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EPIDEMIOLOGY

Epidemiological Differences Between Localized and Nonlocalized Low Back Pain

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Study Design. A cross-sectional survey with a longitudinal follow-up.

Objectives. The aim of this study was to test the hypothesis that pain, which is localized to the low back, differs epidemiologically from that which occurs simultaneously or close in time to pain at other anatomical sites

Summary of Background Data. Low back pain (LBP) often occurs in combination with other regional pain, with which it shares similar psychological and psychosocial risk factors. However, few previous epidemiological studies of LBP have distinguished pain that is confined to the low back from that which occurs as part of a wider distribution of pain.

Methods. We analyzed data from CUPID, a cohort study that used baseline and follow-up questionnaires to collect information about musculoskeletal pain, associated disability, and potential risk factors, in 47 occupational groups (office workers, nurses, and others) from 18 countries.

Results. Among 12,197 subjects at baseline, 609 (4.9%) reported localized LBP in the past month, and 3820 (31.3%) nonlocalized LBP. Nonlocalized LBP was more frequently associated with sciatica in the past month (48.1% *vs*. 30.0% of cases), occurred on more days in the past month and past year, was more often disabling for everyday activities (64.1% *vs*. 47.3% of cases), and had more frequently led to medical consultation and sickness absence from work. It was also more often persistent when participants were followed up after a mean of 14 months (65.6% *vs*. 54.1% of cases). In adjusted Poisson regression analyses, nonlocalized LBP was differentially associated with risk factors, particularly female sex, older age, and somatizing tendency. There were also marked differences in the relative prevalence of localized and nonlocalized LBP by occupational group.

Conclusion. Future epidemiological studies should distinguish where possible between pain that is limited to the low back and LBP that occurs in association with pain at other anatomical locations.

Key words: diagnostic classification, disability, epidemiology, low back pain, medical consultation, occupation, prognosis, risk factors, sciatica, sickness absence, somatizing.

Level of Evidence: 2

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Low back pain (LBP) is a major cause of disability among people of working age,[1] but investigation of its causes has been hindered by challenges in case definition. In most people with LBP, there is no clearly demonstrable underlying spinal pathology, and even where the pain occurs in association with structural abnormalities such as disc herniation or nerve root compression, only a minority of cases are attributable to the observed pathology.[2] In the absence of more objective diagnostic criteria, most epidemiological studies have defined cases according to report of symptoms and/or accompanying disability, and this approach has given useful insights. For example, we know that LBP is associated with heavy lifting and other physical activities that subject the spine to mechanical stresses,[3] although disappointingly, ergonomic interventions in the workplace to reduce such exposures have failed to prevent back problems.[4] Associations have also been found with psychological characteristics such as low mood,[5–7] tendency to worry about common somatic symptoms (somatizing tendency),[5,7] adverse health beliefs about musculoskeletal pain,[6] and (to a lesser extent) psychosocial aspects of work.[8]

The same psychological and psychosocial risk factors have also been linked with other regional musculoskeletal pain, for example, in the upper limb[8,9] and knee,[10] and somatizing tendency has shown particularly strong associations with multisite pain.[11] Moreover, LBP frequently occurs in combination with pain at other anatomical sites, either simultaneously or close in time.[12–15] This raises the possibility that the observed associations of LBP with psychological and psychosocial risk factors might reflect effects on musculoskeletal pain more generally, and that pain which is limited only to the low back is epidemiologically distinct from that which occurs as part of a wider distribution of pain. If this were the case, studies that failed to distinguish localized from nonlocalized LBP might miss associations with preventable causes, or incorrectly assess the impacts of treatment.

To test the hypothesis that localized and nonlocalized LBP are epidemiologically distinct, we analyzed data from CUPID (Cultural and Psychosocial Influences on Disability), a large, multinational cohort study of musculoskeletal pain and associated disability in selected occupational groups,[16] looking for differences in severity, associations with risk factors, and prognosis of LBP, according to whether or not pain was limited to the lower back.

MATERIALS AND METHODS

The study sample for CUPID comprised men and women from 47 occupational groups (mainly nurses, office staff, and workers carrying out repetitive manual tasks with their hands or arms) in 18 countries. Each of the 12,426 participants (overall response rate 70%) completed a baseline questionnaire, either by self-administration or at interview. The questionnaire was originally drafted in English and then translated into local languages as necessary, accuracy being checked by independent back-translation. Among other things, it asked about demographic characteristics, smoking habits, whether an average working day entailed lifting weights $\geq$25 kg, various psychosocial aspects of work, somatizing tendency, mental health, beliefs about back pain, and experience of musculoskeletal pain during the past 12 months.

