ORIGINAL ARTICLE

Prevalence of musculoskeletal pain in leather products industry workers: cross-sectional study in a city of the state of Minas Gerais

Prevalência de dor osteomuscular em trabalhadores de indústria de artefatos de couro: estudo transversal em um município do estado de Minas Gerais

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ABSTRACT

BACKGROUND AND OBJECTIVES: Musculoskeletal injuries induced by labor process and organization are relevant for health/labor relationship. This study aimed at investigating the prevalence of musculoskeletal complaints and associated factors among leather products manufacturers.

METHODS: Cross-sectional study where data were obtained by means of self-applied questionnaires to 320 workers distributed among 13 plants of the city of Cristina, MG, between February and March 2011. Nordic questionnaire of musculoskeletal symptoms was applied to measure the prevalence of complaints in different body regions. A descriptive analysis was carried out on the socio-demographic profile of the studied population. Multivariate logistic regression was used to describe the association between dependent variable, musculoskeletal complaint and the set of explanatory variables, with adjusted odds ratio calculation. Logistic regression was used with adjusted odds ratio calculation.

RESULTS: The study involved 138 workers. Better adjusted multivariate model after confusion variables control was for knee pain, with prevalence of 40.0% among males and 24.1% among females. Sewing and finishing sectors behaved as "protection", that is, less chance for pain as compared to the cutting sector. Age had negative association, that is, the higher the age the lower the chance of pain. In a different adjusted model for shoulder pain, workers and time working on the job showed higher chance of pain.

CONCLUSION: The prevalence of complaints was higher than that found in the literature. Significant variables were identified which may subsidize the prevention of job distress, such as knee pain. Further studies are needed with the inclusion of other variables and other designs to minimize biases.

Keywords: Epidemiology, Pain, Work.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As lesões musculoesqueléticas decorrentes do processo e da organização do trabalho são relevantes na relação saúde e trabalho. O objetivo deste estudo foi investigar a prevalência de queixas osteomusculares e os fatores associados entre trabalhadores de confecção de artefatos de couro.

MÉTODOS: Estudo transversal, pelo qual os dados foram obtidos por meio de questionários autoaplicados a 320 trabalhadores distribuídos em 13 fábricas do município de Cristina, MG, entre os meses de fevereiro e março de 2011. O questionário nórdico de sintomas osteomusculares foi empregado para mensurar a prevalência de queixas nas diferentes regiões do corpo. Foi realizada uma análise descritiva sobre o perfil sócio-demográfico da população do estudo. Utilizou-se de regressão logística multivariada para descrever a associação entre a variável dependente, queixa osteomuscular, e o conjunto de variáveis explanatórias, com o cálculo das razões de chances ajustadas. Utilizou-se regressão logística, com cálculo das razões de chances ajustadas.

RESULTADOS: O estudo compreendeu 138 trabalhadores. O modelo multivariado mais bem ajustado, após o controle das variáveis de confusão, foi para dor nos joelhos, com prevalência de 40,0% entre os homens e de 24,1% entre as mulheres. Os setores de costura e acabamento se comportaram como "proteção", ou seja, de menor chance de dor, quando comparado ao setor de corte. A idade apresentou uma associação negativa, ou seja, à medida que ela se eleva, menor a chance de dor. Em outro modelo ajustado, para dor nos ombros, as trabalhadoras e a extensão do tempo no cargo apresentaram maior chance de dor.

CONCLUSÃO: Foram reveladas prevalências de queixas superiores às encontradas na literatura. Variáveis significativas foram identificadas, que podem subsidiar a prevenção de sofrimento no trabalho, como por exemplo, dor nos joelhos. São necessários estudos posteriores, com a inclusão de outras variáveis e outros desenhos para a redução de vieses.

Descritores: Dor, Epidemiologia, Trabalho.

INTRODUCTION

Repetitive strain injuries or work-related musculoskeletal disorders (RSI-WRMD) involve a wide range of degenerative and inflammatory conditions, normally affecting muscles, tendons, ligaments, joints and peripheral nerves. These situa-

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tions manifest themselves as clinical syndromes, inflammation of the tendon and associated conditions (tenosynovitis, epicondylitis, bursitis), nerve compression disorders (carpal tunnel syndrome, sciatica) and osteoarthritis. There are also other conditions, considered less standard in this scenario, such as myalgia, back pain, and other localized pain syndromes[1].

RSI-WRMD are classified as the category of higher expression in the list of work processes harms to health. In the United States, the Nordic countries and Japan they account for one-third or more of all occupational diseases[1]. In Brazil, the reality is not different, since they are the most prevalent harm to the worker`s health, according to the Social Security data[2].

