Epidemiology of the Rheumatic Diseases in Mexico. A Study of 5 Regions Based on the COPCORD Methodology

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ABSTRACT. ***Objective.*** To estimate the prevalence of musculoskeletal (MSK) disorders and to describe predicting variables associated with rheumatic diseases in 5 regions of México.

Methods. This was a cross-sectional, community-based study performed in 5 regions in México. The methodology followed the guidelines proposed by the Community Oriented Program for the Control of the Rheumatic Diseases (COPCORD). A standardized methodology was used at all sites, with trained personnel following a common protocol of interviewing adult subjects in their household. A "positive case" was defined as an individual with nontraumatic MSK pain of > 1 on a visual analog pain scale (0 to 10) during the last 7 days. All positive cases were referred to internists or rheumatologists for further clinical evaluation, diagnosis, and proper treatment.

Results. The study included 19,213 individuals; 11,602 (68.8%) were female, and their mean age was 42.8 (SD 17.9) years. The prevalence of MSK pain was 25.5%, but significant variations (7.1% to 43.5%) across geographical regions occurred. The prevalence of osteoarthritis was 10.5%, back pain 5.8%, rheumatic regional pain syndromes 3.8%, rheumatoid arthritis 1.6%, fibromyalgia 0.7%, and gout 0.3%. The prevalence of MSK manifestations was associated with older age and female gender.

Conclusion. The prevalence of MSK pain in our study was 25.5%. Geographic variations in the prevalence of MSK pain and specific diagnoses suggested a role for geographic factors in the prevalence of rheumatic diseases. (J Rheumatol 2011;38 Suppl 86:3–6; doi:10.3899/jrheum.100951)

Key Indexing Terms:
EPIDEMIOLOGY MEXICO RHEUMATIC DISEASE COPCORD METHODOLOGY

The rheumatic diseases encompass an important group of clinical conditions and specific diseases affecting a significant proportion of the world population. Rheumatic diseases are distinguished by the presence of musculoskeletal (MSK) pain, stiffness, reduced mobility, and inflammation. The consequences of rheumatic diseases extend to all areas of quality of life. The burden imposed by rheumatic diseases to the society may be high.

Until now most of the information related to the prevalence and influence of the rheumatic disease comes from developed countries and little from developing nations. Information from Latin America is particularly scarce.

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Nevertheless, according to recent reports, MSK pain contributes to the burden of disease in 1.7% of the population in developing countries in contrast to 3.4% in developed nations[1].

The prevalence of MSK pain in Latin America includes reports of 23.0% in the community of San Pedro Martir in México City[2], 34.5% in the community of Santa Catalina, 43.9% in Havana, Cuba[3,4], 30.9% in the State of Minas Gerais, Brazil[5], and 47.0% in a Peruvian community[6]. Of note is that such Latin American studies have followed the same methodology, specifically the World Health Organization/International League of Associations for Rheumatology (WHO/ILAR) Community Oriented Program for the Control of Rheumatic Diseases (COPCORD) stage 1, which collects data on the prevalence of MSK disorders in the community and establishes a diagnosis[7]. COPCORD has been particularly useful in developing countries all over the world.

In the Mexican study, 63.0% of the individuals who scored positive in the COPCORD core questionnaire in the community had a rheumatic disease[2]. Nevertheless, there is a need to replicate such studies in other communities in México in order to increase validity and reproducibility of the findings on other types of urban and rural communities elsewhere in the country. Therefore we carried out a study to estimate the prevalence of MSK disorders and to identify variables associated with rheumatic diseases in 5 regions of México.

MATERIALS AND METHODS

Our cross-sectional study consisted of a community-based survey. The main protocol was approved in each region by local ethics committees. All participants provided signed informed consent before entering the study. Every subject identified as having any disease without medical care was advised to look for medical assistance and directed to the appropriate level of care.