Somatizing tendency was ascertained through questions taken from the Brief Symptom Inventory,[17] and classified according to how many of five common somatic symptoms (faintness or dizziness, pains in the heart or chest, nausea or upset stomach, trouble getting breath, and hot or cold spells) had caused at least moderate distress during the past week. Mental health was assessed through the relevant section of

the Short Form 36 (SF-36) questionnaire,[18] and scores were graded to three levels (good, intermediate, or poor) representing approximate thirds of the distribution across the study sample. Participants were classed as having adverse beliefs about the work-relatedness of back pain if they completely agreed that such pain is commonly caused by work; about its relationship to physical activity if they completely agreed that for someone with back pain, physical activity should be avoided, as it might cause harm, and that rest is needed to get better; and about its prognosis if they completely agreed that neglecting such problems can cause serious harm, and completely disagreed that such problems usually get better within 3 months.

The questions about musculoskeletal pain used diagrams to define 10 anatomical regions of interest (low back; neck; and right and left shoulder, elbow, wrist/hand, and knee). Participants were asked whether during the past 12 months, they had experienced pain lasting for a day or longer at these sites, and those who reported LBP were also asked whether the pain had occurred in the past month, whether it had spread down the leg to below the knee (sciatica), how long in total it had been present during the past month and past 12 months, whether during the past month it had made it difficult or impossible to cut toe nails, get dressed or do normal jobs around the house (disabling pain), whether it had led to medical consultation during the past 12 months, the total duration of any resultant sickness absence from work during the past 12 months, and whether the most recent episode had started suddenly while at work, suddenly while not at work, or gradually (an episode of pain was defined as occurring after a period of at least 1 month without the symptom).

After an interval of approximately 14 months, participants from 45 of the occupational groups were asked to complete a short follow-up questionnaire, which again asked about LBP in the past month.

Further details of the methods of data collection, specification of variables, and characteristics of the study sample have been reported elsewhere.[16] Approval for the study was provided by the relevant research ethics committees in each participating country.[16]

Statistical analysis was carried out with Stata software (Stata Corp LP 2012, Stata Statistical Software: Release 12.1, College Station, TX). From the baseline questions about pain, we distinguished participants who reported LBP in the past month but no pain at any other site during the past 12 months (''localized LBP''); LBP in the past month with pain at one or more other sites during the past 12 months (''non-localized LBP''); and no LBP at any time during the past 12 months. We used simple descriptive statistics to compare the features of localized and nonlocalized LBP, including the prevalence of continuing LBP (*i.e.*, present in the past month) at follow-up. Associations with risk factors were explored by Poisson regression, and summarized by prevalence rate ratios (PRRs) with 95% confidence intervals (CIs) based on robust standard errors. To account for possible clustering by occupational group, we fitted random-intercept models. A scatter plot was used to explore the correlation of localized and nonlocalized LBP across the 47 occupational groups after adjustment for other risk factors. To derive adjusted prevalence rates, we took no LBP in the past 12 months as a comparator, and first estimated PRRs for the two pain outcomes in each occupational group relative to a reference (office workers in the UK), using Poisson regression models that included the other risk factors. We then calculated the ''adjusted numbers'' of participants in each occupational group with the two pain outcomes that would give crude PRRs equal to those estimated from the regression model. Finally, we used these adjusted numbers to calculate adjusted prevalence rates.

RESULTS

From the total of 12,426 participants who completed the baseline questionnaire, we excluded 149 because of missing information about LBP in the past month (122), 12 months (2), or both (25), and a further 80 who did not provide full responses regarding pain at other anatomical sites in the past 12 months. Among the remaining 12,197 subjects (35% men), 609 (5.0%) reported localized LBP in the past month, and 3820 (31.3%) nonlocalized LBP.

Table 1 compares the characteristics of the pain in these two groups of people with low back symptoms. Nonlocalized LBP was more frequently associated with sciatica (48.1% *vs.* 30.0% in the past month), occurred on more days in the past month and past year, was more often disabling for everyday activities (64.1% *vs.* 47.3%), and had more frequently led to medical consultation and sickness absence from work during the past year. However, there was no difference between the categories of LBP in the prevalence of sudden as opposed to gradual onset.