According to a survey conducted by the Ministry of health[2], the textile and apparel industry is one of the sectors with the most frequent occurrence of RSI-WRMD among workers in Brazil, along with bank employees, typists and assembly line operators.

The determining factors of its onset are linked to the fast pace of work and the repetitive movements; insufficient recovery time, weightlifting and forced movements with the hands, body postures that are not neutral, the concentration of mechanical pressure, localized or whole body vibration. Surely there may be interactions among these variables in addition to the factors associated with the psychosocial work environment, characterized by high demands and low control over the work itself[3].

It has been shown that muscle activity is substantially higher, regarding capacity, among women than men when performing activities considered identical. In addition, RSI-WRMD in the neck and upper extremities regions are also more prevalent in women[4].

Regarding the lower limbs region, especially the knees, studies on occupational loads have shown that standing, intensive walking, weight lifting, heavy-duty work in the standing position are important risk factors for the onset of pain. Such results have been adjusted for gender, age, body mass index (BMI), smoking, domestic activities and practice of sports[5].

Tenure, execution of repetitive movements and exposure to vibration are classified in the literature as significant conditions in the occurrence of shoulder pain[6].

Several studies in Brazil, in various areas of activity, have been devoted to investigating existing associations between risk factors in the work process and the occurrence of indicating symptoms of RSI-WRMD, including the apparel industry[7-12]. However, no specific studies have been published about the manufacturing of leather goods. Furthermore, it is important to explore the health and work reality to contribute to the promotion and preventive measures in the city, where this industry has great economic relevance.

The objective of this study was to investigate the prevalence of musculoskeletal pain and identify the associated variables in a sample of workers in the leather manufacturing sector.

METHODS

Cross-sectional study, which investigated the association between musculoskeletal complaints, expressed by pain, and the activities carried out at workstations in the manufacturing of leather gloves in the city of Cristina, South of Minas Gerais. The number of plants and workers in the city was obtained through secondary data from the City Council[13]. Main job positions in the factories, description of activities and occupational hazards for each position has been identified.

The target population was composed of 550 workers from 42 plants located in the city. The workers in the cutting, sewing, finishing, and central process flow, answered questionnaires with clear and easy to understand questions. Considering a level of reliability of 95%, an expected prevalence of musculoskeletal complaints of 20%[14,15], the sample was defined with 246 workers[16] and an absolute accuracy of five percentage points. The exclusion criteria were workers aged below 18 years, working with the company for less than one year, as well as the workers who refused to answer the questionnaire. In each company, the workers were asked to answer the questionnaire at home and hand it back on the following day. In this way, the procedure used in other studies on the prevalence of the theme [7,10] was characterized as a non-probabilistic sample or named for convenience, aiming at meeting the entire population of workers of the city. It is known that the representativeness of a sample process is based on randomness, that allows the results to be extended to the population of workers of leather products manufacturing. Despite this observation, a randomness-based process can also contain factors that influence the consistency of the results.

Data were collected through the application of two questionnaires, the first with demographic variables (age, gender) and occupational (tenure, work sector). Lifestyle related ones (regular domestic activity in last the 12 months, regular practice of physical activity in the same previous period, current smoking) have been categorized into two levels: yes or no.

The Nordic Musculoskeletal Questionnaire (NMQ), was applied with the purpose of measuring the prevalence of complaints (pain/tingling/numbness in last the 12 months) in different regions of the body[17]. It consists of a binary or multiple choice questionnaire concerning the occurrence of symptoms in different anatomical regions where it is more common to be found. In the questionnaire, the respondent reported the occurrence of symptoms in the 12 months and the seven days before the interview, as well as the occurrence of leave of absence in the previous year. A pilot study to adjust the instrument was carried out arbitrarily with 5% of the population calculated for the sample, randomly selected and kept in the study.

This study was approved by the Research Ethics Committee of the Medical School of Itajubá, with registry number 060/10. The data obtained were considered valid only with the signature of the worker on the Free and Informed Consent Term (FICT). Resolution 466/12 of the National Health Council was followed in all stages of the study.

Statistical analysis

A descriptive analysis was elaborated with the purpose of outlining the social-demographic profile of the study population.

The prevalence of complaints from all the population and in the different sectors was described separately. It was used the non-corrected Chi-square test for the analysis of the different category variables.

The study-dependent variable was of the dichotomy type and represented by complaint (pain/tingling/numbness in last the 12 months) or absence of this manifestation.