Sampling and settings. Sample size was calculated according to results of a pilot study that considered a 50% prevalence of MSK complaints with a 3% uncertainty level, 95% of confidence level, and with 80% power to discriminate up to 5% of differences in prevalence. In every participating site, a pilot study with 100 subjects was conducted to adjust sample size to calculate participation rate and validity of the survey. Study sites were located in the states of Chihuahua, Nuevo León, Sinaloa, Yucatán, and in México City. Selection of these regions took into account 2 criteria: geography and the availability of local researchers interested in epidemiologic data in rheumatology (Figure 1).

A multistage random probability sampling was used for the states of Nuevo León, Sinaloa, and Yucatán. The 2005 census was used to generate a sample of subjects aged 18 years and older, stratified by region, to obtain a representative proportion of adults across all states and regions. In each region a second random assignation was made to select one or more municipalities according to proportional sample size, and in each municipality one or more basic geostatistical areas were selected to interview all households[8]. An updated census was used in México City for the 3 participating communities (Corpus Christi, Cuajimalpa III, and Santa Lucía) as well as for the Aldama community in Chihuahua. All sampling procedures were aimed at having a regional representation that could be used locally for epidemiologic purposes as well as for healthcare planning.

Characteristics of the population. México is divided into 31 states and one Federal District, México City. The 2005 population census by the National Institute of Statistics and Geography (INEGI) reported a population of 103,263,388 inhabitants. Of these, 76% were distributed in urban areas and 24% lived in rural communities. The mean education level was 8.1 years and the literacy rate 91.6%. The average annual income of the economically active population was $6316.74 US. Sixteen out of 1000 inhabitants migrated to the USA in 2005[8].

Chihuahua is the country's largest state. It has 3,241,444 inhabitants, accounting for 3.1% of the country's total population. Its capital city is Chihuahua. For this study, we chose the community of Aldama. Eighty-four percent of the population lives in urban and 16% in rural communities. The mean education level at that time was 8.3 years. The income of the economically active population was below the national average ($6022), comprising 3.3% of the gross domestic product (GDP). There are 549 public healthcare units with 5772 physicians and 100 private healthcare units with 649 physicians. The city's migration rate is similar to the national rate (16/1000)[8].

The state of Nuevo León is located in the northeastern part of México and has 4,199,292 inhabitants (50% female), representing 4.1% of the country's total population. The capital city is Monterrey. The population is distributed across 94% urban and 6% rural communities. The mean education level was 9.5 years. The income of the economically active population was above the national average ($7706), making up 7.5% of the GDP. There are 662 public healthcare units with 6828 physicians and 64 private healthcare units with 544 physicians. The state has a lower migration rate (9/1000)[8].

Sinaloa is located in northwest México, and Culiacan is its capital. The population is 2,608,442 (50.3% female), accounting for 2.5% of the country's population, distributed across 71% urban and 29% rural communities. The mean education level was 8.5 years. The income of the economically active population was below the national average ($3975), representing 1.9% of GDP. There are 454 public healthcare units with 5238 physicians and 69 private healthcare units with 113 physicians. The state has a high migration rate (14/1000)[8].

México City is the capital of México with a population of 8,720,916, representing 8.4% of the country's total population. Education level is 10.2 years. México City accounts for 21.1% of the GDP. It is made up of 16 delegations. Among them is Cuajimalpa de Morelos, which has 3 communities that participated in this study. There are 541 public healthcare units with 24,140 physicians and 302 private healthcare units with 3603 physicians. México City has a low international migration rate (7/1000)[8].

The state of Yucatán is located in southeast México, with Merida as its capital. There are 1,818,948 inhabitants (50.7% female), accounting for 1.8% of the country's population, distributed across 83% urban and 17% rural communities. The mean education level is 7.6 years. The income of the economically active population is below the national average ($3426), representing 1.4% of GDP. There are 376 public healthcare units with 3396 physicians and 35 private healthcare units with 139 physicians. The state has a low migration rate (4/1000)[8].

At the time when the study was performed, 65% of the subjects in each state (Chihuahua, Nuevo León, Yucatán, and Sinaloa) were age 18 years and older. One community from each metropolitan area was selected in each region to participate in a pilot study in which the COPCORD questionnaire was applied in order to prepare the final study.