Table 2 summarizes the associations of localized and nonlocalized LBP with various risk factors. The comparator in this analysis was no LBP at any time in the past 12 months ($n = 5501$). Nonlocalized LBP was significantly more common in women than men, and at older ages, whereas the prevalence of localized LBP was significantly higher in men, and varied little with age. Somatizing tendency was much more strongly related to nonlocalized LBP (PRR 1.7, 95% CI 1.5–1.8 for report of distress from two or more somatic symptoms) than localized LBP (PRR 1.1, 95% CI 0.9–1.4). Associations with nonlocalized pain were also stronger for poor mental health and report of time pressure at work. Direct comparison of participants with localized and nonlocalized LBP in a single Poisson regression model (effectively taking those with nonlocalized LBP as cases and those with localized LBP as controls) indicated that the differences in associations with sex, age, and somatizing tendency were all highly significant statistically ($P < 0.001$).

Figure 1 shows the 1-month prevalence of localized and nonlocalized LBP by occupational group, after adjustment for all of the risk factors in Table 2. Rates of localized LBP ranged from zero among postal workers in New Zealand and 1.0% in office workers in Nicaragua to 11.9% in Sri Lankan nurses, and 12.6% in Brazilian sugar cane cutters.

TABLE 1. Characteristics of Localized and Nonlocalized Low Back Pain

Characteristic	Localized Low Back Pain (n = 609)			Nonlocalized Low Back Pain (n = 3820)		
	N	%	(95% CI)	N	%	(95% CI)
Sciatica in the past month	183	30.0	(26.4–33.9)	1836	48.1	(46.5–49.7)
Sciatica in the past 12 months	233	38.3	(34.4–42.3)	2238	58.6	(57.0–60.2)
Total duration in past month						
1–6 days	369	60.6	(56.6–64.5)	2067	54.1	(52.5–55.7)
1–2 weeks	123	20.2	(17.1–23.6)	783	20.5	(19.2–21.8)
>2 weeks	112	18.4	(15.4–21.7)	947	24.8	(23.4–26.2)
Not known	5	0.8		23	0.6	
Total duration in the past 12 months						
1–6 days	180	29.6	(26.0–33.4)	740	19.4	(18.1–20.7)
1–4 weeks	263	43.2	(39.2–47.2)	1661	43.5	(41.9–45.1)
1–12 months	162	26.6	(23.1–30.3)	1403	36.7	(35.2–38.3)
Not known	4	0.7		16	0.4	
Disabling in past month	288	47.3	(43.3–51.3)	2447	64.1	(62.5–65.6)
Led to medical consultation in the past 12 months	255	41.9	(37.9–45.9)	1974	51.7	(50.1–53.3)
Attributed sickness absence in the past 12 months (days)						
0	475	78.0	(74.4–81.2)	2707	70.9	(69.4–72.3)
1–5	83	13.6	(11.0–16.6)	674	17.6	(16.4–18.9)
6–30	29	4.8	(3.2–6.8)	238	6.2	(5.5–7.0)
>30	10	1.6	(0.8–3.0)	85	2.2	(1.8–2.7)
Not known	12	2.0		116	3.0	
Onset of most recent episode						
Sudden while at work	167	27.4	(23.9–31.2)	1176	30.8	(29.3–32.3)
Sudden not while at work	110	18.1	(15.1–21.4)	530	13.9	(12.8–15.0)
Gradual	318	52.2	(48.2–56.2)	2015	52.7	(51.2–54.3)
Not known	14	2.3		99	2.6	

95% CI indicates 95% confidence interval.

For nonlocalized LBP, the absolute variation in prevalence was even greater—from 3.9% in Brazilian sugarcane cutters and 6.8% among office workers in Pakistan to 28.1% in Brazilian office workers and 28.8% in Brazilian nurses. However, there was no clear relationship between the two categories of LBP. Thus, as illustrated in Figure 2, the proportion of all back pain cases that were localized varied substantially, but did not consistently rise or fall as the overall prevalence of LBP increased (Spearman correlation coefficient = −0.37).

Among the 11,764 participants from whom follow-up data were sought, 9188 (78%) provided satisfactory information about LBP at a mean of 14 months (range 3–35 months, 84% within 11–19 months) after baseline. Table 3 summarizes the prevalence of continuing LBP at follow-up according to the features of pain at baseline. Overall, persistence of pain was more frequent when initially it was nonlocalized (65.6%) than when it was localized (54.1%). Moreover, both categories of pain were more likely to be persistent if there was associated sciatica at baseline.

