

Musculoskeletal symptoms, postural disorders and occupational risk factors: correlation analysis

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Abstract. Work-related musculoskeletal disorders (WRMSD) include a list of inflammatory and degenerative diseases characterized by the presence of musculoskeletal symptoms, compensatory posture changes and functional disabilities. The objective of this study was to evaluate the kinetic/functional characteristics of textile plant workers, their level of exposure to risk factors and the contribution these make to musculoskeletal symptoms. The sample of 42 workers answered the Nordic Questionnaire and the Job Factors Questionnaire. The kinetic/functional characteristics of each worker were verified by a blinded evaluator. Data were analyzed using descriptive statistics and Pearson's correlation. Musculoskeletal symptoms were more prevalent in the spinal region and upper limbs. The exposure levels to risk factors were identified as a serious problem. Postural disorders, musculoskeletal symptoms and risk factors were correlated ($P \leq 0.05$).

Keywords: Musculoskeletal Disorders; Ergonomic risk factors; Occupational Health

1. Introduction

Work-related musculoskeletal disorders (WRMSD) are responsible for a large portion of worker's compensation costs and are a primary source of lost production. Recent estimates (2009) from the International Labor Organization (ILO) show that of 1.2 million workers out of work due to disabilities, 28% were related to WRMSDs^[4].

Both the high incidence and severity of musculoskeletal injuries seem to be associated with current methods of work organization, which are characterized by new technologies, the fragmentation of tasks and an intensification of labor. In developing countries, the negative effects of these methods are aggravated by precarious work conditions, low salaries and insufficient medical coverage. This scenario interferes with the workers' health-disease process, considering that they are more exposed to occupational

risk factors that lead to the development of WRMSDs^[14].

Risk factors include physical (environmental and biomechanical), organizational and psychosocial conditions present during work activities. The physical conditions are related to postures and movements required during daily work routines, whereas organizational and psychosocial conditions are linked to work organization methods and their perception by workers^[6, 10]. Recent studies have demonstrated an association between the frequency, intensity and time of exposure to risk factors and the development of WRMSD^[6, 12].

The Brazilian Social Security Agency defines WRMSD as a clinical syndrome involving a variety of inflammatory and degenerative morbidities that affect the musculoskeletal system, particularly in the spinal region and upper limbs^[3]. The condition is characterized by the presence of musculoskeletal

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symptoms, compensatory posture changes and temporary or permanent functional disabilities^[12].

Thus, awkward positions adopted during work may cause muscular imbalance and posture changes. Compensatory postures generate musculoskeletal pain and are a leading cause of occupational disease^[6]. It is important to point out that the literature reports an association between awkward postures and musculoskeletal symptoms^[1,15].

In consonance with previous studies and considering the need to understand the association between musculoskeletal disorders and work conditions, the objective of the present study was to evaluate the kinetic/functional characteristics of textile plant workers, their level of exposure to occupational risk factors, and the contribution these make to the presence of musculoskeletal symptoms.

2. Methods

This was a cross-sectional, convenience-based epidemiological study. Fifty workers from the finishing and production sectors of a textile plant were originally selected, of which eight were excluded due to having been employed at the facility less than six months, pregnancy or having physical defects (lower limb asymmetry or congenital deformity), resulting in a total of 42 workers.

2.1. Procedures

The workers were approached in their respective work sectors and, after agreeing to participate in the study and signing the Free and Informed Consent Form, they filled out a sociodemographic questionnaire, the Nordic Questionnaire for Musculoskeletal Symptoms^[2] and the Job Factors Questionnaire^[5].

The sociodemographic questionnaire included seven questions – full name, gender, age, weight, height, length of time in that specific job function, and work sector.

The Nordic Questionnaire evaluates the frequency of musculoskeletal symptoms such as pain, tingling and/or numbness in nine body regions in two time spans: the previous seven days and the previous 12 months. This instrument also verifies whether these symptoms have compromised work performance or activities of daily living and whether medical treatment or physical therapy was necessary^[5].

The Job Factors Questionnaire, which is based on the worker's perceptions, evaluates exposure levels to

risk factors of musculoskeletal symptoms. This questionnaire presents a descriptive list of 15 risk factors to be classified with regard to how much each factor contributed to the appearance of work-related musculoskeletal symptoms. The factors are rated on a scale from zero to ten where zero means "no contribution" and ten means "the greatest possible contribution". The score can also be divided into three categories: the first, from 0 to 1, represents no contribution; the second, from 2 to 7, a minimum to moderate contribution; and the third, from 8 to 10, indicates a great contribution^[5-11].

After filling in the questionnaires, the workers were sent to the company medical clinic for postural evaluation. The kinetic/functional characteristics of each worker were verified by a blinded evaluator experienced in postural evaluations. The evaluation was based on the postural alignment parameters proposed by Kendall et al.^[8] and observed the frontal (anterior and posterior) and sagittal planes (right and left). A Fisiobrás posturograph was used to facilitate posture observation.

