

Physical and psychosocial risk factors for musculoskeletal disorders in Brazilian and Italian nurses

Fatores de risco físico e psicossocial para distúrbios musculoesqueléticos em enfermeiras brasileiras e italianas

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Abstract

As part of the international CUPID investigation, we compared physical and psychosocial risk factors for musculoskeletal disorders among nurses in Brazil and Italy. Using questionnaires, we collected information on musculoskeletal disorders and potential risk factors from 751 nurses employed in public hospitals. By fitting country-specific multiple logistic regression models, we investigated the association of stressful physical activities and psychosocial characteristics with site-specific and multisite pain, and associated sickness absence. We found no clear relationship between low back pain and occupational lifting, but neck and shoulder pain were more common among nurses who reported prolonged work with the arms in an elevated position. After adjustment for potential confounding variables, pain in the low back, neck and shoulder, multisite pain, and sickness absence were all associated with somatizing tendency in both countries. Our findings support a role of somatizing tendency in predisposition to musculoskeletal disorders, acting as an important mediator of the individual response to triggering exposures, such as workload.

Nursing Staff; Cross-cultural Comparison; Musculoskeletal Diseases; Absenteeism

Introduction

Musculoskeletal disorders are an important cause of morbidity in Western countries ¹ where they have been a major focus for research. Moreover, in the last decade the body of evidence on musculoskeletal disorders has extended to also include epidemiological investigations conducted in the so called “developing” countries ^{2,3,4}.

Many studies have highlighted the important role of stressful physical activities in the generation and progression of musculoskeletal disorders. At the same time, psychosocial risk factors, such as job satisfaction, somatizing tendency and mood, are receiving growing attention as determinants of musculoskeletal disorders, and appear at least equally important ^{5,6,7,8}. In addition, some studies have started to explore the role of culturally determined health beliefs in generating and maintaining musculoskeletal symptoms. These studies have suggested marked variations in the prevalence of common musculoskeletal complaints and associated disability among workers carrying out similar jobs but in dissimilar settings (different countries) ^{9,10}. It is hypothesized that in many cases, chronic musculoskeletal symptoms and disability may be “psychologically mediated responses to triggering exposures” ¹¹ (p. 281) conditioned by individual characteristics and cultural circumstances.

Nurses employed in hospitals are particularly liable to work-related musculoskeletal disorders:

their work frequently involves heavy lifting, often in awkward postures, and sometimes entails forceful movements of the upper limbs. Low back, neck and shoulder pain have been shown to be highly prevalent among nurses¹².

In order to study the psychosocial and cultural influences on musculoskeletal disorders, we recruited two populations of Brazilian and Italian nurses and nursing technicians (called nurses as a whole), as part of the international CUPID (Cultural and Psychosocial Influences on Disability) study.

Our aim was to compare the prevalence of musculoskeletal disorders among nurses in the two locations, and their association with physical and psychosocial risk factors.

Methods

We conducted a cross-sectional survey focusing on nurses from large public hospitals in Brazil and Italy. Between May 2008 and March 2010, we recruited nurses who were employed in medical wards at São Paulo University Hospital (Brazil), and Milan and Varese University Hospitals (Italy), here on called Brazilian and Italian nurses, respectively, for the sake of brevity. To be included in the study, subjects had to have been employed in their current job for at least 1 year.

The study protocol was approved by each Institutional Review Board, and written informed consent was obtained from all participants. Each subject completed a self-administered questionnaire in their native language. The questionnaire for the CUPID study was originally compiled in English, and translated into Portuguese and Italian. To check the accuracy of the translations, each questionnaire was independently back-translated to English. The back-translated versions were then compared to the original to identify any inconsistencies, and re-submitted to the central coordinator of the CUPID study (D.C.) who suggested adjustments. In addition, as described by a previous study³, the Portuguese version of the questionnaire was pre-tested on a sample of nurses before applying it to the main study.

Questions covered aspects such as demographic characteristics, hours worked per week, duration of employment, whether the nurse's job involved specific physical activities in an average working day, job satisfaction, tendency to somatize, mental health (mood), pain at specific anatomical sites, and related disability and sickness absence.