With the purpose to analyze the association between the dependent variable, musculoskeletal complaint, and the set of independent variables, it was used the non-conditional multivariate logistic regression technique. In order to find the best-adjusted model, we applied the Forward Stepwise method. In the construction of the multivariate model, single variant analyses were performed, using a value of $p<0.20$ as the criterion to enter in the modeling process based on the maximum likelihood ratio test. The significance of the variables in the final model was also checked by the same test, allowing the permanence of the variables ($p\leq0.05$)[18].

Table 1. Distribution of workers' characteristics in the leather goods industry (n = 138)

Explanatory variable	Gender		Total	P value
	Female n(%)	Male n(%)		
Age (years)				
<25	19 (27.5)	50 (72.5)	69	<0.01
≥25	39 (56.5)	30 (43.5)	69	
Tenure (months)				
<32	26 (36.6)	45 (63.4)	71	0.185
≥32	32 (47.8)	35 (52.2)	67	
Sector				
Cutting	0 (0.0)	24 (100.0)	24	<0.01
Sewing	49 (68.1)	23 (31.9)	72	<0.01
Finishing	9 (21.4)	33 (78.6)	42	<0.01
Domestic activity				
No	4 (8.5)	43 (91.5)	47	<0.01
Yes	54 (59.3)	37 (40.7)	91	
Physical activity				
No	47 (70.1)	20 (29.9)	67	<0.01
Yes	11 (15.5)	60 (84.5)	71	
Smoking				
No	41 (48.6)	49 (54.4)	90	0.25
Yes	17 (35.4)	31 (64.6)	48	
Total	58 (42.0)	80 (58.0)	138	

RESULTS

Of the studied universe comprising 42 companies of the sector, only 13 (31%) agreed to participate in the study. 320 questionnaires were distributed, of which 220 (69.0%) were considered to be suitable to use in the study. The application of the exclusion criteria reduced the sample to 138 employees. Amongst participants 42.0% were male. In the sewing area, however, 68.1% of the workforce was made up of women. The other sectors discussed have a male predominance, and in the cutting area, all workers were men. Workers' age ranged from 18 to 49 years, with an average of 27.0 ± 7.6 years. The male population is also more prevalent in the finishing sector, in particular, in the age range of 18 to 29 years. Tenure was in the range between 12 and 180 months, with an average of 36.9± 25.9 months.

Table 1 presents the distribution of the workers' characteristics. Table 2 shows the prevalence of complaints according to the various sites referred in the questionnaire.

The general prevalence of musculoskeletal complaints was 89.1%. Among women, the prevalence of complaints was 94.8%, while among men it was 85.0% showing no significant difference (p=0.07). The sewing sector presented the largest number of complaints among workers, with a value of 80.4%. For workers, the highest prevalence of complaints (38.6%) was in the finishing sector.

There were significant differences in the prevalence of pain between genders in the following regions: upper dorsal, shoulder, neck, wrists/hands, knees, and forearms. In all areas, except for the knees, the prevalence of pain was higher in

Table 2. Distribution of the prevalence of complaints (%), according to the site of pain, work sector and gender of workers in the leather goods industry (n=138)

Site of pain	Cutting		Sewing		Finishing		Total		P value
	Male	Female	Male	Female	Male	Female	Male	Female	
Shoulder	29.2		21.7	55.1	24.2	66.7	25.0	56.9	<0.001
Neck	33.3		34.8	51.0	30.3	77.8	32.5	55.2	<0.001
Wrists/hands	29.2		21.7	55.1	36.4	44.4	30.0	53.4	<0.001
Knees	54.2		34.8	24.5	33.3	22.2	40.0	24.1	0.051
Upper dorsal	37.5		56.5	59.2	36.4	77.8	42.5	62.1	0.023
Forearms	8.3		17.4	26.5	12.1	33.3	12.5	27.6	0.025
Ankles/feet	37.5		30.4	34.7	33.3	66.7	33.8	39.7	0.476
Hips/thighs	20.8		13.0	16.3	15.2	44.4	16.3	20.7	0.503
Lower dorsal	29.2		34.8	32.7	27.3	44.4	30.0	34.5	0.577
Elbows	8.3		8.7	6.1	3.0		6.3	5.2	0.789

female workers, being the pain in the dorsal region the highest value (Table 2).

The most prevalent pain in the cutting sector was knee pain (54.2%). On the other hand, in sewing and finishing, the highest prevalence relates to pain in the upper dorsal region, higher among female workers, with values between 59.2 and 77.8%, respectively.

