Epidemiology of Rheumatic Diseases. A Community-Based Study in Urban and Rural Populations in the State of Nuevo Leon, Mexico

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ABSTRACT. ***Objective.*** To estimate the prevalence of rheumatic diseases in rural and urban populations using the WHO-ILAR COPCORD questionnaire.

Methods. We conducted a cross-sectional home survey in subjects > 18 years of age in the Mexican state of Nuevo Leon. Results were validated locally against physical examination in positive cases according to an operational definition by 2 rheumatologists. We used a random, balanced, and stratified sample by region of representative subjects.

Results. We surveyed 4713 individuals with a mean age of 43.6 years (SD 17.3); 55.9% were women and 87.1% were from urban areas. Excluding trauma, 1278 individuals (27.1%, 95% CI 25.8%–28.4%) reported musculoskeletal pain in the last 7 days; the prevalence of this variable was almost twice as frequent in women (33% vs 17% in men); 529 (11.2%) had pain associated with trauma. The global prevalence of pain was 38.3%. Mean pain score was 2.4 (SD 3.4) on a pain scale of 0–10. Most subjects classified as positive according to case definition (99%) were evaluated by a rheumatologist. Main diagnoses were osteoarthritis in 17.3% (95% CI 16.2–18.4), back pain in 9.8% (95% CI 9.0–10.7), undifferentiated arthritis in 2.4% (95% CI 2.0–2.9), rheumatoid arthritis in 0.4% (95% CI 0.2–0.6), fibromyalgia in 0.8% (95% CI 0.6–1.1), and gout in 0.3% (95% CI 0.1–0.5).

Conclusion. This is the first regional COPCORD study in Mexico performed with a systematic sampling, showing a high prevalence of pain. COPCORD is a useful tool for the early detection of rheumatic diseases as well as for accurately referring patients to different medical care centers and to reduce underreporting of rheumatic diseases. (J Rheumatol 2011;38 Suppl 86:9–14; doi:3899/jrheum.100952)

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Rheumatic diseases are characterized by chronic discomfort and functional limitation due to progressive joint and soft-tissue involvement. Manifestations associated with this group of diseases frequently cause varying degrees of physical disability, which means a high cost for patients, their families, and society. Reported prevalence rates seem to change according to diagnosis, ethnicity, age, and gender. Of these, osteoarthritis (OA) is the most frequent joint disease. The prevalence of knee OA is 2.0% to 42.4%, affecting women more frequently[1], and increases with age, reaching 80% in individuals over 75 years[2]. However, the distribution of inflammatory diseases in adults, such as rheumatoid arthritis (RA; 0.3%–1%)[3], ankylosing spondylitis (AS; 0.15%–0.21% in the general population)[4], and systemic lupus erythematosus (SLE; 0.042%–0.067%)[5] is low.

In general, studies of prevalence of rheumatic diseases have methodological difficulties mostly due to selection bias, particularly if the information is obtained from hospitals. Another source of bias is related to case definitions used to diagnose each disease.

The Community Oriented Program for the Control of the Rheumatic Diseases (COPCORD) has been endorsed by the International League of Associations for Rheumatology (ILAR) and the World Health Organization (WHO) to obtain reliable epidemiological information from the community[6].

In 2002, Cardiel and Rojas-Serrano studied an adult population from a suburban community in central Mexico and found that more than half of those interviewed who had musculoskeletal (MSK) pain had some type of rheumatic disease confirmed by a physician. That study relied on the COPCORD stage 1 questionnaire to screen the population[7].

Rheumatic diseases in general do not increase short-term mortality; therefore, they are not considered health and education priorities, but due to their influence on quality of life and their strong socioeconomic impact, they are becoming a public health problem. Direct and indirect costs involved in these disorders are considerable[8,9]. In Mexico, such costs are also elevated and are the leading cause of permanent disability due to illness among affiliates of the Mexican Social Security Institute (IMSS). They comprise almost 7% of the consultations with the family physician in this institution[10].

