Validity of the COPCORD Core Questionnaire as a Classification Tool for Rheumatic Diseases

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ABSTRACT. ***Objective***. Rheumatic diseases are vastly underdiagnosed and undertreated, particularly among minorities and those of low socioeconomic status. The WHO-ILAR Community Oriented Program in the Rheumatic Diseases (COPCORD) advocates screening of musculoskeletal complaints in the community. The objective of this study was to evaluate the performance of the COPCORD Core Questionnaire (CCQ) as a diagnostic tool for rheumatic diseases.

Methods. We conducted a cross-sectional study designed in parallel with a large COPCORD survey in Mexico. A subsample of 17,566 questionnaires, selected from 4 of the 5 states included in a national COPCORD survey were included in the analysis as a diagnostic test to evaluate sensitivity, specificity, receiver operating characteristics curve (ROC), and positive likelihood ratio (LR+) of the CCQ as a case-detection tool for rheumatic diagnosis and for the most frequent diagnoses identified in the survey, osteoarthritis, regional rheumatic pain syndromes, and rheumatoid arthritis (RA). Logistic regression with the questions with LR+ ≥ 1 was performed to identify the strength of association (OR) for each question.

Results. Pain in the last 7 days, high pain score (> 4), and previous diagnosis were the questions with highest LR+ for diagnosis, and for diagnosis of RA treatment with NSAID. The variables that contributed most to the model were pain in the last 7 days (OR 2.0, 95% CI 1.8–2.3), NSAID treatment (OR 3.3, 95% CI 3.0–3.7), a high pain score (OR 1.15, 95% CI 1.13–1.17), and having a previous diagnosis (OR 1.4, 95% CI 1.3–1.6). These 4 questions had $R^2 = 0.24$, $p < 0.01$, for detection of any rheumatic diagnosis. The single variable that explains 16% (OR 1.33, 95% CI 1.31–134) of variance was a high pain score in the last 7 days.

Conclusion. Some variables were identified in the CCQ that could be combined in a brief version for case detection of rheumatic diseases in community surveys. The validity of this proposal has to be tested against the original version. (J Rheumatol 2011;38:31–35; doi:3899/jrheum.100955)

Key Indexing Terms:
COMMUNITY SURVEYS EPIDEMIOLOGY RHEUMATIC DISEASES OSTEOARTHRITIS REGIONAL RHEUMATIC PAIN SYNDROMES RHEUMATOID ARTHRITIS

Rheumatic diseases are the principal cause of disability worldwide. Their prevalence is increasingly producing a large personal, family, and socioeconomic burden[1]. Developed countries have measured the prevalence of rheumatic diseases, reporting high rates[2,3]. This has motivated them to implement different strategies to identify patients in the community and bring them into their healthcare systems at early stages of disease[4,5,6]. Scarce studies have been conducted in developing countries[7,8].

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Control of Rheumatic Diseases (COPCORD) was initially proposed as an effective tool to identify musculoskeletal (MSK) complaints as a first screening for rheumatic diseases, in societies with limited access to healthcare systems; in particular to detect pain/swelling/stiffness and restricted range of motion in joints and/or MSK soft tissue in the last 7 days and/or at any time in the past[9,10,11].

The cross-cultural adaptation of COPCORD in Brazil, Chile, and Mexico evaluated the usefulness of the COPCORD Core Questionnaire (CCQ) and detected the presence of rheumatic disorders by comparing results with a full clinical examination by a rheumatologist[12]. The CCQ includes questions in 7 domains: pain, symptoms (tenderness, swelling, stiffness), trauma, functionality, coping, healthcare seeking behavior, and treatments received. In the validation process the presence of pain in the last week had high sensitivity, but when the definition of pain became more restricted (including pain intensity), the specificity improved. The authors[12] discussed that the use of 2 questions (pain in the last 7 days and pain without trauma) could be an attractive instrument in the context of epidemiologic surveys and suggested its use to evaluate prevalence, limiting the CCQ to only 3 of the 7 domains: pain, symptoms, and trauma. However, domains regarding functionality, coping, healthcare seeking behavior, and treatment had not been validated.

In Mexico, in recent years, different surveys have been conducted in 5 states of the country according to COPCORD recommendations. Ultimately a pooled analysis was performed, and important epidemiological data related to rheumatic disorders were identified[13]. The conclusion reached by the group of researchers studying the epidemiology of MSK diseases is the same as Chopra's: COPCORD has yet to be explored for its global merit and use; it remains largely unrecognized by the rheumatology community[14].