Screening tool. The Mexican version of the COPCORD core questionnaire was used to detect MSK pain. The COPCORD questionnaire has 8 sections evaluating: (a) sociodemographic data, (b) self-reported illnesses, (c) work history, (d) MSK pain during the past 7 days, measured as pain intensity (0–10) and perceived severity (0–10), (e) MSK pain for any period of time in the past, (f) functional disability, (g) coping, and (h) help-seeking behavior[7]. In addition, a sociodemographic questionnaire was specifically designed to include the following data: education, access to healthcare, family income as per INEGI, and various individual household characteristics. A manual of these questionnaires prepared to train interviewers is available upon request.

Survey. In each household subjects aged 18 years and older were interviewed. If one or more of the potential participants could not be located on the first visit, the household was visited up to 4 more times in an effort to find the selected individual for interviewing. No substitutes were made for nonparticipants. No more than 7 days passed between the administration of the COPCORD questionnaire and the medical examination; in most cases clinical evaluation was performed on the same day. In addition, strategies to administer the surveys and the medical examinations on weekends and outside business hours were implemented in order to minimize sampling biases, e.g., women and older people over-representing subject population.

The survey was administered only after obtaining a signed informed consent form from each participant. The COPCORD questionnaire was used at all sites and the socioeconomic questionnaire at 3 sites (México City, Sinaloa, and Yucatán). All subjects reporting pain, swelling, or stiffness over the last 7 days and at any point during their lives were considered positive for clinical examination by a team of family doctors, internists, and rheumatologists undergoing specific interview training. If the examined subjects had a clinical evaluation suggesting a rheumatic disease, they were examined further by a team of board certified rheumatologists.

Case definitions. 1. A "positive case" was defined as an individual with nontraumatic MSK pain > 1 on a visual analog pain scale (0–10) during the last 7 days or in the last 6 months. All these subjects were evaluated searching for a rheumatic disease.

Case definitions. 2. Final diagnoses were based on standardized medical classification criteria including inflammatory back pain[9], rheumatoid arthritis (RA)[10], osteoarthritis[11,12], fibromyalgia[13], systemic lupus erythematosus (SLE)[14], gout[15], spondyloarthropathy[16], and ankylosing spondylitis[17]. For nonspecific cases of MSK disorders, the International Classification of Diseases, 10th revision, published by the World Health Organization was used[18]. All individuals with a diagnosis were properly treated or referred for appropriate medical treatment.

Statistical analysis. The data were entered through a Web interface into a database designed for the study. All analyses were conducted using Stata v.10. A chi-square test was used to compare prevalence and percentages, while the comparison of mean values was done by the Student's t-test. P values ≤ 0.05 were considered significant; 95% confidence intervals (95% CI) were given where relevant. A logistic regression model was used for assessing the association of nontraumatic pain over the past 7 days and the diagnosis of a rheumatic disease given by a rheumatologist adjusting by factors such as gender, age, work status, and type of community (urban or rural). A simple weighting strategy was used for the basic estimation process due to the unequal probabilities of selection and based on the inverse probability. Sampling weights were constructed so that each sampling unit could be inflated or expanded to represent other individuals or households in each state. Mathematically, the sampling weight represents the inverse probability of each selection unit in the sample. That probability is then the cross-product of probabilities at each stage of sampling, separately and independently for each state. The final component is a post-stratification adjustment for age and gender, using the last census figures for México. If needed, corrections for specific response rates were also made[19,20].

RESULTS

A total sample size of 25,587 study subjects was calculated. Participation rate varied widely across regions, ranging from 43.2% to 100% (Figure 1). Of 19,213 participants, 11,602 (60.3%) were female, mean age was 42.8 years, SD 17.3 years; 12,961 (67.4%) were married, and 15,255 (79.4%) had a paid job. The distribution of the sample by region can be seen in Figure 1. Most participants (17,565; 91.4%) answered the questionnaire on sociodemographic information. The mean education level was 8.5 years, SD 4.7 years; 90.1% reported a monthly income below $485.6 US or 5196 pesos; 10.6% preferred not to answer this question; 27.5% lacked healthcare coverage. Urban respondents numbered 13,415 (69.8%).