Exposure assessment

We categorized hours worked per week using a cut-off of 38 hours (a full-time working week). We assessed job satisfaction by asking participants directly how satisfied they were with their job as a whole and grouping answers to form a dichotomous variable (satisfied vs. dissatisfied). To measure somatizing tendency, we used elements of the somatic subscale of the *Brief Symptom Inventory*¹³, asking about distress caused by nausea, faintness, dizziness, weakness, numbness, chest pain and breathing difficulties in the previous week. Participants were then classified according to the number of these symptoms (zero, one, two or more) causing at least moderate concern. We assessed mental health using questions from the relevant section of the Short Form-36 questionnaire¹⁴. The sum of scores resulting from individual questions was grouped into approximate tertiles of their distribution in the whole study sample (poor, intermediate or good mental health).

The CUPID questionnaire focused on six anatomical sites: low back, neck, shoulder, elbow, wrist/hand and knee. For each site, we identified one or more stressful physical activities in an average working day including: lifting a weight of $\geq 25\text{kg}$ by hand (low back) and work with hands above shoulder height for ≥ 1 hour (neck and shoulders).

Outcome definition

Pain at different anatomical sites was assessed by means of specific questions regarding location and duration of pain, whether the pain had made one or more everyday activity (such as getting dressed, doing normal household jobs, etc.) difficult or impossible, and whether it had led to absence from work; to avoid misunderstanding regarding pain location, each anatomical site was depicted by an image. The simplest outcome measures were the presence or absence of pain in the past month at each of the six anatomical sites of interest. Pain was then defined as "disabling" if it had made at least one of the specified everyday activities difficult or impossible in the past month. We also investigated whether pain had occurred in three or more sites in the past month (multisite pain), and whether sickness absence had occurred in the past year because of musculoskeletal pain.

When considering regional pain, we focused only on those anatomical sites which are most likely to be stressed by the typical activities of nurses employed in hospital wards: low back, neck, and shoulder. However, when investigating

multisite pain and sickness absence, all anatomical sites were taken into account.

Statistical analysis

We first compared the occupational and psychosocial characteristics of nurses in the two locations, by means of descriptive statistics, Pearson's chi-squared test, and Mann-Whitney U test for ordinal variables. We then fitted location-specific multiple logistic regression models to assess the association of risk factors with pain, disabling pain, multisite pain and sickness absence; for categorical variables with more than two levels, a test for trend was performed. All statistical tests were two-sided where; a p -value < 0.05 was considered statistically significant. The statistical analysis was performed using Stata/MP 11.1 (Stata Corp., College Station, USA).

Results

A total of 969 nurses were invited to take part in the study. Questionnaires were returned by 195 Brazilian nurses (participation rate: 96%) and 585 Italian nurses (participation rate: 76%). However, we excluded two Brazilian and 27 Italian nurses because they had been employed in their current job for less than one year. Thus, our analysis was based on 751 subjects.

Table 1 summarizes the main characteristics of the study sample by location. Gender distribution was similar in the two locations (84% females) but Italian nurses were younger (50% aged < 40 vs. 39%) with a shorter duration of employment. Approximately 72% of participants reported an average working week of 38 hours or less, with a higher proportion of Italian nurses (26% vs. 19%) working more than 38 hours/week. Both lifting a weight of 25kg or more and working with the hands above shoulder height for an hour or longer were more frequent among Italian participants. Approximately 92% of Brazilian nurses declared they were satisfied with their current job, as compared with 83% of Italian nurses. In both locations, more than 30% of the study participants reported two or more somatic symptoms causing at least moderate concern (somatizing tendency). Mood was poorer among Brazilian nurses, with more than 65% of the participants having intermediate or poor mental health. The corresponding proportion among Italian nurses was 55%.

Table 2 shows the prevalence of regional pain among participating nurses by location. Rates of low back pain in the past month were similar (45% in São Paulo vs. 49% in Milan/Varese), but

there was a higher prevalence of related absence in the past year in the Italian cities. Italian nurses reported more neck pain, although the difference was not statistically significant. Brazilian nurses reported more shoulder problems, with significant differences for shoulder pain in the past month (42% in São Paulo vs. 33% in Milan/Varese, $p = 0.04$) and shoulder pain causing absence in the past year (12% in Brazil vs. 7% in Italy, $p = 0.04$). The frequency of multisite pain was different in the two locations, with a higher proportion of Brazilian nurses reporting ≥ 3 painful anatomical sites in the past month (42% vs. 30%); however, the percentages of participants reporting no painful sites at all were very similar (23% in São Paulo vs. 25% in Milan/Varese).

