), dorsal pain ( $X=6.6$ ) and shoulder tendonitis ( $X=4.7$ ) (Table V).

Regarding the total amount of workers involved in the study, it may be observed that the number of clinically relevant injuries was of 5.9% (24 269 cases). From these, 4.22% (17,340 cases) resulted from diagnoses of back pain, 1,13% (4,651 cases) of cervical pain; 0.82% (3,379 cases) of dorsal pain and 2.27% (9,310 cases) of low back pain. The other identified injuries involved the upper limb, in which the number of cases was higher for the shoulder tendonitis – 0.6%.

Analyzing the distribution of the injuries prevalence by activity sectors, we have observed that, in the Construction Industry, Machinery and “Other Industry”, low back pain prevail (2.85%, 2,92%, 3,66%, respectively), and that in the Automobile, Electric and Electronic Components Assembly Industries, the upper limbs injuries are the most prevalent ones (2.43%, 2.16% and 1.5%, respectively),

**Table III. Distribution of workers per gender, regarding the activity sector**

	Gender					
	Male			Female		
	X	Sd	Med	X	Sd	Med
Automotive Industry	433,93	495,02	312	152,07	175,05	62
Assembling of electric or electronic components industry	311,71	318,59	311,71	464,07	367,75	373,50
Building Industry	553,65	575,82	403,00	58,09	42,00	42,00
Machinery Industry	315,25	239,84	256,00	66,88	46,00	60,19
Fishing	473,00		473,00	123,00		123,00
Mining	756,00		756,00	65,00		65,00
Other Industry	263,77	454,13	197,00	246,03	431,35	162,00
Services Company	522,56	1048,72	218,00	811,77	2526,10	263,00
Others	322,76	342,20	226,50	290,34	352,74	193,50

**Table IV. Characterization of the mean age and number of workers with more than 45 years old, by activity sector**

Activity Sector	Mean Age						> 45 years old (n)		
	Female			Male					
	x	Sd	Med	X	Sd	Med	x	Sd	Med
Automotive Industry	35,72	3,57	36,00	35,95	4,29	35,00	95,66	85,48	75,00
Assembling of electric or electronic components industry	36,56	5,61	38,00	36,56	5,05	35,00	106,29	88,53	99,50
Building Industry	36,71	4,68	36,34	41,17	2,55	41,00	244,55	282,37	153,00
Machinery Industry	38,51	4,54	39,00	39,32	4,95	40,00	133,16	142,62	98,50
Fishing	49,00		49,00	49,00		49,00	450,00		450,00
Mining	42,00		42,00	41,00		41,00	281,00		281,00
Other Industry	39,15	4,56	39,00	40,77	4,75	41,00	180,34	453,19	117,50
Services Company	37,45	5,38	38,39	38,37	6,45	40,00	309,28	594,03	137,00
Others	38,12	5,23	38,50	40,60	6,19	40,95	209,44	232,03	133,00

especialmente hombro y tendinitis de la muñeca. Las diferencias de prevalencia fueron debidas, muy probablemente, a la especificidad de la naturaleza de las condiciones de trabajo.

En los sectores de Minería y Pesca encontramos un nivel muy alto de enfermedades pero debido a los pequeños números de empresas evaluadas no podemos extrapolar para el resto de este sector. Sin embargo estos números deben ser vistos como un indicador de severidad.

Estos hechos han sido confirmados por los resultados del análisis de comparación múltiple, en el cual fue posible observar diferencias estadísticas significativas entre los sectores de actividad en el número de casos diagnosticados de, tendinitis de hombro, síndrome del túnel del carpo, tendinitis de codo y tendinitis de la muñeca (Tabla VI).

Junto con los valores absolutos de lesiones musculoesqueléticas, el análisis de frecuencia relativa de lesiones por sector de actividad también se realizó en relación con el número total de operadores en cada sector (Tabla VII). Encontramos que los valores relativos mantuvieron la misma tendencia observada para el análisis de los valores absolutos de las lesiones, es decir, la predominancia de dolor de espalda baja, seguido por otras lesiones en la columna vertebral. La Industria de Ensamblaje de Componentes Eléctricos y Electrónicos y Servicios presentaron valores relativos de lesiones musculoesqueléticas relacionadas con el trabajo.