There are differences between urban and rural populations in relation to living conditions, access to healthcare services, and infrastructure available. However, the prevalence of MSK disorders has not been studied in other regions in Mexico and it is likely that some of the above-mentioned differences, as well as the role of occupation and trauma[11], could contribute to different prevalence figures of MSK disorders between communities.

The aim of this study was to determine the prevalence of rheumatic diseases in a population in northeast Mexico and to obtain information on their characteristics.

MATERIALS AND METHODS

Study design. We carried out a cross-sectional home survey by trained interviewers using the COPCORD questionnaire. This research project was approved by the Ethics Committee of the Hospital Universitario "Dr. José Eleuterio González" of the Universidad Autónoma de Nuevo León and all subjects who agreed to participate in this study provided signed informed consent before starting the interview.

The survey was carried out in the State of Nuevo Leon, which is located in northeast Mexico on the southern border of the USA[12]. Its climate is semi-arid with extreme temperatures; very hot in the summer and cold in the winter. It has an area of 64,220 km^2. Of the population, 0.5% are Native American ancestry who are not originally from the region[13]. Monterrey, the capital, is the third most developed urban area of Mexico, with an annual average gross domestic product (2003–2008) growth rate of 5.2% compared with 3.4% for the rest of the country. Mean annual unemployment (2003–2008) is 5% versus 3.7% nationally[14]. Migration in the state of Nuevo Leon is lower than elsewhere in Mexico. With regard to the percentage distribution of the migrant population in the state, men exceed women by 16.2%. At the time this study was performed, an estimated population of 4,199,292 subjects were registered, with 65% being ≥ 18 years old[13]. Nuevo Leon has traditionally been divided into 6 regions; however, we divided it into 7 regions because the state capital was considered a region per se.

The ethnic composition of urban and rural areas in the region is similar. However, in rural areas there are fewer basic home services, there is a greater percentage of individuals who are illiterate, and there is more migration in comparison with the urban population[13].

Subject selection. Sample size, based on a pilot study in which prevalence of MSK complaints was 50% with a 3% uncertainty level and a 95% confidence interval with a power of 80% to discriminate a 5% difference in prevalence between regions, was estimated at 3208. The pilot study showed a response rate of 85% after 5 home visits and due to the complexity of the design, the sample size was estimated at 5000 subjects.

An updated census (2005) by Mexico's National Institute of Statistics, Geography and Informatics was used to generate a stratified (by region), balanced, and random sample of subjects ≥ 18 years old that was representative of the entire state. In each region a second random assignment was done to select one or more municipalities (according to proportional sample size); in each municipality one or more basic statistical areas[15,16] were selected to carry out interviews in all homes. In each home all subjects ≥ 18 years of age were interviewed by 6 interviewers, and staff trained coordinators. If one or more of the potential participants was not located at first visit, the home was visited 3 more times; after that, if the selected subject could not be interviewed, no other person replaced them.

Case definition. The COPCORD questionnaire was considered positive when individuals reported MSK pain > 1 on visual analog scale (0–10) during the last 7 days that was not associated with trauma or a history of pain. However, for the medical examination, all individuals that reported MSK pain, including pain associated with trauma, were evaluated. The medical examination was conducted primarily by a general practitioner on the day of the interview. Subjects with suspected rheumatic disease were evaluated in the community by certified rheumatologists to confirm diagnosis and provide adequate followup. For diagnosis of OA, RA, fibromyalgia, and SLE we used the American College of Rheumatology criteria[17,18,19,20,21]; for gout we used the Wallace criteria[22]; and for AS the modified New York criteria[23]. For nonspecific cases of MSK disorders, we used the International Classification of Diseases, 10th revision[24]. The maximum time period between interview and medical examination by a specialist was 7 days. The results of laboratory or radiographic studies were collected when available.