One aspect of COPCORD that remains unexplored is its performance using the CCQ as a referral tool for rheumatic assessment: the instrument has been applied only in its complete version. For populations with low literacy or with limitations in time and resources, a shorter questionnaire would be more suitable for its applicability in large population surveys. In order to consider COPCORD as a referral tool, it is necessary to validate its specific aspects as a diagnostic test[15,16].

The objective of our study was to evaluate the performance of the CCQ as a diagnostic tool for rheumatic diseases. We hypothesized that a simplified COPCORD questionnaire should keep its classification properties as a screening tool for MSK complaints and could be useful for early detection of rheumatic diseases associated with pain and disability.

MATERIALS AND METHODS

A detailed description of the COPCORD survey in Mexico has been reported elsewhere in this supplement by Peláez-Ballestas, *et al*[13]. In brief, the Mexican validated version of the COPCORD questionnaire[12] was applied in 5 of the 31 states of Mexico, according to stage 1 of the methodology suggested by the original COPCORD developers[9]. Each regional research team obtained local ethics and research committee approval.

Study population. In selected communities a total of 19,213 subjects completed the survey[15]. In a subsample comprising 17,566 questionnaires, 4357 (24.8%) subjects with a positive COPCORD result (positive: pain, inflammation, or stiffness occurring over the last 7 days, at any point during their lifetime, and not associated with trauma) selected from states that applied the survey concurrently, were considered for this study; subjects completed a clinical examination by a physician, and those cases with data suggesting a rheumatic disease were further examined by a rheumatologist to confirm the presence of a rheumatic disease.

Statistical analysis. The Mexican Spanish version of COPCORD has 4 domains with core questions, proposed in the original version; however, we do not know the contribution of each core question to identify a rheumatic condition. The validity of each core item as a case-detection tool for a rheumatic disease was evaluated through estimation of standard parameters. After that, positive versus negative questionnaires were included to calculate the sensitivity, specificity, and likelihood ratios (LR) of the COPCORD core items. The receiver operating characteristics (ROC) analysis was applied by plotting sensitivity against 1 – specificity for the selected variables. The overall diagnosis accuracy and predictive ability were estimated by sensitivity + 1 – specificity[15,16]. Cases with a positive questionnaire and a diagnosis by the rheumatologist were categorized as true positive, versus the cases without a diagnosis that were the true negative group, to estimate the properties as a diagnostic test of the CCQ.

In a second step a logistic regression model was performed, including as dependent variable the rheumatic diagnosis; and the questions with positive LR (LR+) ≥ 1.0 reported in the initial analysis as independent variables. The model was repeated with each specific diagnosis [osteoarthritis (OA), regional rheumatic pain syndromes (RRPS), and rheumatoid arthritis (RA)].

The variables with significant odds ratio (OR) values ($p < 0.005$) were included in a final multiple forward logistic regression to explore the contribution of significant variables to establish a diagnosis. The analysis was performed with Stata v 9.2.

RESULTS

We included 17,566 cases in this analysis: 4876 (24.8% CI 24.1–25.4) were considered positive questionnaires, and 2706 (15.38%) were confirmed as having a rheumatic disease. Results for sensitivity, specificity, LR, and ROC curves of each core question to identify a rheumatic disease are presented in Table 1. The most important sensitivity values were pain in the last 7 days (51.7%), high pain scores (visual analog scale > 4; 66.4%), and previous use of nonsteroidal antiinflammatory drugs (NSAID; 63.6%). The most important specificity rates were pain in the last 7 days (80.1%), high pain score (62.7%), Health Assessment Questionnaire (HAQ; scores > 0.8; 88.9%), physical limitation (88.1%), and existence of a previous diagnosis (89.8%).

An independent analysis for disease detection (OA, RRPS, RA) showed that pain in the last 7 days had 51.8% sensitivity and 78.0% specificity for OA, 53.5% sensitivity and 76.4% specificity for RRPS, and 33.7% and 85.8% specificity for RA. Results for other questions: for OA diagnosis, HAQ had 31.4% sensitivity, 87.8% specificity, and 2.5 LR+; previous diagnosis had 27.2% sensitivity, 88.7% specificity, and 2.4 LR+. For RA diagnosis: treatment with NSAID had 90.6% sensitivity, 58.6% specificity, and 2.1

Table 1. Diagnostic test values for each COPCORD core question to identify a rheumatic disease.

