Association between biomechanical and psychosocial risk factors with low back and upper arms symptoms in aluminum industrial workers

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Introduction: Work-related musculoskeletal disorders are associated with the exposure to biomechanical and psychosocial risk factors. The postures and movements adopted during work have a strong evidence of association with musculoskeletal disorders [Bernard, 1997]. Aluminum industry workers are prone to these disorders [Hughes et al, 1997]. However, not only the biomechanical, but also the psychosocial risk factors may contribute to musculoskeletal complaints [Devereux et al, 2002].

Objective: To assess the correlation between biomechanical and psychosocial risk factors and low back and upper arms symptoms in aluminum industrial workers.

Method: The study was carried out in an aluminum household utensils industry, located within the state of São Paulo, Brazil. The industry has 265 workers and 28 of them work in the roughing sector of aluminum plates. In this sector the aluminum plates are manually introduced into rolling mills, which decrease the thickness of the plates, before they are formed and cut in manually operated hydraulic presses to produce the goods. Fifteen workers were evaluated [43.3 (16.3) years; 78.1 (13.6) kg; 172.2 (7.5) m]. All subjects answered the Nordic Musculoskeletal Questionnaire (NMQ) and the Job Stress Scale (JSS). Inclinometers (Logger Tecknologi, Åkarp, Sweden) were used to evaluate the posture and movements of the upper arms and low back during the whole shift. The inclinometers were placed bilaterally at the insertion of the deltoid muscle and at the right side of T12/L1 and L5/S1, the difference between these two spinal measurements was regarded as the low back. Data was analyzed by amplitude probability distribution function (APDF) providing the low (percentile 10), median (percentile 50) and peak values (percentile 90 and 99). The amount of time spent in predefined angular sectors was also obtained. The angular sectors were defined as >15 and >45° of low back flexion and >60 and >90° for upper arms elevation. The median angular velocities were also calculated. The correlations between the variables were tested using the point biserial coefficient. All analyses were performed in SPSS software with significance level set at 5%.

Results: Workers with upper arms symptoms in the last 7 days presented lower social support (rps=-0.63; P=0.01), and workers with low back pain in the last 12 months reported higher control (rps=0.59; P=0.02) than asymptomatic workers (Figure 1).

Discussion: The results show an association between low social support and upper arm symptoms, as well as between high job control and low back symptoms. No association was found between biomechanical risk factors and symptoms. These results can be due to the evaluation restricted to the postural risks. Other biomechanical risk factors, such as excessive force during the manual material handling, may contribute to the musculoskeletal symptoms. Besides this, the fact that both the psychosocial factors and the disorders were self-reported may cause a bias. Other limitation of this study was the small sample size.

Keywords: cumulative trauma disorders, occupational exposure, posture, inclinometry, stress.
References
Devereux JJ, Vlachonikolis IG, Buckle PW. Epidemiological study to investigate potential interaction between physical and psychosocial factors at work that may increase the risk of symptoms of musculoskeletal disorder of the neck and upper limb. Occup Environ Med, 59:269–77, 2002.