Statistical analysis. Prevalence (%) and 95% CI were calculated by region and by all variables included in the COPCORD screening questionnaire. Variables that were included in the theoretical model were reported as measures of central tendency and dispersion for continuous variables and as absolute and relative frequencies for ordinal, nominal, or categorical variables. Bivariate analysis was performed for each study variable, using one- and 2-way analysis of variance for continuous variables and chi-square for nominal or categorical ordinal variables.

A logistic regression model was used to estimate crude and adjusted OR in assessing the association of presence of nontraumatic pain over the past 7 days and all variables included in the COPCORD questionnaire. Statistical analysis was performed using the statistical package Stata SE version 9.0 for Windows[25].

RESULTS

Our study was conducted between August 2008 and June 2009. The response rate to the COPCORD questionnaire was 94.2%. There were 4713 participants who responded, of whom 2639 (56%) were women and 2074 (44.0%) men, with an average age of 43.6 years (SD 17.3). Age distribution is shown in Table 1. At time of the study, 3567 (75.7%) were employed and 1146 (24.3%) were housewives. Occupations were reclassified as those that involve a repetitive activity and/or a load ≥ 4 kg versus those that do not. Of the total population, 2210 (46.9%) had a job that

Table 1. Distribution by age group.

Age Group, yrs	Men, n = 2078, no. (%)	Women, n = 2635 no. (%)	Total, n = 4713 no. (%)
18–25	415 (19.9)	466 (17.6)	881 (18.6)
26–35	412 (19.8)	503 (19)	915 (19.4)
36–45	375 (18)	456 (17.3)	831 (17.6)
46–55	330 (15.8)	503 (19)	833 (17.6)
56–65	284 (13.6)	391 (14.8)	675 (14.3)
66–75	175 (8.4)	207 (7.8)	382 (8.1)
> 76	87 (4.1)	109 (4.1)	196 (4.1)

involved a physical effort and 2503 (53.1%) did not. Comorbidity was present in 3535 (75%).

Pain report. Pain over the last 7 days was reported by 1807 subjects (38.3%, 95% CI 36.9–39.7), of whom 529 (11.2%, 95% CI 10.3–12.1) associated this pain to a traumatic event, while 1278 (27.1%, 95% CI 25.8–28.4) did not relate pain to trauma. Pain intensity by visual analog scale (VAS) was 2.4 (SD 3.4). There was a difference in the prevalence of pain between men and women irrespective of age, with women reporting more frequent pain ($p < 0.01$; Table 2).

When we used pain in the last 7 days and no trauma as our case definition (definition 1) from Cardiel, *et al*, and added a VAS ≥ 4 to this definition[7], we found 1086 (23%, 95% CI 21.8–24.2) individuals. Pain at some point in a lifetime with an intensity of 0.6 (SD 2.0) was reported by 524 subjects (11.1%, 95% CI 10.2–12). The most affected parts of the body in the last 7 days and at least once in a lifetime were the knees, wrists, shoulders, and spine (Table 3). Mean duration of pain was 1 year (interquartile range 0.38–4).

Of the patients who reported pain in the last 7 days with no history of trauma, 555 (11.8%) presented pain in only one region and 1794 (38%) had pain in 2 or more regions (range 1–21). With regard to pain at least once in a lifetime, 378 (8%) individuals reported pain in at least one location and 146 (3%) in 2 or more.

Physical limitations related to pain. Of the total, 4208 (89.3%) had never had limitations, 443 (9.4%) reported limitations only at a time in the past, and 57 (1.2%) described a current limitation. In contrast, among patients who reported pain, 1418 (78.5%) never had a physical limitation, 336 (18.6%) had a limitation in the past, and 52 (2.8%) had a current limitation. These differences were clinically significant.

Table 2. Distribution of nontraumatic pain in the last 7 days by age group.