The presence of nontraumatic MSK pain > 1 in the last 7 days was reported in 4896 (25.5%) individuals. Of these, 4109 (21.3%) had an intensity ≥ 4 on a 0–10 visual analog pain scale. Thirteen percent reported some physical disability at the time of this survey. The median score in the Health Assessment Questionnaire was 0.2 (95% interquartile range 0–0.5).

When variables related to pain were compared between regions, significant differences were found in nontraumatic MSK pain prevalence during the previous 7 days, pain severity, and use of medication. This was especially true for the urban communities within México City and the states of Nuevo León and Chihuahua (Table 1). Body pain distribution is shown in Figure 2. Pain intensity was highest in Yucatán and México City (Table 1). As shown in Table 2, pain distribution in the MSK pain in the last 7 days was more prevalent in women and increased with age in both genders.

Medical treatment was prescribed for 4930 (25.6%) subjects with MSK pain. Nonsteroidal antiinflammatory drugs were the most commonly prescribed medications (34.2%). General practitioners were the most commonly consulted professionals (11.5%). Alternative medicine was used by 367 (1.9%). Only 320 (1.7%) individuals were treated by physiotherapists.

Variables associated with nontraumatic MSK in the last 7 days in logistic regression were: age > 65 years (OR 1.02, 95% CI 1.01–1.02); female gender (OR 2.3, 95% CI 1.9–2.8, $p < 0.01$); urban living (OR 4.8, 95% CI 4.1–5.6, $p < 0.01$), particularly in México City (OR 8.8, 95% CI 7.1–10.9, $p < 0.001$); anxiety (OR 1.6, 95% CI 1.33–1.9, $p < 0.001$); depression (OR 3.7, 95% CI 3.1–4.4, $p < 0.001$); and cigarette smoking (OR 1.6, 95% CI 1.4–2.0, $p < 0.001$). Other illnesses indirectly related to stress that were associated to MSK were gastritis (OR 2.5, 95% CI 2.2–2.7, $p < 0.001$); high blood pressure (OR 1.8, 95% CI 1.6–2.0, $p < 0.001$); and obesity (OR 2.0, 95% CI 1.8–2.3, $p < 0.001$).

The prevalence of major rheumatic conditions was as follows: osteoarthritis, 10.5% (95% CI 10.1–10.9); rheumatic regional pain syndromes, 3.8% (95% CI 3.5–4,0); RA, 1.6% (95% CI 1.4–1.8); ankylosing spondylitis, 0.1% (95% CI 0.1–0.2); and SLE, 0.06% (95% CI 0.03–0.10). Significant differences were observed in the prevalence of rheumatic diseases by region (Table 3). Some disease predominated in female versus male subjects: RA, 1.8% vs 0.8%, respectively; fibromyalgia, 0.8% vs 0.4%; SLE, 0.08% vs 0.04%; and osteoarthritis, 11.1% vs 8.7%; in contrast, gout predominated in males (0.5% vs 0.1%; Table 4).

The following variables were associated with a higher probability of developing a rheumatic disease according to

Table 1. Musculoskeletal pain characteristics according to setting. Values are number (%) unless otherwise indicated.

Variable	México City, n = 4059	Nuevo León, n = 4712	Yucatán, n = 3915	Sinaloa, n = 4879	Chihuahua, n = 1647	p
Pain in the last 7 days	1776 (43.7)	1086 (23.0)	685 (17.5)	347 (7.1)	215 (13.0)	< 0.01
Pain in the past	1020 (25.1)	524 (11.1)	842 (21.5)	521 (10.6)	604 (36.6)	< 0.01
Pain intensity, mean (IQR)	4.6 (5; 0–8)	0 (0; 0–5)	0.6 (7; 5–8)	0 (0; 0–0)	1.8 (1; 1–3)	< 0.01
Medical prescription	1652 (40.7)	1487 (31.5)	830 (21.2)	530 (10.8)	431 (26.1)	< 0.01

IQR: interquartile range.

Table 2. Distribution of musculoskeletal pain in the last 7 days by age and gender.