Table 3 shows the results of the multiple logistic regression analyses, exploring associations between the main investigated risk factors and pain at different anatomical sites in the past month. The reference category for each of the risk estimates in this table was no pain at the investigated site during the past month. All regression models included sex, age, hours worked per week, site-specific stressful physical activity, job satisfaction, somatizing tendency and mood; associations are summarized by odds ratios (OR) and corresponding 95% confidence intervals (95%CI). With regard to low back pain, our analysis showed a lower risk in men than in women, which reached statistical significance among Italian nurses (OR = 0.51, $p = 0.02$). Increasing age was clearly associated with higher risk of low back pain in the Italian nurses and a similar pattern was apparent in the Brazilian nurses, although none of the OR was statistically significant. Working for more than 38 hours per week carried an increased risk only among Italian nurses (OR = 1.83, $p = 0.01$). No significant association was found between low back pain and lifting a weight of 25kg or more in an average working day, although OR in both locations were greater than one. Job dissatisfaction also carried an increased risk (OR = 1.52 in São Paulo and OR = 2.27 in Milan/Varese), but this reached statistical significance only in Italy ($p = 0.002$). We found a strong relationship between somatizing tendency and risk of low back pain, with OR ranging from 1.49 among Brazilian nurses reporting one symptom causing at least moderate concern in the past week to 2.99 among Italian nurses reporting two or more distressing symptoms: in both locations associations were statistically significant (p -trend = 0.02, and p -trend < 0.001 in São Paulo and Milan/Varese respectively). No association was found with mood.

As regards neck pain in the past month, associations with gender and age were similar to

Table 1

Characteristics of participating nurses by location **.

Characteristic	São Paulo		Milan/Varese		Total	
	(n = 193)		(n = 558)		(n = 751)	
	n	%	n	%	n	%
Sex						
		p = 0.1				
Female	169	87.6	464	83.2	633	84.3
Male	22	11.4	90	16.1	112	14.9
Missing	2	1.0	4	0.7	6	0.8
Age (years)						
		p = 0.04				
19-29	30	15.5	93	16.7	123	16.4
30-39	46	23.8	185	33.2	231	30.8
40-49	81	42.0	174	31.2	255	34.0
≥ 50	32	16.6	81	14.5	113	15.1
Missing	4	2.1	25	4.5	29	3.9
Job duration (years)						
		p = 0.003				
1-5	21	10.9	113	20.3	134	17.8
> 5	172	89.1	445	79.8	617	82.2
Hours worked per week						
		p = 0.05				
≤ 38	148	76.7	395	70.8	543	72.3
> 38	36	18.7	144	25.8	180	24.0
Missing	9	4.7	19	3.4	28	3.7
Lifting a weight of ≥ 25kg by hand						
		p = 0.001				
No	97	50.3	205	36.7	302	40.2
Yes	94	48.7	342	61.3	436	58.1
Missing	2	1.0	11	2.0	13	1.7
Work with hands above shoulder						
		p < 0.001				
≥ 1 hour						
No	167	86.5	409	73.3	576	76.7
Yes	23	11.9	138	24.7	161	21.4
Missing	3	1.6	11	2.0	14	1.9
Job satisfaction						
		p = 0.002				
Satisfied	178	92.2	461	82.6	639	85.1
Dissatisfied	15	7.8	94	16.9	109	14.5
Missing	0	0.0	3	0.5	3	0.4
Somatizing tendency ***						
		p = 0.2				
0	92	47.7	245	43.9	337	44.9
1	40	20.7	108	19.4	148	19.7
≥ 2	58	30.1	199	35.7	257	34.2
Missing	3	1.6	6	1.1	9	1.2
Mental health						
		p = 0.0002				
Good	62	32.1	242	43.4	304	40.5
Intermediate	49	25.4	163	29.2	212	28.2
Poor	78	40.4	142	25.5	220	29.3
Missing	4	2.1	11	2.0	15	2.0

* p = chi-squared test after excluding subjects without available information; for ordinal variables, Mann-Whitney U test was performed;

** Percentages may not add up to 100.0 because of rounding;

*** Number of symptoms in past week causing at least moderate concern.

Table 2

Prevalence of regional pain among participating nurses by location **.