Age, yrs	Male, n = 605 no./total (%)	Female, n = 1202 no./total (%)	OR (95% CI)	p
18–25	55 (9)	108 (8.9)	1.9 (1.3, 2.8)	0.001
26–35	81 (13.3)	168 (13.9)	2.0 (1.5, 2.7)	0.000
36–45	103 (17)	201 (16.7)	2.0 (1.5, 2.7)	0.000
46–55	125 (20.6)	303 (25.2)	2.4 (1.8, 2.3)	0.000
56–65	119 (19.6)	231 (19.2)	2.0 (1.4, 2.7)	0.000
66–75	77 (12.7)	121 (10)	1.7 (1.1, 2.6)	0.000
> 76	45 (7.4)	70 (5.8)	1.6 (0.9, 2.9)	0.000

Table 3. Frequency (percentage) of current pain in the past.

Pain Location	Current Pain % (n)	No. of Days, Median (IQR)	Pain in the Past % (n)
Knee	31 (1547)	365 (168–1460)	27.3 (278)
Wrists	19.2 (959)	365 (140–1460)	19.4 (198)
Shoulders	14.3 (716)	730 (168–1825)	12 (123)
Spine	13.8 (693)	365 (126–1460)	20.1 (205)
Ankles	9 (449)	365 (140–1825)	8.5 (87)
Elbows	7.7 (388)	365 (140–1460)	6.1 (63)
Hips	4.1 (209)	730 (90–1825)	5.8 (60)
Other	0.7 (27)		0.4 (4)

Physical disability by Health Assessment Questionnaire-Damage Index (HAQ-DI)[26]. We found differences with regard to disability. A group of 940 individuals (20%) expressed some discomfort when kneeling (43.5% vs 5.3%) or squatting (44.12% vs 4.5%) in groups with MSK pain compared to those without pain ($p < 0.01$). The mean HAQ-DI score was 0 (IQR 0–3). The most commonly reported symptoms on the HAQ-DI were associated with knee dysfunction, which was the most frequently reported site.

Diagnosis. Of the respondents, 50.4% scored positive on the COPCORD questionnaire (pain in the last 7 days or history of pain); 98.8% of patients were examined by a rheumatologist; and 1.2% refused medical examination. The prevalence of rheumatic diseases is shown in Table 4.

Four subjects were diagnosed with psoriatic arthritis (0.08%, 95% CI 0.02–0.20), 2 subjects for each entity were diagnosed with AS, scleroderma, and SLE (0.04%, 95% CI 0.05–0.10), one subject had Wegener's granulomatosis, and another had polymyositis.

Treatment. Some type of treatment was used in 2391 (50.7%) patients: 1174 (49.10%) took nonsteroidal antiinflammatory drugs, 594 (24.8%) analgesics, 89 (3.72%) vitamin B, 89 (3.72%) disease-modifying drugs (DMARD), and

Table 4. Prevalence of rheumatic disorders in the selected population.

Diagnosis	Total, n = 4713 no. (%)	95% CI
Osteoarthritis	815 (17.3)	16.2, 18.4
Musculoskeletal complaint	510 (10.8)	9.9, 11.7
Back pain	464 (9.8)	9.0, 10.7
Undifferentiated arthritis	116 (2.4)	2.0, 2.9
Fibromyalgia	40 (0.8)	0.6, 1.1
Rheumatoid arthritis	20 (0.4)	0.2, 0.6
Gout	16 (0.3)	0.1, 0.5
Psoriatic arthritis	4 (0.08)	0.02, 0.2
Ankylosing spondylitis	2 (0.04)	0.05, 0.1

59 (2.47%) took calcium supplements; 162 subjects (6.78%) did not remember. In 1891 subjects (79.08%), medication was prescribed by a physician, 15 (0.62%) self-medicated, 4 (0.16%) obtained treatment at the pharmacy, and the rest did not remember. A group of 1694 (36%) received more than one medication. A second group of 144 (3%) received physical therapy, and a third group of 77 individuals (1.6%) reported surgical treatment.