El sexo está positivamente correlacionado con todas las lesiones (con la excepción de tendinitis de miembros inferiores). En los hombres, hay correlaciones solo con la tendinitis de codo y tendinitis de miembros inferiores (Tabla VIII).

**Table V. Description of central trend parameters of the injuries studied, concerning the number of evaluated companies**

	<b>N</b>	<b>Mean</b>	<b>Sd</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>
Cervicodynia	511	9,1	24,4	2	0	400
Shoulder tendinitis	512	4,7	27,9	1	0	600
Carpal tunnel syndrome	512	2,3	5,8	0	0	70
Elbow tendinitis	511	2,4	5,8	0	0	60
Hand and fist tendinitis	512	3,6	9,3	1	0	110
Dorsal pain	510	6,6	14,2	2	0	200
Low back pain	512	18,2	40,4	2	0	500
Lower limb tendinitis	512	0,7	2,7	0	0	36

**Table VI. Results of the multiple comparison analysis between activity sectors by type of analyzed injury**

	<b>Cervicodynia</b>	<b>Shoulder tendinitis</b>	<b>Carpal tunnel syndrome</b>	<b>Elbow tendinitis</b>	<b>Hand and fist tendinitis</b>	<b>Dorsal pain</b>	<b>Low back pain</b>	<b>Lower limb tendinitis</b>
QK	43,53	46,86	44,72	34,08	16,69	15,29	15,39	12,62
Df	8	8	8	8	8	8	8	8
pp	0,000	0,000	0,000	0,000	0,034	0,054	0,052	0,125

**Table VII. Relative frequency of skeletal muscle injuries in relation with activity sector**

<b>%</b>	<b>A.I.</b>	<b>E.E.I.</b>	<b>B.</b>	<b>M.I.</b>	<b>M.</b>	<b>O.I.</b>	<b>S.C.</b>	<b>OTH.</b>
Cerv.	2,10±1,77	1,31±2,38	1,13±2,20	1,39±2,00	11,81	2,54±3,91	1,40±3,00	1,70±3,28
S.T.	0,76±1,95	2,04±3,72	0,40±1,20	0,63±1,10	3,05	1,09±2,52	0,41±1,37	0,76±1,88
CTS	0,47±1,13	1,00±1,23	0,25±0,72	0,34±0,57	0,12	0,81±1,68	0,29±0,65	0,35±1,19
E.T.	0,46±1,09	0,83±1,09	0,33±0,72	0,41±0,46	0,97	0,69±1,57	0,27±0,86	0,34±0,73
H.F.T.	0,75±1,82	1,39±2,16	0,47±1,47	1,00±2,28	0,97	1,00±1,99	0,38±0,88	0,77±2,22
Dors.	1,36±2,56	0,84±0,97	1,09±1,69	0,78±0,98	4,02	2,08±3,05	1,44±2,32	1,34±2,71
L.B.P.	3,61±5,78	1,61±2,45	3,91±5,94	3,71±6,08	36,18	4,74±6,29	2,82±4,95	3,46±5,73
L.L.T.	0,97±5,78	0,29±0,10	0,26±0,80	0,04±0,11	2,31	0,13±0,40	0,48±0,17	0,97±0,30

A.I.– Automotive Industry; E.E.I.– Assembling of electric or electronic components industry; B.I.– Building Industry; M.I.– Machinery Industry; M.– Mining; O.I.– Other Industry; S.C.– Service Company; OTH.– Others Cerv.– Cervicodynia; S.T.– Shoulder Tendinitis; CTS– Carpal tunnel syndrome; E.T.– Elbow Tendinitis; H.F.T.– Hand/Fist Tendinitis; Dors.– Dorsal Pain; L.B.P.– Low Back Pain; L.L.T.– Lower Limb Tendinitis

When performing the same analysis per activity sector, we found positive correlations between the Administrative Sector and the shoulder tendonitis. In the Production Sector, we found positive correlations in all pathologies analyzed.

The results confirm the ones previously obtained for the characterization of the companies in which there is a balanced distribution of workers per sex and a predominance of effective workers in the production sector. It must also be mentioned that 26% of the workers have more than 45 years

old (Table IX).