DISCUSSION

In this large international study, we found that most LBP (86%) was nonlocalized. In comparison with localized LBP, nonlocalized LBP tended to be more troublesome, disabling, and persistent, and showed distinctive associations with risk factors. In addition, the two categories of LBP differed markedly in their relative prevalence across the 47 occupational groups that were studied.

Apart from occupational group, all of the information that was analyzed came from questionnaires. Pain, somatizing tendency, mental health, and health beliefs are all best assessed through self-report. However, it is possible that reliance on participants' recall led to inaccuracies in other variables such as smoking habits and exposure to heavy lifting at work. If so, the impact on risk estimates will have

TABLE 2. Associations of Localized and Nonlocalized Low Back Pain With Personal and Occupational Risk Factors

Risk Factor	No Low Back Pain in the Past 12 Months	Localized Low Back Pain			Nonlocalized Low Back Pain		
	N	N	PRR*	(95% CI)	N	PRR*	(95% CI)
Sex							
Male	2265	292	1		943	1	
Female	3236	317	0.8	(0.6–0.9)	2877	1.2§	(1.1–1.3)
Age, yrs							
20–29	1502	175	1		783	1	
30–39	1737	208	1.0	(0.8–1.2)	1189	1.1‡	(1.1–1.2)
40–49	1446	147	0.9	(0.7–1.1)	1203	1.2§	(1.1–1.4)
50–59	816	79	0.9	(0.7–1.1)	645	1.2§	(1.1–1.4)
Smoking							
Never smoked	3631	339	1		2349	1	
Ex-smoker	727	91	1.3	(1.0–1.7)	579	1.1	(1.1–1.2)
Current smoker	1124	176	1.3	(1.0–1.7)	885	1.1	(1.1–1.3)
Not known	19	3			7		
Activity in average working day							
Lifting weights ≥25 kg	1684	266	1.4	(1.2–1.7)	1,599	1.2	(1.1–1.3)
Psychosocial aspects of work							
Work for >50 hours per week	1394	176	1.0	(0.8–1.3)	601	1.0¶	(0.9–1.1)
Time pressure at work	3948	456	1.0	(0.8–1.2)	3046	1.2†	(1.1–1.3)
Incentives at work	1605	168	0.9	(0.7–1.1)	1054	1.0	(0.9–1.1)
Lack of support at work	1104	126	1.0	(0.8–1.3)	1190	1.1‡	(1.0–1.2)
Job dissatisfaction	1087	128	0.9	(0.8–1.1)	817	1.0	(0.9–1.2)
Lack of job control	1136	134	1.1	(0.9–1.3)	864	1.0	(1.0–1.1)
Job insecurity	1652	220	1.1	(1.0–1.3)	1277	1.1	(1.0–1.2)
Number of distressing somatic symptoms in the past week							
0	3871	406	1		1631	1	
1	983	127	1.2	(1.0–1.5)	943	1.4§	(1.3–1.5)
2+	596	70	1.1	(0.9–1.4)	1200	1.7§	(1.5–1.8)
Missing	51	6			46		
Mental health							
Good	2417	225	1		1137	1	
Intermediate	1628	181	1.1	(0.9–1.3)	1157	1.2	(1.1–1.3)
Poor	1418	198	1.2	(1.0–1.5)	1504	1.4‡	(1.3–1.5)
Missing	38	5			22		
Adverse beliefs about back pain							
Work-relatedness	1472	215	1.3	(1.1–1.5)	1617	1.3†	(1.2–1.3)
Physical activity	999	119	0.9	(0.7–1.1)	669	0.9	(0.9–1.0)
Prognosis	598	86	1.2	(1.0–1.4)	709	1.2‡	(1.1–1.3)

Prevalence rate ratios relative to no low back pain in the past 12 months derived from a single Poisson regression model for each pain outcome, with random intercept modeling to allow for clustering by occupational group.

†*Risk significantly higher for nonlocalized when compared directly with localized low back pain ($P < 0.05$).*

‡*Risk significantly higher for nonlocalized when compared directly with localized low back pain ($P < 0.01$).*

§*Risk significantly higher for nonlocalized when compared directly with localized low back pain ($P < 0.001$).*

¶*Risk significantly lower for nonlocalized when compared directly with localized low back pain ($P < 0.01$).*

depended on whether errors differed systematically according to report of pain. If they were nondifferential with respect to pain, then any resultant bias will have been toward the null. On the contrary, if they varied by pain status (*e.g.*, if participants with LBP tended to report heavy lifting more completely than those who were pain-free), then risk estimates could have been spuriously exaggerated. However, even if such biases occurred, it seems unlikely that they would have differed importantly according to whether or not LBP was localized.