Coping with MSK symptoms. There were 1218 (25.8%) individuals who reported that they coped "well" with MSK symptoms, 44 (0.93%) "not that well," 175 (3.7%) "very well," and 59 (1.2%) "not at all."

Comparison of MSK symptoms among urban and rural communities. We analyzed the frequency of MSK symptoms in patients from rural and urban communities and found differences in pain in the last 7 days (43.5% vs 37.5%, respectively; $p < 0.01$), pain in the last 7 days without trauma (30.6% vs 26.6%; $p = 0.03$), and a history of pain (18.1% vs 10%; $p < 0.01$). Prevalence of OA, MSK symptoms, undifferentiated arthritis, and use of treatments showed differences (Table 5).

In a logistic regression model, using the presence of pain in the last 7 days as the dependent variable, we found 3 associated variables: having a high score (> 0.8) on HAQ-DI (adjusted OR 12.1, 95% CI 8.0–18.4), being a woman (OR 1.4, 95% CI 1.2–1.7), and being married (OR 1.1, 95% CI 1–1.3). Coping very well with symptoms was associated with less frequent reported pain (OR 0.6, 95% CI 0.6–0.6).

DISCUSSION

This was the first study carried out in Nuevo Leon in a relatively short period of time[27] that included a representative sample of an entire region. This study validated the COPCORD method in the selected population.

In our study population 27.1% reported pain in the last 7 days, excluding trauma, with an average intensity on VAS of 2.4. Only 10.6% described a current or past physical limitation. The most frequently reported diagnosis was OA, and almost half of the COPCORD positive population reported having received treatment currently and in the past.

About 94% of the population in Nuevo Leon lives in urban areas and only 6% in rural areas[13]. With regard to age distribution, there is a marked reduction in the oldest age groups[13], similar to that found in our current study.

There was a similarity between self-reported comorbidities found in our study and the mean of the general population of the region and Mexico, with a lower tendency of smoking, alcoholism, and obesity[28]. This information was obtained from the patient's perspective, and diagnoses were not confirmed by the study physician on physical examination or with clinical tests.

The perception of pain in the last 7 days (38.3%) was greater than that reported in studies in Cuba (34.5%)[29] and Brazil (30.9%)[27]. Although the latter study did not specify whether pain was in the last 7 days or was historical, their results are notable because they used a methodology similar to ours. The results in our study can be attributed to the fact that the age of our respondents was higher.

A regional study conducted in Mexico by Cardiel and Rojas-Serrano[7] in 2002 showed a lower prevalence of pain (23%). Although both studies were performed in the same country, the time period and the regional and social environments were different, which could explain differences in the results. The perception of an unsafe community may be a factor that predisposes to more frequent reporting of pain, possibly attributed to social stress[30,31]. In contrast, pain in the past 7 days not associated with trauma was predominant in our population (27.1%). Taking into account a VAS pain score > 4, we found that our population had a higher proportion of affected individuals (23%) compared with the study by Cardiel and Rojas-Serrano (17%). This could explain why about half of our subjects who scored positive on the questionnaire had a diagnosis of rheumatic disease; and their ailments were not due to a temporary or trivial event. Although in our study a larger number of participants reported pain, their pain intensity, whether historical or of recent onset, was lower than that reported in a previous study in Mexico. This may be due to specific characteristics of the region[32,33].

The knee was the most common site for recent and past pain. The spine was the second most frequently reported location. These results correspond to the most frequent diag-

Table 5. Distribution (%) of rheumatic disorders in urban and rural communities.