Regarding the distribution of workers per sex, we observe that the automobile, construction and machinery industries active population is mostly male, contrasting to the services companies where there are mostly female effective workers.

As for the organization of sectors, most workers are integrated in the production sector, independently of the company's economic activity sector.

Finally, the sectors of Construction, Machinery Industry, Services Companies and Other Activity

Table VIII. Correlative analysis between demographic variables and the number of injuries diagnosed

		Cervicodynia	Shoulder tendinitis	Carpal tunnel syndrome	Elbow tendinitis	Hand and fist tendinitis	Dorsal pain	Low back pain	Lower limb tendinitis
Nr. of female workers	Correlation Coefficient	0,09	0,15	0,24	0,12	0,20	0,11	0,09	0,06
	Sig. (2-tailed)	0,05	0,00	0,00	0,01	0,00	0,02	0,04	0,16
	N	497	498	498	497	498	496	498	498
Nr. of male workers	Correlation Coefficient	0,05	0,07	-0,07	0,11	-0,03	0,03	0,06	0,13
	Sig. (2-tailed)	0,31	0,10	0,14	0,01	0,56	0,51	0,15	0,00
	N	496	497	497	496	497	495	497	497
Nr. of workers from the Administrative Sector	Correlation Coefficient	0,07	0,10	0,03	0,08	0,01	0,01	0,03	0,09
	Sig. (2-tailed)	0,13	0,04	0,53	0,09	0,85	0,90	0,47	0,06
	N	461	462	462	461	462	460	462	462
Nr. of workers from the Production Sector	Correlation Coefficient	0,13	0,19	0,17	0,26	0,21	0,13	0,16	0,19
	Sig. (2-tailed)	0,01	0,00	0,00	0,00	0,00	0,01	0,00	0,00
	N	407	408	408	407	408	407	408	408
Nr. of workers with more than 45 years old	Correlation Coefficient	0,18	0,17	0,13	0,14	0,08	0,13	0,18	0,20
	Sig. (2-tailed)	0,00	0,00	0,00	0,00	0,08	0,00	0,00	0,00
	N	485	486	486	485	486	484	486	486
Mean age of the female workers	Correlation Coefficient	0,11	0,05	0,05	0,04	-0,03	0,05	0,06	0,12
	Sig. (2-tailed)	0,02	0,27	0,31	0,35	0,47	0,30	0,21	0,01
	N	461	461	461	460	461	459	461	461
Mean age of the male workers	Correlation Coefficient	0,13	0,02	0,07	-0,01	-0,04	0,07	0,11	0,09
	Sig. (2-tailed)	0,01	0,60	0,14	0,78	0,44	0,12	0,02	0,05
	N	462	462	462	461	462	460	462	462

**Table IX. Characterization of the companies' workers by gender, sector and older than 45 years old (absolute and relative frequency)**

	N	%
Sex		
Female	212012	51,56
Male	198484	48,35
Sector		
Administrative	66701	16,25
Production	107841	47,56
Age > 45 years old	107841	26,27

Sector present a marked frequency of workers with more than 45 years old (>30%) (Table X).

Considering the total amount of the workers' sample, we identified that the most prevalent pathologies were low back pain and cervical pain (Ta-

ble XI).

In an identical analysis by the activity sector, it has been observed that, along with these pathologies, others deserve to be mentioned, such as shoulder tendonitis (automobile industry, electric and electronic components assembly industry, mining and other sector of activity), hand tendonitis (auto industry, machinery industry and mining), lower limb tendonitis (mining) and dorsal pain (other activity sector) (Table XII).