Regional pain	São Paulo (n = 193)		Milan/Varese (n = 558)		p-value
	n	%	n	%	
Low back pain in past month	87	45.1	274	49.1	0.3
Neck pain in past month	78	40.4	259	46.4	0.2
Shoulder pain in past month	80	41.5	185	33.2	0.04
Disabling low back pain in past month	66	34.2	194	34.8	0.9
Disabling neck pain in past month	41	21.2	161	28.9	0.04
Disabling shoulder pain in past month	84	43.5	221	39.6	0.3
Low back pain causing absence in past year	24	12.4	95	17.0	0.1
Neck pain causing absence in past year	12	6.2	58	10.4	0.09
Shoulder pain causing absence in past year	23	11.9	40	7.2	0.04
Number of painful sites in past month					
0	44	22.8	137	24.6	
1	34	17.6	130	23.3	
2	34	17.6	121	21.7	
≥ 3	81	42.0	170	30.5	0.03

* p = chi-squared test; for "Number of painful sites in past month", Mann-Whitney U test was performed;

** Percentages may not add up to 100.0 because of rounding.

those for low back pain. No association was observed with hours worked per week, but stressful physical activity (working with hands above shoulder height for one hour or longer) was associated with a significantly elevated risk in both Brazilian and Italian nurses (OR = 5.45, $p = 0.01$ and OR = 2.11, $p = 0.001$, respectively). No significant association was observed with job satisfaction, although in both locations OR exceeded one. A positive association with somatizing tendency was also observed for neck pain, with a clear trend in risk among the Italian nurses ($p < 0.001$). As for low back pain, no association was observed with poor mental health.

Shoulder pain was also more common at older ages. In addition, there was a positive association with stressful physical activity (work with hands above shoulder height for ≥ 1 hour), with similar OR in the two locations (1.72, $p = 0.4$ in São Paulo and 1.89, $p = 0.01$ in Milan/Varese). Job dissatisfaction was strongly associated with shoulder pain in São Paulo (OR = 8.06, $p = 0.01$). A positive association was also shown in Milan/Varese, but it was not statistically significant (OR = 1.53, $p = 0.1$). Somatizing tendency was a risk factor for shoulder pain and for pain at other sites, with OR ranging from 1.21 (Italian nurses reporting one symptom causing at least moderate concern in the past week) to 4.78 (Brazilian nurses reporting two or more distressing symptoms).

Associations with disabling pain in the past month were generally similar to those for any pain at the same anatomical site (Table 4). Thus, age, hours worked per week, job dissatisfaction and somatizing tendency were associated with disabling low back pain. Working with hands above shoulder height for an hour or longer in an average working day was significantly associated with disabling neck pain in both São Paulo (OR = 5.44, $p = 0.01$) and Milan/Varese (OR = 2.17, $p = 0.001$). In both locations, somatizing tendency was positively associated with disabling neck pain ($p = 0.02$ and $p < 0.001$ for São Paulo and Milan/Varese, respectively) and disabling shoulder pain ($p < 0.001$ for both locations). A 64% increased risk of disabling shoulder pain was observed among Italian nurses working more than 38 hours per week. It was also shown that job dissatisfaction carried an OR of 5.59 ($p = 0.05$) for disabling shoulder pain among Brazilian nurses.

Further analysis (Table 5) confirmed somatizing tendency to be a strong risk factor for reporting pain at three or more sites in the past month (reference category: pain at two or fewer sites) in both Brazilian (OR = 2.37 for one symptom causing at least moderate concern, OR = 3.15 for two or more symptoms, p -trend = 0.004) and Italian (OR = 1.89 for one symptom, OR = 3.51 for two or more symptoms, p -trend < 0.001) nurses. Positive associations were also found between somatizing

Table 3

Associations between risk factors and pain in the past month by location *.