Diagnosis	Rural, n = 611 % (95% CI)	Urban, n = 4102 % (95% CI)	p
Osteoarthritis	22.9 (19.6, 26.4)	16.4 (15.3, 17.6)	< 0.01
Musculoskeletal complaint	14.8 (12.1, 17.9)	9.5 (8.6, 10.4)	< 0.01
Back pain	2.2 (1.8, 2.7)	7.5 (6.8, 8.3)	< 0.01
Undifferentiated arthritis	3.9 (2.5, 5.7)	2.2 (1.8, 2.7)	0.01
Fibromyalgia	1.3 (0.5, 2.5)	0.7 (0.5, 0.1)	NS
Rheumatoid arthritis	0.1 (0.04, 0.9)	0.4 (0.2, 0.7)	NS
Gout	0.3 (0.3, 1.1)	0.3 (0.1, 0.5)	NS

NS: nonsignificant.

noses in our individuals (OA and back pain). A small percentage of the population refused to be evaluated even though a rheumatologist performed the medical examination in the community, but this did not affect our results.

Although a higher proportion of our individuals reported MSK symptoms (48.4%), 89.3% said they never had any limitation of their activities, and only a small percentage mentioned a current limitation. Most individuals said they were well adapted to their symptoms. This can be attributed to a sociocultural aspect observed, albeit not as marked, in other regional studies[7,27,29]. An adequate adaptive response to pain may facilitate progression of disease and be a factor that determines delay in early diagnosis of a rheumatic disease. Not everyone in Mexico has health services, and this can also contribute to a delay in diagnosis. General practitioners can utilize the COPCORD core questionnaire as a tool for early detection of rheumatic disease and individual referral.

Self-reported diagnoses and those made by the rheumatologist differed; however, in both cases OA was the most frequent diagnosis. This indicates that individuals may know the correct diagnosis. It is important to point out that there was under-reporting of gout and fibromyalgia.

No subject self-reported back pain. Low back pain was probably not considered limiting, so patients did not seek medical care. Another important finding in our study was the presence of entities that are infrequent in the general population, including SLE, scleroderma, Wegener's granulomatosis, and polymyositis. This could be due to the large sample size. However, we must point out that the COPCORD questionnaire detects only entities characterized by MSK pain or symptoms at some point in life or at the present time.

With regard to diagnosis, we tried to reach the highest degree of resolution. In our population, 42.3% had a rheumatologic diagnosis. The distribution of diagnoses was similar to that reported in other studies, except that by Cardiel and Rojas-Serrano[7]. They found a lower prevalence, probably because they considered only those individuals reporting VAS pain severity > 4. It is notable that 116 individuals (2.4%) had signs of undifferentiated arthritis. They are still in followup at our early arthritis clinic.

Half our population reported having received some form of treatment. As expected, NSAID were the most widely used, and DMARD one of the least used. Self-medication was low in our population compared to Cardiel and Rojas-Serrano[7] (0.66% vs 4.5%, respectively), and we believe this can be attributed to cultural differences.

Few studies have been conducted with the COPCORD methodology in regions that include rural and urban areas. Chopra, *et al*[31], in an initial study, found that there was similarity in the prevalence of MSK symptoms and diagnoses in both communities. A second recent study[33] reports that although the distribution of rheumatic diseases and pain sites is similar, there is a lower frequency of these conditions in urban communities. We found significant differences between urban and rural areas. There was a greater number of people with pain symptoms in rural areas and there were also more individuals affected by OA, MSK symptoms, and undifferentiated arthritis in comparison with urban areas, where back pain was more frequent. The type of physical activity of people in rural areas and a lack of medical care may explain this finding. Further, our rural population was mostly women and older individuals. This may be due to the higher percentage of unemployment and the migration of men to the USA, which is common in some regions near the border. We must emphasize that despite these results, we found no statistically significant differences in relation to disability between the 2 communities. It is important to consider regional variability because although the prevalence in our study was within the expected ranges for these diseases, we detected differences in frequency. An important point in our study was a female population of 56%, which contrasts with others of similar methodology in which women exceed 60%.

Our study shows that MSK pain is a major health problem and that the most common complaints are knee and back pain. OA was the most frequently identified joint disease and the prevalence of RA was similar to that reported in other regional studies. We found differences between urban and rural areas, with a greater presence of MSK symptoms in the latter. We also found that COPCORD is a very useful screening tool for community surveys of MSK complaints.

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