## Discussion

In our study the presence of clinically relevant WRMSDs is of 5.9% in a population of 410,496, which is thought to be representative of the Portuguese business sector, i.e. 24,269 workers have a muscle skeletal pathology related to work consi-

**Table X. Characterization of the companies' workers by gender, sector and older than 45 years old (absolute and relative frequency), in relation with activity sector.**

	Sex		Sector		Age higher than 45 y.o. N(%)
	Female N(%) 222012 (51,6)	Male N(%) 198484 (48,4)	Administrative N(%) 66701 (16,3)	Production N(%) 195225 (47,6)	
AI	4410 (26%)	12584 (74%)	3086 (18,2)	13185 (77,6%)	2274 (26,3)
E.E.I.	6497 (59,1%)	4364 (40,2%)	1996 (4,4%)	8419 (77,5%)	1488 (13,7)
B	(1975 (9,5%))	18824 (90,5%)	3109 (14,9%)	16517 (79,4%)	8070 (38,8%)
MI	2140 (17,5%)	10088 (82,5%)	1943 (15,9%)	10032 (82%)	4261 (34,8%)
SC	137189 (61%)	87790 (39%)	30113 (13,4%)	69406 (30,9%)	49484 (30%)
OAS	56215 (47,9%)	61256 (52,2%)	25432 (21,7%)	71533 (60,9%)	40525 (34,5%)

A.I.– Automotive Industry; E.E.I.– Assembling of electric or electronic components industry; B.I.– Building Industry; M.I.– Machinery Industry; S.C.– Service Companies; OAS– Other Activity Sectors

**Table XI. Characterization of the pathologies diagnosed in the replying companies (absolute and relative frequency)**

	Absolute Frequency	Relative Frequency	WRMSIs Percentage
Cervicodynia	4651	1,13	19,2
Shoulder Tendinitis	2398	0,59	9,9
Carpal tunnel syndrome	1170	0,29	4,8
Elbow Tendinitis	1202	0,29	5
Hand/Fist Tendinitis	1823	0,44	7,5
Dorsal Pain	3379	0,82	13,9
Low Back Pain	9310	2,27	38,4
Lower Limb Tendinitis	336	0,08	0,01
Total	24269	5,91	



**Table XII. Characterization of the pathologies diagnosed in the companies that responded to the questionnaire, by activity sector (absolute and relative frequency)**

	<b>AI</b>	<b>EEI</b>	<b>B</b>	<b>MI</b>	<b>SC</b>	<b>OAS</b>
Cervicodynia	1.41	0.72	0.91	1.07	0.86	1.63
Shoulder tendinitis	10.3	1.29	0.35	0.54	0.46	0.74
Carpal tunnel syndrome	0.37	0.81	0.14	0.29	0.16	0.50
Shoulder tendinitis	0.86	0.52	0.22	0.42	0.16	0.44
Hand tendinitis	1.40	0.87	0.22	1.00	0.20	0.73
Dorsal pain	0.61	0.66	0.73	0.62	0.60	1.35
Low back pain	2.26	1.10	2.85	2.92	1.64	3.0
Lower limb tendinitis	0.06	0.0	0.18	0.01	0.05	0.11

dered to be clinically relevant by the occupational physician.

The good response rate (62.3%) is probably related, on the one hand, with the fact that the questionnaire was sent in the scope of a relevant national entity within the clinical practice and, on the other hand, with the simplicity and reduced size of the questionnaire. This simplification had improved the response rate but limited some of the conclusions intended. Nevertheless, the balance between simplicity and relevance seemed to have been achieved.

The request for a clinically relevant diagnosis to the occupational physician and not just a complaint, and the fact that the occupational physician was the one that made the diagnosis is considered to be a strength of this work. The absence of credible and large dimension national data makes this work a simple first approach of the WRMSDs impact in Portugal.

With these results, we point out the predominance of back pain, with the prevalence for low back pain of 2.27% ( $n = 9,310$ , 38.4% of the WRMSDs), dorsal pain of 0.82% ( $n = 3,379$ , 13.9% of the WRMSDs) and cervical pain of 1.13% ( $n = 4,651$ , 19.2% of the WRMSDs). Back pain corresponds to 4.22% ( $n = 17,340$ ) and to 74.9% of all WRMSDs identified.

Upper limb injury showed a prevalence of 1.61%, corresponding to 6,493 collaborators with upper limb injuries, divided in shoulder tendinopathy 0.59% ( $n = 2,398$ , 9.9% of the WRMSDs), carpal tunnel syndrome 0.29% ( $n = 1,170$ , 4.8% of the WRMSDs), elbow tendinopathy 0.29% ( $n = 1,202$ , 5% of the WRMSDs) and hand tendinopathy 0.44% ( $n = 1,823$ , 7.5% of the WRMSDs). We had a much lower value for lower limb tendinopathy, with

0.08% ( $n = 336$ , 0.01% of the WRMSDs).