2.2. Data analysis

The data were initially entered in Microsoft Excel 2007 and later imported into SPSS v17.0. The population's sociodemographic characteristics, risk factor exposure level and musculoskeletal symptoms were analyzed using descriptive statistics (frequencies, medians and standard deviation). Pearson's test with a significance level of 5% was used to analyze the correlation between variables.

2.3. Ethical Approval

All individuals were informed about the objectives and procedures of the study and agreed to participate by signing the consent form. This research project was approved by the Research Ethics Committee of the Universidade Cidade de São Paulo (number 1658/2010).

3. Results

A total of 42 workers (1 male) from the production (57%) and finishing (43%) sectors of a textile plant participated in the study. The following means were

found: age = 29.6 ± 7.5 years, weight = 58.79 ± 9.85 kg, and height = 158 ± 5.47 cm. Musculoskeletal symptom complaints involving pain, tingling and/or numbness proved to be significant. The risk exposure level (based on worker perception) was considered a serious problem (80.45 ± 31.63 points).

Factors perceived as serious problems in the work environment included: “Working in the same position for long periods (standing, inclined, seating, kneeling, etc..” (7.71 ± 3.03); “Bending or twisting your back in an awkward way” (7.26 ± 3.33); “Working in awkward or cramped positions” (7.05 ± 3.55); and “Continuing to work when injured or hurt” (6.93 ± 3.91).

The body regions with the highest prevalence of musculoskeletal complaints were: the shoulders (59.5%), upper back (47.6%), lower back (45.2%), neck (42.9%), and wrists/hands (40.5%). Symptoms

in the wrist/hand (11.9%) and shoulder (9.5%) regions had the highest impact during work and activities of daily living. Complaints in these regions typically resulted in seeking medical care or physical therapy.

All workers presented at least one posture change. The most affected regions were: pectoral girdle (78.6%), knee (71.4%), lumbar (64.3%) and cervical (61.9%). The following types of changes were identified in these regions: loss of lordotic curving (27.6%), scapular elevation on the right side (25.9%), protruding shoulders (19.0%), lumbar hyperlordosis (50.0%), and knee recurvatum (39.7%).

A correlation was found between postural changes, musculoskeletal symptoms and risk factors (P ≤ 0.05). Table 1 shows the association between these three variables.

Table 1
Correlation between postural changes, musculoskeletal symptoms and risk factors

	Postural Disorders	Symptoms	Risk
Cervical Postural Disorders	∅	Lombar Spine r = 0,417 P=0,006	Working in hot, cold, humid or wet conditions r = 0,307 P=0,048
Shoulders Postural Disorders	∅	Neck r = 0,335 P=0,03	∅
Dorsal Postural Disorders	Lombar Spine r = 0,363 P=0,018	Lombar Spine r = 0,305 P=0,049 Legs/Feet r = 0,372 P=0,015	Having to handle or grasp small objects r = 0,318 P=0,04
Lumbar Postural Disorders	Dorsal Spine r = 0,363 P= 0,018	Legs/Feet r = 0,311 P=0,045	Working without any type of training r = 0,368 P=0,016

4. Discussion

The present study identified correlations between postural changes, musculoskeletal symptoms and occupational risk factors in textile plant workers. The study population was almost entirely women (98%), which is normal in this line of work since women are preferentially selected for manual activities.

According to the Brazilian Ministry of Health [3], the textile industry ranks fifth in WRMSD cases. Corroborating this statistic, the present study found that exposure to occupational risk factors is perceived as a serious problem by the workers and is related to regions with a higher incidence of musculoskeletal complaints.

The most serious WRMSD risk factors were identified as awkward and prolonged postures and con-

tinuing to work when injured. This result was similar to other studies involving textile plant workers^[9-10-16] and different populations of industrial workers^[5, 11].

The correlation analysis indicated that the risk factors are connected with regions of higher incidence of musculoskeletal symptoms, i.e., the spine and lower limbs. This result reflects the observed reality in the studied production sectors, where the lumbar and cervical spine must be kept static for prolonged periods and repetitive movements involving the upper limbs, particularly the shoulders, wrists and hands, are required.

A previous study investigating the prevalence of musculoskeletal symptoms in textile industry workers verified that the most affected regions were the spine, lower limbs and shoulders, and that they were significantly associated with work conditions^[9].

Postural alterations were more frequent in the shoulder, knee and spinal regions and presented a statistically significant association with musculoskeletal complaints and some exposure factors. Kinetic functional alterations are found when musculoskeletal symptoms reach the chronic stage. They are generally caused by incorrect biomechanical demands associated with insufficient time for tissue recovery.

The present study verified that there is a significant correlation between posture changes, musculoskeletal symptoms and occupational risk factors in textile plant workers, which corroborates the results of previous studies. Thus, the risk factors present in certain sectors of a textile plant can cause symptoms such as pain, tingling and/or numbness, which can subsequently lead to compensatory posture changes.

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