The best-adjusted model among all complaints, in accordance with the adopted logistic regression procedure, was a pain in the knees. The single and multivariate analysis are shown in table 3. In the odds ratio analysis for the production sector, the cutting sector was used as a reference in comparison with the others, that is, with odds ratio equal to one. The possible interactions were tested. However, no statistically significant result was observed.

The model built for the occurrence of pain in the knees presents a very adequate adjustment with a significant level of 0.02, for the likelihood ratio test. The age variable presented an adjusted RC for pain of 0.94, being considered a protective factor. Working in the cutting sector represents a risk for knee pain, as the adjusted RC was 3.34 and 3.46, compared with sewing and finishing sectors, respectively, that showed up in the model as "protection" sectors for knee pain. Despite being significant in the multivariate analysis, it was not possible to design an adjusted model for the gender variable.

Regarding the outcome of shoulder pain in the built multivariate model considered significant, being male represents less chance (RC = 0,26) of pain, compared with being female. Tenure is shown as a risk for the outcome (RC = 1.02), as mentioned in the literature[6]. Table 4 shows the results corresponding to the single and multivariate analysis.

Figures 1 and 2 present estimates of pain probability according to the two models.

Table 3. Single and multivariate analysis of the explanatory variables in the occurrence of knee pain, over the last 12 months, in workers in the leather goods manufacturing industry (n=138)

Explanatory variable	Single variable			Multivariate	
	RC[a]	$IC_{95\%}$[b]	p[c]	RC[d]	$IC_{95\%}$
Sectors					
Cutting	1.00		0.06	1.00	
Sewing	0.33	0.13-0.85		0.30	0.11-0.81
Finishing	0.38	0.13-1.07		0.29	0.10-0.86
Age (years)	0.94	0.89-0.99	0.16	0.93	0.88 - 0.99
Gender					
Female	1.00				
Male	2.10	0.99-4.43	0.05		
Smoking					
No	1.00				
Yes	1.76	0.85-3.66	0.13		
Tenure (months)	1.00	0.99-1.02	0.53		
Physical activity					
No	1.00				
Yes	0.92	0.45-1.86	0.81		
Domestic activity					
No	1.00				
Yes	0.95	0.45-2.01	0.90		

RC[a] = gross odds ratio; $IC_{95\%}$[b] = confidence interval of 95%; Likelihood ratio test; RC[d] = adjusted odds ratio.

Table 4. Single and multivariate analysis of the explanatory variables in the occurrence of shoulder pain, over the last 12 months, in workers in the leather goods manufacturing industry (n=138)

Explanatory variable	Single variable			Multivariate	
	RC[a]	$IC_{95\%}$[b]	p[c]	RC[d]	$IC_{95\%}$
Gender					
Female	1.00				
Male	0.25	0.12-0.52	<0.01	0.26	0.12-0.54
Tenure (months)	1.02	1.00 – 1.03	0.02	1.02	1.00 – 1.03
Physical activity					
No	1.00				
Yes	0.46	0.23-0.92	0.03		
Domestic activity					
No	1.00				
Yes	1.77	0.83 – 3.74	0.13		
Age (years)	1.03	0.99-1.08	0.15		
Sectors					
Cutting	1.00		0.29		
Sewing	1.94	0.72-5.26			
Finishing	1.21	0.41-3.60			
Smoking					
No	1.00				
Yes	1.08	0.53-2.21	0.84		

RC[a] = gross odds ratio; $IC_{95\%}$:[b]= confidence interval of 95%; Likelihood ratio test; RC[d] = adjusted odds ratio.

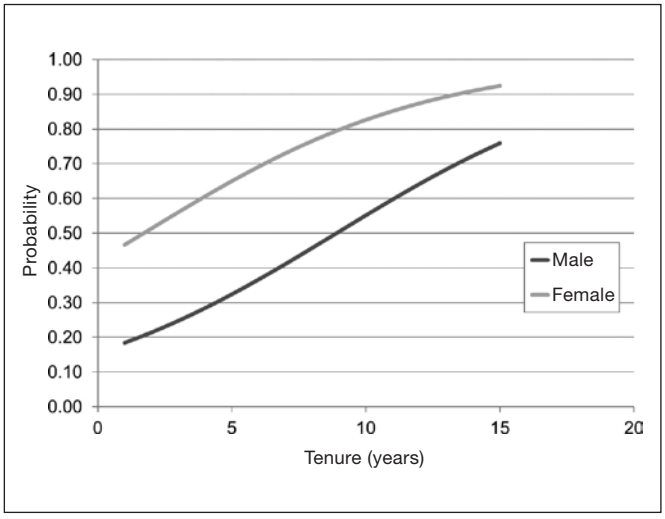

Figure 1. Estimates of pain probability in the shoulder, by tenure (years) and gender

