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ORIGINAL RESEARCH

Investigation of musculoskeletal symptoms in a manufacturing company in Brazil: a cross-sectional study

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Abstract
Background: Musculoskeletal disorders (MSD) are prevalent and represent the most common health problem among the working population in industrially-developing countries, with considerable costs and impact on quality of life. Despite the high incidence of disability insurance claims among Brazilian manufacturing-sector workers, only a few studies assessed MSD prevalence. Q2
Objective: To provide information on the prevalence of MSD among manufacturing-sector workers and to explore the relationship between MSD and sociodemographic and occupational characteristics in a medium metallurgical company located in Brazil.
Methods: A cross-sectional study was carried out. Data was collected through the use of a specifically-designed questionnaire and the items used to collect MSD data were based on the Nordic Musculoskeletal Questionnaire. Descriptive statistics were used and multivariate logistic regression analysis ($p < 0.02$) was performed to explore the associations between MSD and potential risk factors.
Results: The upper limb was the most frequently affected body region among manufacturing-sector workers: shoulder (24.8%), elbow and/or forearm (15.5%), wrist and/or hand (19.0%). Adjusted logistic regression analysis showed that company experience ($p = 0.02$), presence of sleep disorders ($p = 0.00$), self-reported general health state ($p = 0.00$) and perform work pause ($p = 0.00$) were significant risk factors for development of MSD.

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Conclusion: Sociodemographic and work-related aspects are influential risk factors for MSD. These results add comprehension about MSD prevalence and suggest a need for greater emphasis on prevention strategies.

Introduction

Musculoskeletal disorders (MSD) are worldwide occupational health problems and affect all types of economic activities, with considerable costs and impact on workers' quality of life.[1,2] Poor working conditions in manual manufacturing industries often expose workers to many risk factors for musculoskeletal diseases, especially in small and medium companies that feature worse ergonomic conditions when compared with the large ones.[3,4] An increase in work-related MSD was observed in most of the Latin American countries during the 1990s, including Brazil.[5]

Growing industrialization in developing countries exposes the economically-active population to the risk of injuries.[6] Brazil has a large population of manual workers doing activities with high physical demands,[7] however only a few studies have assessed MSD prevalence among Brazilian manufacturing workers in industry.[8–10] Despite the high prevalence of MSD in industrially-developing countries, research into prevention is scarce and there is a lack of quantitative and reliable data.[5,6]

Occupational activities involving a predominance of manual tasks seem to present a higher risk of injury.[7] In Brazil, manufacturing of metal products features high incidence of disability insurance claims and ranks as eighth among work-related claims.[7] Workers in manufacturing industry are directly involved in the production process and could be exposed to different physical work demands such as lifting, lowering, pushing, pulling, and carrying besides dealing with heavy machinery.

The level of risk depends on the duration, frequency and magnitude of the exposure. Physical risk factors for MSD often cited in experimental and epidemiological studies include: repetitiveness, insufficient recovery time, physical workload, static effort, non-neutral body postures, mechanical compression of tissues, segmental or whole-body vibration and exposure to the cold.[2,11] Psychosocial and individual characteristics are also involved.[12] There are many challenges when dealing with these issues such as diagnosing and treating the MSD, establishing the relationship between risk factors and manual occupational activities as well as providing work environments that minimize their occurrence.[13,14] Therefore, this paper concentrates on detecting the prevalence of musculoskeletal symptoms among manual manufacturing workers and finding the risk factors which had impact on this prevalence.

Physical therapists and health professionals play an important role in the prevention and management of injuries and illnesses at work. The aim of this study, conducted in a medium metallurgical industry, was to determine the prevalence of musculoskeletal injuries among manufacturing workers and to investigate their relation to sociodemographic characteristics and work-related risk factors.

Methods

Study design and sample

This cross-sectional study was conducted in a medium industry in Brazil which manufactured metal products. A total of 456 employees worked in the five different sectors of the company at the time of the study.

The inclusion criteria for taking part in the study was to have worked in the metallurgical industry sometime in the past 12 months. Workers who were on sick leave due to musculoskeletal problems did not participate in the selected sample. The study sample consisted of 226 eligible workers (192 assembly-line workers, 20 machine operators and 14 welding operators) allocated in three sectors, chosen considering tasks similarities. Work tasks performed at the evaluated sectors were cutting and bending metal tubes, assembling, welding, calibrating and packaging for the production of evaporators and tubular resistors. The sample size was representative of the total ($N = 456$), a sample error of 5% and confidence level of 95% was established.

This study was approved by the Research Ethics Committee of the Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina, Brazil (44541315.3.0000.0121) and was conducted according to the Human Research of the National Health Council Code of Ethics. All subjects received information about objectives and procedures of the study and signed a consent form.

Data collection

Data were obtained through a specifically-designed questionnaire that featured 21 items including individual information and sociodemographic characteristics, work-related factors and MSD investigation. Face-to-face interviews with the workers were conducted by two trained data collectors during a work day.

The questionnaire consisted of three sections and items regarding workers' individual, demographic and occupational data were gathered with structured questions, based on a literature review of previous published epidemiological studies.[2,15–17]

Demographic variables included the participant's sex (male; female), age (in years), body weight (in kilograms), body stature (in meters), educational level ($\leq$9 years; 10–12 years; $\geq$13 years), marital status (married; single), self-reported hand dominance (right or left-handed), as well as individual variables such as smoking habits (no: nonsmoker

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