COPCORD Core Questions	Rheumatic Diagnosis Sensitivity, %	Specificity, %	LR+	ROC (95% CI)	Osteoarthritis Sensitivity, %	Specificity, %	LR+	ROC (95% CI)	Rheumatic Regional Pain Syndrome Sensitivity, %	Specificity, %	LR+	ROC (95% CI)	Rheumatoid Arthritis Sensitivity, %	Specificity, %	LR+	ROC (95% CI)
Historic pain without trauma	23.13	86.57	1.72	0.54 (0.54–0.55)	21.89	85.82	1.5	0.53 (0.53–0.54)	21.02	85.34	1.44	0.53 (0.52–0.53)	35.14	85.4	24075	0.60 (0.59–0.61)
Intensity of historic pain	22.46	86.93	1.72	0.54 (0.53–0.55)	21.8	86.19	1.53	0.53 (0.46–0.47)	67.17	59.32	1.65	0.53 (0.52–0.54)	33.7	85.8	2.372	0.59 (0.59–0.60)
Pain in the last 7 days	51.78	80.1	2.60	0.65 (0.65–0.66)	51.87	78.06	2.36	0.64 (0.64–0.65)	53.57	76.44	2.27	0.65 (0.64–0.65)	48.55	75.58	1.988	0.62 (0.61–0.62)
High pain score*	66.47	62.72	1.78	0.64 (0.63–0.65)	64.43	60.62	1.64	0.62 (0.61–0.63)	67.17	59.32	1.65	0.63 (0.62–0.63)	79.35	58.83	1.927	0.69 (0.68–0.69)
Severity	12.47	94.33	2.20	0.53 (0.52–0.54)	12.02	93.84	1.95	0.52 (0.52–0.53)	11.13	93.47	1.70	0.52 (0.51–0.53)	18.84	93.48	2.888	0.56 (0.55–0.56)
NSAID treatment	63.65	63.77	1.76	0.63 (0.62–0.64)	63.89	61.34	1.65	0.62 (0.61–0.63)	56.26	58.73	1.36	0.56 (0.55–0.57)	90.63	58.67	2.193	0.76 (0.75–0.77)
HAQ†	29.76	88.9	2.68	0.5934 (0.58–0.60)	31.47	87.88	2.60	0.59 (0.58–0.60)	22.25	86.39	1.63	0.54 (0.53–0.54)	39.49	86.44	2.912	0.63 (0.62–0.6)
Physical limitation	23.71	88.1	1.99	0.5602 (0.55–0.56)	23.69	87.35	1.87	0.55 (0.54–0.56)	19.81	86.52	1.47	0.53 (0.52–0.53)	34.5	86.53	2.531	0.60 (0.59–0.61)
Previous or preexistent diagnosis	27.13	89.81	2.66	0.58 (0.57–0.59)	27.25	88.74	2.42	0.57 (0.57–0.58)	19.92	87.52	1.60	0.53 (0.52–0.54)	43.48	87.7	3.534	0.65 (0.64–0.66)

* Visual analog score > 4. † HAQ score > 0.80. LR+: positive likelihood ratio; ROC: area under the receiver operating characteristic curve; HAQ: Health Assessment Questionnaire. NSAID: nonsteroidal antiinflammatory drug.

LR+; previous diagnosis had 43.4% sensitivity, 87.7% specificity, and 3.5 LR+; physical limitation (using Likert scale) had 34.5% sensitivity, 86.5% specificity, and 2.5 LR+; and HAQ had 39.9% sensitivity, 86.4% specificity, and 2.9 LR+.

In summary, the questions with LR+ ≥ 1.0 reported in the initial analysis were pain in the last 7 days, high pain score, pain in the past without trauma, high pain score in the past without trauma, treatment with NSAID, HAQ, physical limitation, having a previous diagnosis; and for RA, treatment with NSAID; results when these variables were included in a logistic regression are presented in Table 2. The OR of each variable associated with a rheumatic diagnosis was included in the model, reported by disease: in OA: pain in the last 7 days (OR 1.89, $p < 0.01$, 95% CI 1.60–2.24), high pain score (OR 1.89, $p < 0.01$, 95% CI 1.60–2.24), and having a previous diagnosis (OR 1.8, $p \leq 0.01$, 95% CI 1.60–2.09); in RRPS: pain in the last 7 days (OR 2.4, $p < 0.01$, 95% CI 1.95–2.12) and high pain score (OR 1.62, $p < 0.01$, 95% CI 1.27–2.06); in RA: high pain score (OR 4.47, $p < 0.01$, 95% CI 3.09–6.48), treatment with NSAID (OR 3.46, $p < 0.01$, 95% CI 2.00–5.98), and having a previous diagnosis (OR 3.42, $p < 0.01$, 95% CI 2.51–4.66).