From the literature, we know that the muscle skeletal disorders of the upper limbs and neck are a common cause of morbidity and, in some professional groups, represent an important contribution to the loss of time derived from work<sup>23-27</sup>.

Community-based inquiries have stated a prevalence of 4-20% in specific places for neck pain and upper limb, with prevalence throughout life as high as 60%<sup>28-30</sup>.

In another study involving inquiry directed to the population ( $n = 5,133$ ), it was assessed a pain prevalence in the last month of 50.5% (2,539/5,032) of the ones replied. The prevalence of pain in each one of the areas was as follows: neck, 24.0%; shoulder (s), 31.7%; elbow (s), 13.9%; forearm(s), 14.9%; hand(s), 19.2%.

The prevalence of pain associated to work was around 44%<sup>31</sup>.

In OPRA (Occupational Physicians Reporting Activity) study, from 1996 to 1999, 800 occupational physicians observed that 49.1% of the reported cases were of WRMSDs, with an annual incidence of 20.6 per 100,000 workers, in a total amount of 21,480 cases preferentially distributed by the upper limb (37.5% of the cases), lower spine and trunk (27.9%), elbow (9.5%), cervical and thoracic spine (7.7%), shoulder (7.4%) and, in a lower percentage, hip and knee (4.8%)<sup>32</sup>.

In the subsequent registry, OPRA demonstrated that 47% of the reported occupational diseases were WRMSDs, preferentially distributed by the upper limbs (54%), vertebral spine (35%), lower limbs (6%) and other diagnosis (4%). In the United Kingdom, 12% of the working population has access to an occupational physician.

After 6 years, this registry reached a total amount

of 66.000 cases of occupational diseases from these 48% WRMSDs. In another registry of rheumatic occupational diseases conducted by rheumatologists (MOSS - Musculoskeletal Occupational Surveillance Scheme) in the first 3 years, revealed 8,442 new cases reaching hand/wrist (44%), shoulder (12%), elbow (10%), neck/spine (25%), hip/knee (3%) and foot/ankle (4%) in most of the cases attributable to repetitive traumas and not single trauma<sup>33</sup>.

In other countries, the WRMSDs prevalence data are similar. In one Canadian study, 1.3 million occupational diseases were found. Approximately 50% were WRMSDs. 63.3% of these were upper limb diseases and 36% were in the spine and lower limbs. The most affected areas were wrist/hand (39%), shoulder (29%) and elbow (27%)<sup>2</sup>.

In Netherlands, on the other hand, the prevalence of low back pain is of 44%, cervical pain is of 31%, shoulder pain is of 30%, elbow pain 11% and wrist pain of 18%.

It is known that, given the prevalence, the multiple location in these cases is frequent and, and patients who report pain in more than one location, may vary from 37% to 66%. In a study Ijzelenberg W, et confirmed that patients with low back pain had a higher possibility (68%) of having other co-morbidities and that these are associated to the intensity of low back pain reported<sup>34</sup>.

In a population based study in a region of France that corresponded to 5% of the country workers, there was an upper limb WRMSDs prevalence rate of 58% in women and 53% in men throughout the 12 previous months and 35% of women and 27% of men reported symptoms during the last week. The clinically diagnosed injuries were of 11% in men and 15% in women. The most prevalent situations were the rotator cuff syndrome (6.8% of men and 9% of women), followed by carpal tunnel syndrome (2.3%/4%) and epicondylitis (2.2%/2.7%)<sup>5</sup>.

Over the last years, the carpal tunnel syndrome (CTS) has become a very relevant disease within WRMSDs. For example, in the United States, in 1993, it represented 13% of all WRMSDs and it was estimated that 50% of all CTS cases had an occupational origin. In this study, there are in Portugal obvious differences from what was observed in the international literature. On one hand, there is a larger supremacy of the back pain and, relatively, an important cervical pain value; on the other hand, there is a clear decrease in the values of upper and

lower limbs WRMSDs.