Risk factor	Low back pain		Neck pain		Shoulder pain	
	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)
Sex						
Female	1.00	1.00	1.00	1.00	1.00	1.00
Male	0.82 (0.28-2.37)	0.51 (0.30-0.88)	0.65 (0.21-2.02)	0.38 (0.21-0.69)	1.10 (0.35-3.51)	0.64 (0.35-1.18)
	p = 0.7	p = 0.02	p = 0.5	p = 0.001	p = 0.9	p = 0.2
Age (years)						
19-29	1.00	1.00	1.00	1.00	1.00	1.00
30-39	1.65 (0.59-4.59)	1.15 (0.66-2.00)	1.74 (0.58-5.25)	1.42 (0.80-2.51)	1.04 (0.33-3.33)	1.81 (0.93-3.49)
40-49	1.85 (0.71-4.80)	1.57 (0.89-2.78)	2.45 (0.90-6.67)	1.88 (1.05-3.35)	2.33 (0.84-6.44)	3.09 (1.60-5.95)
≥ 50	1.25 (0.40-3.88)	2.06 (1.03-4.10)	1.59 (0.48-5.25)	1.68 (0.85-3.36)	2.42 (0.72-8.14)	5.07 (2.41-10.66)
	p = 0.6	p = 0.02	p = 0.3	p = 0.06	p = 0.04	p < 0.001
Hours worked/week						
≤ 38	1.00	1.00	1.00	1.00	1.00	1.00
> 38	1.02 (0.44-2.36)	1.83 (1.18-2.84)	1.05 (0.44-2.52)	1.19 (0.77-1.85)	0.87 (0.34-2.21)	1.22 (0.77-1.92)
	p = 1.0	p = 0.01	p = 0.9	p = 0.4	p = 0.8	p = 0.4
Physical activity **						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes	1.15 (0.59-2.23)	1.31 (0.88-1.96)	5.45 (1.62-18.28)	2.11 (1.35-3.32)	1.72 (0.52-5.68)	1.89 (1.20-2.97)
	p = 0.7	p = 0.2	p = 0.01	p = 0.001	p = 0.4	p = 0.01
Job satisfaction						
Satisfied	1.00	1.00	1.00	1.00	1.00	1.00
Dissatisfied	1.52 (0.42-5.52)	2.27 (1.34-3.86)	2.18 (0.59-8.02)	1.45 (0.86-2.45)	8.06 (1.58-41.21)	1.53 (0.91-2.58)
	p = 0.5	p = 0.002	p = 0.2	p = 0.2	p = 0.01	p = 0.1
Somatizing tendency ***						
0	1.00	1.00	1.00	1.00	1.00	1.00
1	1.49 (0.65-3.42)	2.60 (1.57-4.31)	1.32 (0.56-3.11)	1.52 (0.92-2.52)	2.76 (1.12-6.80)	1.21 (0.70-2.10)
≥ 2	2.42 (1.14-5.14)	2.99 (1.93-4.65)	1.33 (0.61-2.93)	3.02 (1.94-4.69)	4.78 (2.03-11.27)	1.85 (1.17-2.91)
	p = 0.02	p < 0.001	p = 0.4	p < 0.001	p < 0.001	p = 0.01
Mental health						
Good	1.00	1.00	1.00	1.00	1.00	1.00
Intermediate	0.98 (0.43-2.25)	0.85 (0.54-1.36)	0.65 (0.27-1.55)	0.98 (0.62-1.55)	0.28 (0.10-0.77)	0.76 (0.47-1.23)
Poor	0.98 (0.45-2.12)	0.96 (0.59-1.56)	0.77 (0.35-1.70)	0.81 (0.49-1.33)	1.31 (0.56-3.03)	0.83 (0.49-1.40)
	p = 1.0	p = 0.8	p = 0.5	p = 0.4	p = 0.5	p = 0.4

* Multivariable logistic regression models adjusted for all the variables presented in the table; for categorical variables with more than two levels, a test for trend was performed;

** Stressful occupational activity in an average working day defined as lifting a weight of ≥ 25kg by hand (low back) or work with the hands above shoulder height for ≥ 1 hour (neck and shoulder);

*** Number of symptoms in past week causing at least moderate concern.

tendency and sickness absence in the past year, both in São Paulo (OR = 1.91 for one symptom, OR = 3.14 for two or more symptoms, p-trend = 0.01) and in Milan/Varese (OR = 1.55 for one symptom, OR = 2.32 for two or more symptoms, p-trend = 0.001).