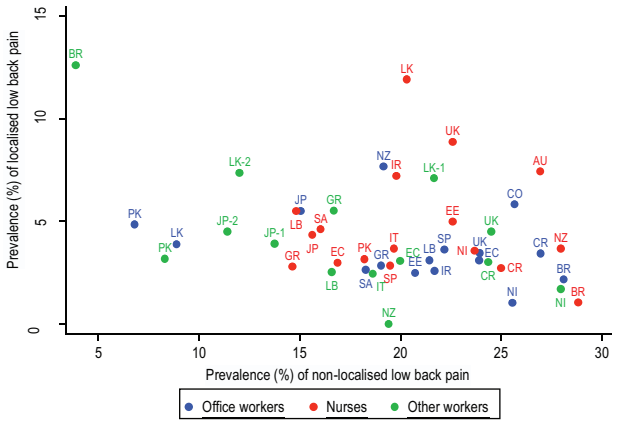

Figure 1. One-month prevalence of localized and nonlocalized low back pain by occupational group, Prevalence rates are adjusted for all of the risk factors in Table 2. AU indicates Australia; BR, Brazil; CO, Colombia; CR, Costa Rica; EC, Ecuador; EE, Estonia; GR, Greece; IR, Iran; IT, Italy; JP, Japan; LB, Lebanon; LK, Sri Lanka; NI, Nicaragua; NZ, New Zealand; PK, Pakistan; SA, South Africa; SP, Spain; UK, United Kingdom.

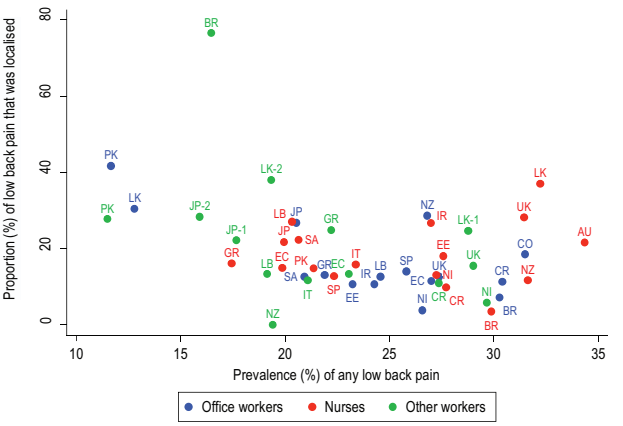

Figure 2. Proportion of low back pain that was localized according to overall prevalence of low back pain in each occupational group. Prevalence rates are adjusted for all of the risk factors in Table 2. AU indicates Australia; BR, Brazil; CO, Colombia; CR, Costa Rica; EC, Ecuador; EE, Estonia; GR, Greece; IR, Iran; IT, Italy; JP, Japan; LB, Lebanon; LK, Sri Lanka; NI, Nicaragua; NZ, New Zealand; PK, Pakistan; SA, South Africa; SP, Spain; UK, United Kingdom.

A particular methodological challenge in the CUPID study was the possibility that despite our efforts to minimize errors in translation of the questionnaires, terms for pain might be understood differently in different cultures. However, misunderstandings are less likely to have occurred in determining the anatomical location of symptoms, which was assisted by the use of diagrams. Thus, although some of the differences between occupational groups in the overall prevalence of LBP may have been a linguistic artifact, variations in the proportion of LBP that was localized are likely to be more reliable.

It seems unlikely that the differences which we found between localized and nonlocalized LBP could be explained by selective participation in the study. Eligibility for inclusion depended only on participants' employment in designated jobs and being in the specified age range, and response rates were relatively high both at baseline and at follow-up. Moreover, we can think of no reason why responders should differ from nonresponders differentially in relation to associations with nonlocalized as compared with localized LBP.

In comparison with localized LBP, nonlocalized LBP was more persistent and more often a cause of disability, sickness absence from work, and medical consultation. This accords with the observation in a Dutch study that among industrial workers with LBP, those whose pain was disabling or had lasted for longer than 3 months were more likely to have musculoskeletal comorbidity,[14] although in that investigation, rates of sickness absence and medical care-seeking were only marginally higher in subjects whose LBP was accompanied by pain in the upper extremity. Also, in a community-based Norwegian investigation, functional ability was better among participants with localized LBP than in those who reported LBP as part of widespread pain.[12] These differences may occur because people who report pain at multiple sites have a generally lower threshold for awareness and intolerance of symptoms.