Age, yrs	Male, n (%)	Female, n (%)	Total (%; 95% CI)	p
18–25	123 (7.8)	317 (15.3)	404/3644 (11.0; 10.0–12.1)	< 0.01
26–35	198 (12.7)	554 (22.4)	752/4018 (15.2; 17.5–19.9)	< 0.01
36–45	255 (17.9)	734 (31.6)	989/3743 (26.4; 25.0–27.8)	< 0.01
46–55	262 (23.1)	788 (41.2)	1050/3046 (34.4; 32.7–36.1)	< 0.01
56–65	227 (24.7)	587 (40.2)	814/2378 (34.2; 32.3–36.1)	< 0.01
66–75	177 (28.1)	379 (41.3)	556/1547 (35.9; 33.5–38.3)	< 0.01
> 76	120 (31.8)	175 (38.1)	295/837 (35.2; 32.0–38.5)	0.05

Table 3. Prevalence of the most common rheumatic diseases in the 5 regions of México surveyed. Values are percentage (95% CI).

Variable	México City, n = 4059	Nuevo León, n = 4712	Yucatán, n = 3915	Sinaloa, n = 4879	Chihuahua, n = 1647	p
Osteoarthritis	12.8 (11.8–13.9)	16.3 (15.2–17.3)	6.7 (6.0–7.6)	2.5 (2.1–3.0)	20.5 (18.6–22.6)	< 0.01
Rheumatoid arthritis	1.0 (0.7–1.4)	0.7 (0.5–1.0)	2.8 (2.3–3.3)	1.8 (1.4–2.2)	1.9 (1.3–2.7)	< 0.01
RRPS	6.9 (6.2–7.7)	5.6 (5.0–6.3)	2.3 (1.8–2.8)	1.1 (0.8–1.4)	NR	< 0.001
Fibromyalgia	1.7 (1.3–2.1)	0.7 (0.4–0.9)	0.2 (0.1–0.4)	0.08 (0.02–0.20)	1.5 (1.0–2.3)	< 0.01
Gout	0.4 (0.3–0.7)	0.3 (0.1–0.5)	0.1 (0.07–0.3)	0.06 (0.01–0.10)	0.8 (0.4–1.4)	< 0.01
Ankylosing spondylitis	0.09 (0.02–0.2)	0.04 (0.05–0.10)	0.04 (0.05–0.10)	0.2 (0.1–0.40)	0.6 (0.2–1.1)	< 0.01
Inflammatory arthritis	0.6 (0.4–0.9)	4.5 (4.0–5.2)	0.4 (0.2–0.6)	0.3 (0.2–0.6)	0.2 (0.06–0.60)	< 0.01
Systemic lupus erythematosus	0.09 (0.02–0.20)	0.04 (0.05–0.10)	0.07 (0.01–0.20)	0.04 (0.05–0.10)	0.04 (0.05–0.10)	NS

RRPS: rheumatic regional pain syndrome. NR: not reported; NS: not significant.

Table 4. Point prevalence (pp) and 95% CI of rheumatic diseases in 19,213 subjects.

Diagnosis	Point Prevalence, % (95% CI) Crude	Male	Female	Adjusted
Osteoarthritis	10.51 (10.08–10.95)	8.71 (8.08–9.34)	11.70 (11.11–12.28)	10.24 (9.81–10.67)
Rheumatoid arthritis	1.60 (1.43–1.78)	0.85 (0.65–1.06)	2.09 (1.83–2.36)	1.49 (1.32–1.66)
Fibromyalgia	0.74 (0.62–0.86)	0.34 (0.21–0.47)	1.00 (0.82–1.18)	0.68 (0.56–0.80)
Gout	0.31 (0.23–0.39)	0.56 (0.40–0.73)	0.15 (0.08–0.22)	0.35 (0.27–0.43)
Ankylosing spondylitis	0.14 (0.09–1.19)	0.18 (0.09–0.28)	0.11 (0.05–0.17)	0.15 (0.09–0.20)
Systemic lupus erythematosus	0.07 (0.03–0.10)	0.04 (0.00–0.08)	0.09 (0.03–0.14)	0.06 (0.03–0.10)
Scleroderma	0.02 (0.00–0.03)	0.1 (0.00–0.04)	0.02 (0.00–0.04)	0.02 (0.00–0.03)

the diagnosis provided by rheumatologists: higher pain intensity (OR 3.7, 95% CI 3.3–4.2 p < 0.001); pain severity (OR 1.2, 95% CI 1.0–1.3, p < 0.001); inability to cope (OR 1.2, 95% CI 1.2–1.3); taking medication (OR 1.8, 95% CI 1.6–2.0, p < 0.001); and living in urban communities (OR 9.3, 95% CI 7.7–12.0, p < 0.001).