Discussion

Our study evaluated musculoskeletal disorder prevalence in two occupational groups from different socio-cultural backgrounds, both performing very similar job tasks (nursing staff from medical wards in large public hospitals in Brazil and Italy) and compared, across different loca-

Table 4

Associations between risk factors and disabling pain in the past month by location *.

Risk factor	Low back pain		Neck pain		Shoulder pain	
	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)
Sex						
Female	1.00	1.00	1.00	1.00	1.00	1.00
Male	1.00 (0.32-3.14)	0.51 (0.27-0.95)	0.48 (0.09-2.57)	0.43 (0.20-0.90)	0.74 (0.22-2.48)	0.38 (0.20-0.72)
	p = 1.0	p = 0.04	p = 0.4	p = 0.03	p = 0.6	p = 0.003
Age (years)						
19-29	1.00	1.00	1.00	1.00	1.00	1.00
30-39	3.66 (1.01-13.32)	1.48 (0.78-2.79)	0.86 (0.19-3.94)	1.89 (0.95-3.75)	3.17 (0.95-10.60)	1.86 (1.00-3.44)
40-49	4.51 (1.33-15.28)	2.24 (1.19-4.24)	2.33 (0.65-8.30)	2.59 (1.31-5.14)	4.47 (1.48-13.49)	2.57 (1.38-4.79)
≥ 50	3.36 (0.84-13.43)	3.31 (1.59-6.89)	2.01 (0.47-8.64)	1.35 (0.60-3.02)	3.96 (1.10-14.23)	3.07 (1.49-6.30)
	p = 0.08	p < 0.001	p = 0.1	p = 0.2	p = 0.02	p = 0.001
Hours worked/week						
≤ 38	1.00	1.00	1.00	1.00	1.00	1.00
> 38	1.27 (0.51-3.16)	1.64 (1.04-2.60)	0.46 (0.13-1.62)	0.84 (0.51-1.39)	0.83 (0.32-2.14)	1.64 (1.04-2.58)
	p = 0.6	p = 0.03	p = 0.4	p = 0.5	p = 0.7	p = 0.03
Physical activity **						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes	1.01 (0.49-2.08)	0.96 (0.63-1.46)	5.44 (1.64-18.00)	2.17 (1.35-3.49)	2.50 (0.71-8.84)	1.24 (0.79-1.96)
	p = 1.0	p = 0.8	p = 0.01	p = 0.001	p = 0.2	p = 0.4
Job satisfaction						
Satisfied	1.00	1.00	1.00	1.00	1.00	1.00
Dissatisfied	2.21 (0.57-8.59)	1.88 (1.11-3.18)	1.45 (0.30-7.03)	1.70 (0.98-2.94)	5.59 (1.04-29.93)	1.46 (0.86-2.47)
	p = 0.3	p = 0.02	p = 0.6	p = 0.06	p = 0.05	p = 0.2
Somatizing tendency ***						
0	1.00	1.00	1.00	1.00	1.00	1.00
1	1.39 (0.56-3.49)	2.49 (1.44-4.31)	1.97 (0.66-5.92)	2.26 (1.25-4.08)	3.16 (1.30-7.65)	2.48 (1.46-4.20)
≥ 2	3.66 (1.62-8.24)	3.67 (2.29-5.89)	3.36 (1.26-8.96)	4.21 (2.56-6.94)	6.89 (2.89-16.40)	3.84 (2.43-6.08)
	p = 0.002	p < 0.001	p = 0.02	p < 0.001	p < 0.001	p < 0.001
Mental health						
Good	1.00	1.00	1.00	1.00	1.00	1.00
Intermediate	0.67 (0.27-1.69)	0.95 (0.58-1.55)	0.46 (0.15-1.40)	0.84 (0.50-1.39)	0.66 (0.26-1.69)	0.88 (0.55-1.42)
Poor	1.07 (0.46-2.47)	1.18 (0.70-1.99)	0.46 (0.31-2.09)	0.83 (0.47-1.47)	1.17 (0.49-2.79)	1.07 (0.64-1.79)
	p = 0.8	p = 0.6	p = 0.7	p = 0.5	p = 0.7	p = 0.9

* Multivariable logistic regression models adjusted for all variables presented in the table; for categorical variables with more than two levels, a test for trend was performed;

** Stressful occupational activity in an average working day defined as lifting a weight of ≥ 25kg by hand (low back) or work with the hands above shoulder height for ≥ 1 hour (neck and shoulder);

*** Number of symptoms in past week causing at least moderate concern.

tions, the relation of risk factors to pain, disability and sickness absence.