Table 2. Results of logistic regression applied to COPCORD Core Questionnaire (CCQ) items.

CCQ	OR	p	95% CI
Historic pain	1.60	0.053	0.99–2.60
Intense historic pain	0.86	0.558	0.99–1.40
Pain in the last 7 days	1.94	< 0.01	1.69–2.22
High pain score*	2.09	< 0.01	1.82–2.41
Previous diagnosis	1.86	< 0.01	1.65–2.10

* Visual analog scale > 4.

Forward multiple logistic regression was performed to explain the association of the CCQ as independent variables to establish a rheumatic diagnosis (dependent variables), which were pain in the last 7 days (OR 2.0, 95% CI 1.8–2.3), treatment with NSAID (OR 3.3, 95% 95% CI 3.0–3.7), high pain score (OR 1.15, 95% CI 1.13–1.17), and previous diagnosis (OR 1.4, 95% CI 1.3–1.6). These 4 questions had an $R^2 = 0.24$, $p < 0.01$. The single variable that explained 16% (OR 1.33, 95% CI 1.31–1.34) of variance was pain scores in the last 7 days.

DISCUSSION

Our study evaluated the classification properties of the COPCORD core questionnaire as a case-detection tool for rheumatic diseases. The questionnaire was described, validated, and applied as a screening instrument to detect MSK complaints at a community level, especially in developing countries. However, to date the capacity to identify candidates for rheumatic assessment had never been explored. Although in the different surveys the complete COPCORD version has been applied[17,18,19,20], Bennett, *et al* suggested the possibility of a shorter version more than 10 years ago[12].

Different domains are explored with the complete version of COPCORD; however, among the 7 domains of the

instrument, 4 domains performed well in diagnostic test analysis: presence of pain in the last 7 days, high pain score, previous NSAID treatment, and previous diagnosis. The same questions provided consistent findings when analyzed for 3 specific entities; however, we can identify some differences by disease: for OA the most significant questions were pain in the last 7 days, HAQ score, and previous diagnosis; for RRPS, only pain in the last 7 days; and for RA (in addition to the 4 questions) previous pain without trauma, use of NSAID, HAQ score, and self-reported physical limitation all correlated with diagnosis.

Bennett, *et al*, in their cross-cultural adaptation of the CCQ used in Mexico, estimated sensitivity of 84% and specificity of 61.3%; but adding pain scores > 4, sensitivity decreased to 42.7% and specificity increased to 80%. Their rates are similar to our results, where we estimated LR+ ≥ 2, indicating a clear association with a rheumatic diagnosis that can be applied at the population level. This association could also be applied as a referral tool, from primary care to the specialist level of the healthcare system, because an important consideration to note in a reference tool as a screening test is that, in addition to having adequate sensitivity, it must also have high specificity.

This simple questionnaire meets these requirements; the variables have good sensitivity (pain in the last 7 days, 51.7%; high pain score, 66.4%) and better specificity, being more specific than sensitive.

If the CCQ can detect the most prevalent rheumatic diseases, we can really help the patient obtain a timely diagnosis and treatment by the rheumatologist and in turn not burden specialist services. This is a practical consideration in emerging economies with complex and fragmented healthcare systems, including Mexico, which has 3 levels of healthcare with different coverage. The most widely disseminated level (although up to only 50% of the population) is primary care, where efficient guidelines for case detection are lacking and in many cases there is limited access to specialized care. The introduction at the primary care level of specific questions such as the CCQ to properly detect a possible rheumatic disease is highly desirable and recommended.

On the other hand, access to specialized care is scarce, because only limited centers have a rheumatologist. There is a clear imbalance between the total population with a high prevalence of MSK complaints (our research group found between 7.1% and 43.5%), poor detection systems, and inefficient referrals.

Woolf, *et al*[21] wrote a persuasive article on the prevention of MSK conditions and the priority conditions that have to be considered in developing countries, postulating some key recommendations: prevention and effective control of MSK conditions as a priority in view of the enormous and growing burden; promotion of greater public and individual awareness of the problems that relate to the MSK system, with good-quality information on what can be done to prevent or effectively manage the conditions; and the need for early assessment.

In adherence to these recommendations, we offer the option of identifying MSK disorders through a shortened version of COPCORD, containing significant questions identified in our analysis for early referral for assessment. Further surveys will be conducted to validate this version as a diagnostic tool for early detection and referral that can improve healthcare in the rheumatic diseases.

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