DISCUSSION

Epidemiological studies describing the frequency, distribution, and determinants of diseases in human populations are significant initial strategies for disease control. Rheumatic diseases impose an important burden of illness in developed countries[1,21]. Information from developing countries is

scarce, making it evident that rheumatic diseases usually do not receive proper recognition and attention in their healthcare programs.

Our results show the importance of gathering regional information in epidemiological studies. Important variations were found among these 5 regions. Previous COPCORD studies have been characterized by a high participation rate[1]. Participation rates in our study were as low as 43% in México City and as high as 100% in Sinaloa. Other settings had acceptable participation rates between 75% and 90%. In the final analysis, we should question the influence of a low participation rate. The possibility of bias could influence final results. It could be argued that these communities in México City were carefully selected and that this low level of participation could be related to poverty level, non-secure communities, a high level of urbanization that moves poor people to other areas, increased travel time to workplaces, and social underdevelopment. All these factors contribute to having a low interest in personal health. Unlike Sinaloa, where the response rate we obtained was 100%, this may be explained by the public healthcare intervention programs that were successful in raising awareness in this population to participate in healthcare surveys.

The global prevalence of MSK pain reported over the period of the previous 7 days was 25%. This information is quite similar to that found in other COPCORD studies[1]. Eleven percent of subjects visited a doctor for MSK pain, usually a general practitioner who mainly prescribed nonsteroidal antiinflammatory drugs. Several variables were identified as associated with MSK pain, including age, gender, urban residency, and other illnesses. It is relevant to emphasize that obesity, gastritis, hypertension, and tobacco use were associated with MSK pain. Some modifiable factors were identified, but increased community awareness of rheumatic diseases will allow earlier access to healthcare, diagnosis, and treatment.

Important results in our study are related to more female representation and higher pain scores in women. Although most rheumatic diseases are more prevalent in women and female gender has been consistently associated with more pain, several theoretical explanations have been proposed to explain these findings, such as a better interest in personal health, more physical and emotional complaints that impose a differential demand on healthcare systems, and even biologic theories such as the use oral contraceptives, different smoking rates, vitamin D deficiency, multiple infections, obesity, and socioeconomic status[22,23,24,25]. Socioeconomic deprivation has been described as a risk factor for pain in general and also with chronic pain[25]. This is consistent with the findings of this study that higher prevalence of pain related to MSK disorders was observed in urban areas and in conditions of social deprivation, such as the case of surveyed communities in México City and Nuevo León (43% and 23%, respectively), in contrast with the states with larger proportions of rural areas, Yucatán and Sinaloa (17.5% and 7.1%).

These data can be used for better healthcare program planning and medical resource use. Rheumatology training in medical schools and for general practitioners will be direct recommendations based on our findings.

Different research questions have been raised due to our results. Data from México City deserve special attention. An extremely high prevalence of MSK pain was detected and several variables were identified. There is no question that living in a stressful urban environment has a clear adverse health impact on these inhabitants. It is difficult to propose control strategies without involving the collaboration between communities and healthcare programs to prevent and treat these disorders. These urban communities will pose special challenges to minimize the burden of illness.

In summary, this study in 5 regions of México showed that MSK pain is notably prevalent. Specific diagnoses showed regional variations. Particularly important is the high prevalence of rheumatoid arthritis in Yucatán, while all other rheumatic diseases were more prevalent in México City. Other illnesses were associated with rheumatic pain. This information will be useful in education, healthcare planning, proper diagnosis, and treatment of rheumatic diseases. This will be realized only if we are able to coordinate efforts at the different levels.

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