Furthermore, within upper limb WRMSDs, a higher value for hand tendinopathy and a reduced value of the elbow tendinopathies and of the carpal tunnel syndrome were observed.

The reason for this fact may not be clear. As this is the first transversal study on the prevalence of WRMSDs within the large Portuguese companies, these results may demonstrate only that the Portuguese business sector, of its working population and the anthropometric, social, and labour training characteristics, result in relevant clinical pathologies different from the international literature. Another explanation is that the clinical relevance given by Portuguese occupational physicians may be different from the one given by physicians from other countries or by patients themselves in international studies.

Finally, and given the simplicity of this questionnaire, these results may have several design or response biases that were not anticipated by its authors.

The global data found is clearly contrary to the social security data, in what concerns to the reported occupational diseases and, therefore, corroborate the deficit in the national registry system of these diseases.

If we consider that our work review the impact of WRMSDs in 11% of the Portuguese working force and found a prevalence of 5,9% (24,249 patients) we could try to extrapolate to the entire Portuguese workforce and we would found 220,467 workers with a relevant pathology for the occupational physician. This is not so linear and it is just an exercise because other issues can influence the result of the global work force (type of activity, size of the company, presence of occupational health services etc.).

Nevertheless, in the 2005 Social Security data reported 1,274 occupational diseases without incapacity and 201 with incapacity, in a total amount of 1,475 certified WRMSDs<sup>35</sup>. The important question here is to understand the reason for this difference. Maybe the occupational physicians do not systematically report the diseases because of difficulties related with the occupational medicine practice in Portugal or maybe they do not perceive them as important for the workers or for the country. Other reasons would be the inexistence of a simplified system for working pathologies or maybe it is understood that the sending of this information for the *Centro Nacional para Prevenção*

*das Doenças Profissionais* (National Centre for the Prevention of Occupational Diseases) (CNP RP) does not give any added-value for the workers, for the company or for the occupational physician itself. In any case, these pathologies correspond to 40.7% of all diseases certified in Portugal in 2005 which, despite being below the numbers from other countries, demonstrates its clinical and social importance<sup>36-38</sup>.

## Conclusion

WRMSDs have replaced other occupational diseases worldwide, such as deafness or respiratory pathology, in terms of labour and social impact.

However, the data that we have obtained demonstrate that, in Portugal, there are still some obvious needs in the appreciation of these diseases and in the occupational physicians, employers and state structure responsibility.

The absence of clinical guidelines and the difficulty in identifying these diseases has been influencing for many years the true reality of these injuries in Portugal. New registry and clinical guidance systems must be implemented in order to prevent a non-controlled increase of these injuries, with clear implications in the use of health resources.

The data obtained, which point out to a prevalence of around 6%, was obtained by of a short and simple questionnaire, the number of replies and the sample size as well as clinical evaluation instead of workers complaints are a strength of this study. However we should consider some weaknesses. The non-identification of the diseases relation with the type of work or a better characterization of the affected group in relation to sex, age and work description has weakened the extrapolations we could have obtained. Nevertheless, these limitations were contemplated in the study design having into account the multiple types of training of the specialists who replied, the type of contract, the time to reply to the questionnaire, the several types of registry systems for medical appointments and diseases implemented by the several occupational physicians and the need to design a representative study of the Portuguese business sector.

With this study, we were able to have a better vision on the number, location and type of WRMSDs in Portugal.

This study was a first epidemiologic approach to

the theme and, due to its design, it will be necessary to perform further studies focused on specific pathologies or added-risk activity sectors, in order to more accurately understand the real impact of these diseases in Portugal.

## Acknowledgments

The authors would like to sincerely acknowledge Dr. Carlos Pipa, from the Direção Geral da Saúde (Health General Directorate), Dr. Pedro Aguiar, from the Escola Nacional de Saúde Pública (National School of Public Health) – Universidade Nova de Lisboa, Prof. Doutor Jaime Branco, Coordinator of the National Plan Against Rheumatic Diseases, Prof. Doutor António Sousa-Uva, from the Escola Nacional de Saúde Pública (National School of Public Health) - Universidade Nova de Lisboa and Dr. Mário Carreira, from the Direção Geral da Saúde (Health General Directorate).

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