In our population, musculoskeletal disorder prevalence tended to be higher than that previously reported from similar occupational settings in other countries ¹⁵.

Despite possible differences in working conditions, systems of remuneration and worker

beliefs, no major inconsistencies were observed between the Italian and Brazilian nurses studied with respect to low back pain prevalence or related disability and sickness absence.

After adjustment for the effect of other individual and psychosocial risk factors, physical activity (lifting a weight of ≥ 25kg by hand) was not significantly associated with low back pain

Table 5

Associations of selected risk factors with multisite pain and sickness absence by location.

Risk factor	Multisite pain ^{*,**}		Sickness absence ^{**,***}	
	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)	São Paulo OR (95%CI)	Milan/Varese OR (95%CI)
Job satisfaction				
Satisfied	1.00	1.00	1.00	1.00
Dissatisfied	2.55 (0.63-10.35)	1.50 (0.86-2.63)	3.56 (0.83-15.28)	1.39 (0.80-2.41)
	p = 0.2	p = 0.2	p = 0.09	p = 0.2
Somatizing tendency [#]				
0	1.00	1.00	1.00	1.00
1	2.37 (0.98-5.73)	1.89 (1.04-3.44)	1.91 (0.71-5.16)	1.55 (0.85-2.83)
≥ 2	3.15 (1.40-7.08)	3.51 (2.12-5.80)	3.14 (1.27-7.80)	2.32 (1.39-3.87)
	p = 0.004	p < 0.001	p = 0.01	p = 0.001

* Pain at three or more sites in past month (reference category: pain at two or fewer sites);

** Multivariable logistic regression models adjusted for sex, age (categorical), hours worked per week, stressful physical activity (categorical: 0,1,2,3,4/+), mental health (categorical: poor, intermediate, good); for categorical variables with more than two levels, a test for trend was performed;

*** Sickness absence in past year because of any pain;

Number of symptoms in past week causing at least moderate concern.

or disabling low back pain in either Brazilian or Italian nurses.

The prevalence of neck pain and shoulder pain was similar to the observed prevalence of low back pain in both locations. An increased risk of neck and shoulder pain was observed for subjects working with the hands above shoulder height for at least one hour/day.

Somatizing tendency appeared to be a relevant risk factor for all the investigated outcomes, particularly for disabling pain, multisite pain and sickness absence. Despite possible differences in cultural and social backgrounds, these associations were seen in both locations and are consistent with findings in other studies ^{15,16}.

Major strengths of our study are: a relatively high participation rate, comparison of the same occupational group in two locations characterized by different social and cultural backgrounds, and the ability to evaluate not only pain prevalence but also – as suggested by recent investigations ^{17,18} – its consequences (disability and sickness absence).

The participation rate was 96% among Brazilian and 76% among Italian nurses, being higher or just slightly lower than response rates obtained elsewhere in the CUPID study ^{12,15}. Important response bias is therefore unlikely. While non-responders may have differed somewhat from responders in their prevalence of musculoskeletal symptoms, it seems unlikely that the differences

were so great as to seriously bias prevalence estimates. Moreover, when considering associations between musculoskeletal symptoms and risk factors, important bias is even more unlikely. These response rates were achieved while ensuring the anonymity of participants and in strict collaboration with the occupational physicians at the investigated hospitals.

Applying the same study protocol and standardized measurements of exposures and outcomes, we were able to investigate and compare the associations of prevalent musculoskeletal disorders with potential risk factors in São Paulo (located in a rapidly developing country in which musculoskeletal disorders in occupational settings were extensively investigated only recently ^{19,20}, usually without taking into account psychosocial risk factors) and in Milan and Varese (both located in a country characterized by a higher median income and a more stable economic environment). Moreover, the relation of somatizing tendency to musculoskeletal disorders had not previously been investigated in Brazil.