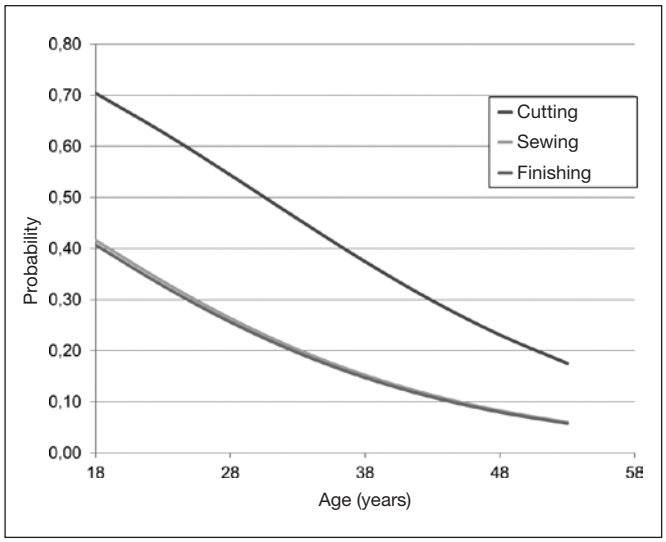

Figure 2. Estimates for the chances of knee pain by age (years) and work sector

DISCUSSION

This study tried to determine the prevalence of musculoskeletal pain or complaints in several regions and to investigate the associations between social-demographic and work related variables. The prevalence of complaints registered in the study was similar to the literature[9,13] and substantially superior to those reported in other studies[7,8,14,15].

Regarding the adopted sampling process, it is known that the representativeness of a sample process is based on randomness, that allows the results to be extended to the population of workers in the leather products manufacturing. Despite this observation, a randomness-based process can also contain factors that influence the consistency of the results. The best known relates to the limitation of observance, that is, the manifestation of lack of interest, indifference when answering the questions[19].

The multivariate analysis generated a model adjusted for knee pain in the last 12 months, controlled by age and work sector. In the cutting sector, in which it was found the highest risk of pain occurrence, the prolonged standing position and other loads, as weightlifting, proved to be relevant factors of risk for pain occurrence, as shown in the literature[5,10]. In the multivariate analysis, the occurrence of knee pain was associated with males. However, in the construction of the final model, which offered the most appropriate adjustment, it was excluded because it lost significance.

For pain in the shoulder, in another multivariate model elaborated, the adjustment was for tenure and gender, in which females outstand with a higher probability of injuries, ratifying the results in other studies for pain prevalence in general[4,7,10]. There was a positive association between pain and tenure, coherent with the literature[8,10].

Prevalence of musculoskeletal symptoms, above 60%, was found in the upper dorsal region, neck, wrist and hands, ankles and feet, and shoulder. The prevalence of pain, corroborating the literature, was most prominent in females[4,7,10]. Only for the knee region was observed a higher and significant prevalence among men. Although domestic activity, representing a double workday, was not a significant explanatory variable in the presented models, it should not be omitted, as mentioned in other studies[7,9].

The risks of ergonomic nature, consolidated in the literature, to which workers are exposed vary whether due to the work organization or to an inadequate posture. When checking the high perception of workers of the adverse conditions of their activities, the study points out important prevention directions, as for example, participative ergonomics. It is necessary to engage all individuals in the company and provide input about the work conditions to be improved, with the criteria of productivity and comfort. In the case of the cutting and sewing sectors, which activities involve being in static positions for long periods of time and repetitive movements, specific preventive measures are necessary to reduce the risk of diseases. Such particular measures are beyond the scope of this study, which purpose was to describe and point out the major risks and complaints with a cross-sectional study.

This study has the typical limitations of a cross-sectional study, subject to distortion of the results due to systemic errors or bias[19]. It is worth mentioning the healthy worker's bias, or survivor, since only workers exerting the activity were addressed, therefore excluding those in leave of absence or who did not adapt to the rhythm. This study is also subject to information bias, particularly because it is a study based on questionnaires[19].

CONCLUSION

The study identified the important prevalence of musculoskeletal complaints among workers in the process of manufacturing leather goods, identifying the associated variables. It discloses a poorly investigated universe, in a relevant regional industry, pointing out that the process must be reformulated to avoid conditions that lead to pain and suffering of the workers in that sector. These results also serve as significant input to the city health surveillance in the context of integration with worker's healthcare actions. Necessary transformations, strongly prioritizing the adaptation of the work to the worker, shall provide dignity to workers and undeniable benefits to the productive process.

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