Before performing our analysis, we speculated that sudden onset and associated sciatica might be indications that LBP arises from acute injury or other localized spinal pathology, and therefore would be more common among people with localized LBP. However, we found no evidence for such a relationship. On the contrary, sciatica was more prevalent among participants with nonlocalized LBP than in those whose LBP was localized.

Previous analysis of the CUPID dataset has indicated that multisite musculoskeletal pain is more common in women than men, and at older ages.[15] It is therefore unsurprising that nonlocalized LBP showed similar associations. In marked contrast, however, localized LBP was more frequent among men than women, and tended to have higher prevalence at younger ages. This is consistent with findings from a community-based survey in Norway.[12]

After adjustment for sex and age, both localized and nonlocalized LBP were associated with smoking, heavy lifting, somatizing tendency, poor mental health, adverse beliefs about occupational causation, and the prognosis of LBP, and less clearly with some psychosocial aspects of work (Table 2). Because the analysis was cross-sectional, these associations cannot necessarily be interpreted as causal, although they are consistent with findings from other studies.[3,5–8,19,20] Of greater interest are the differences in the strength of the relationships according to whether LBP was localized or associated with pain at other anatomical sites. As well as somatizing tendency, poor mental health and several psychosocial aspects of work showed significantly stronger associations with nonlocalized LBP. This could occur if the psychological risk factors were associated with proneness to pain more generally, and not specifically in the low back.

TABLE 3. One-Month Prevalence of Low Back Pain at Follow-Up According to Localization of Low Back Pain at Baseline

Category of Low Back Pain at Baseline	Number of Cases at Baseline	Low Back Pain in the Past Month at Follow-Up		
		Number of Cases	Prevalence %	(95% CI)
Localized with no sciatica in the past 12 months	282	144	51.1	(45.1–57.0)
Localized with sciatica in the past 12 months	158	94	59.5	(51.4–67.1)
All localized low back pain	440	238	54.1	(49.3–58.8)
Nonlocalized with no sciatica in the past 12 months	1199	718	59.9	(57.0–62.6)
Nonlocalized with sciatica in the past 12 months	1695	1181	69.7	(67.4–71.8)
All nonlocalized low back pain	2894	1899	65.6	(63.8–67.4)

Analysis was restricted to the 9188 cases with satisfactory information about low back pain at follow-up.
95% CI indicates 95% confidence interval.

We are aware of only one other study that has compared the epidemiology of localized and nonlocalized LBP,[12] and that did not investigate multiple risk factors as we have done. However, a prospective cohort study in Germany of patients who consulted general practitioners with chronic LBP, but in whom pain was not at the time widespread, found that transition to chronic widespread pain at follow-up was associated with female sex and a high rate of psychosomatic symptoms.[21,22] Nonlocalized LBP, as we defined it, would not necessarily be classed as chronic widespread pain—the pain may have occurred at only one other anatomical site in addition to the low back, and may have been only short-lived. Moreover, we do not know whether the onset of pain in the low back preceded or followed that at other anatomical sites. Nevertheless, our observation that nonlocalized LBP was differentially associated with female sex and somatizing tendency is consistent with the results of the German study.

When the risk factors in Table 2 were taken into account, there were also marked differences in the relative prevalence of localized and nonlocalized LBP by occupational group. Thus, the proportion of LBP that was localized varied from zero in New Zealand postal workers to 76.4% among sugarcane cutters in Brazil, with a tendency to be lower when the overall prevalence of LBP was higher (Figure 2). This again is an indication that localized LBP is epidemiologically distinct.

Our study sample was limited to men and women in employment, and we cannot be certain that the differences which were found between localized and nonlocalized LBP in severity, associations with risk factors, and prognosis would be the same in all populations. However, their observation in a large sample of workers from 18 countries across five continents is sufficient to demonstrate that potentially important epidemiological differences do occur. This suggests that where possible, epidemiological studies on the causes and prognosis of LBP should distinguish pain that is limited to the low back from that which occurs in association with pain at other anatomical locations.

Key Points

- In a large international survey, most low back pain was accompanied by current or recent pain at other anatomical sites.
- In comparison with pain that was localized entirely to the low back, that which was associated with pain elsewhere was more troublesome and persistent, and differed importantly in its associations with risk factors.
- After adjustment for other risk factors, localized and nonlocalized LBP also differed in their relative prevalence by occupational group.
- Future epidemiological studies should distinguish where possible between pain that is limited to the low back, and that which occurs in association with pain at other anatomical sites.

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