The main limitations of our study arise from its cross-sectional design: as is well known, the contemporary collection of data on both risk factors and health limits conclusions drawn about causal relationships. We have therefore presented our findings with caution, without interpreting them as causal relationships, and referring to

“related” or “associated” factors²¹. The direction of cause and effect in cross-sectional associations with musculoskeletal disorders is uncertain²². In our study, the lack of significant association between physical activity and low back pain may be a consequence of healthy worker selection, arising because nurses with musculoskeletal disorders tend to move (or be moved) to other hospital units where there is less frequent lifting and moving of patients. In addition, the observed association between job satisfaction and pain may be influenced by a tendency for nurses to perceive a higher workload and feel less satisfied if they are experiencing frequent musculoskeletal pain (reverse causation).

Reverse causation may also have played a role in the observed association between somatization and pain prevalence. Workers with musculoskeletal disorders might be prone to describe their “general health” more negatively. The items involved in the somatizing tendency measurement included both nonspecific symptoms (such as dizziness, chest pain, nausea and breathing difficulties), and two neurological symptoms that could in some circumstances arise from musculoskeletal disease (“feeling weak in parts of your body” and “numbness or tingling in parts of your body”). When we repeated analyses excluding these two questions, the association of somatizing tendency with low back pain (São Paulo), shoulder pain (both locations), multisite pain (São Paulo) and sickness absence (Milan/Varese) lost their statistical significance, but odds ratios

were generally only slightly reduced and in other cases remained statistically significant (data not shown).

Our study relied on self-reported information, which may have led to misclassification of some exposures. For example, a worker who was currently suffering from musculoskeletal pain might be more aware of stressful physical activities and report them more frequently. The effect of any such misclassification would be to inflate OR, and it would not explain the absence of significant associations between low back pain and lifting.

To address some of the above mentioned limitations we are planning to follow up workers for at least one year and to re-measure musculoskeletal disorders and other outcomes at the end of this period. This will allow us to prospectively evaluate the effect of the evaluated risk factors on the risk of developing new musculoskeletal disorders and the persistence of musculoskeletal disorders already present at baseline.

In conclusion, our findings support a possible role of somatizing tendency in predisposing to musculoskeletal disorders. The influence of psychosocial and cultural characteristics on musculoskeletal disorders prevalence is well described in the earlier literature^{5,23}, suggesting that they are important mediators of the individual response to triggering exposures (such as workload)¹¹. Among such characteristics, somatizing tendency is likely to play an important role, with effects across different cultural environments.

Resumo

Como parte da pesquisa internacional CUPID, comparamos os fatores de risco físico e psicossocial para distúrbios osteomusculares entre enfermeiras no Brasil e na Itália. Foram coletados dados com questionários sobre distúrbios osteomusculares e seus fatores de risco potenciais com 751 enfermeiros de hospitais públicos. Com modelos de regressão logística específicas para cada país, investigamos a associação entre atividades físicas estressantes e as características psicossociais, com dores em sítios específicos e múltiplos, assim como ausências motivadas por doença. Não encontramos clara relação entre dor lombar e levantamento de pesos, porém dores no pescoço e ombros foram as mais

relatadas entre as enfermeiras que realizam trabalho prolongado, com braços elevados. As dores na lombar, pescoço, ombros e em múltiplos sítios foram associadas à tendência somatizante e à ausência por doença em ambos os países. Nossos achados reforçam o papel da tendência somatizante como fator predisponente para distúrbios osteomusculares, atuando como um importante mediador da resposta individual.

Recursos Humanos em Enfermagem; Comparação Transcultural; Doenças Musculoesqueléticas; Absenteísmo

Contributors

M. Carugno and M. Bonzini contributed with the conception and design, acquisition analysis and interpretation of data, drafting the article and final approval of the version to be published. A. C. Pesatori and D. Coggon contributed with the conception and design, interpretation of data, critical revision of the article and final approval of the version to be published. M. M. Ferrario contributed with the conception and design, acquisition and interpretation of data, critical revision of the article and final approval of the version to be published. A. L. Ferrari, F. J. Silva, and A. C. Martins contributed with the interpretation of data, critical revision of the article and final approval of the version to be published. V. E. A. Felli contributed with the conception and design, acquisition and interpretation of data, drafting and critical revision of the article and final approval of the version to be published.

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