ORIGINAL ARTICLE

Perception of risk and impact of the COVID-19 pandemic on patients with rheumatic diseases: a case–control study

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Abstract

Objectives Risk perception of the COVID-19 pandemic may affect chronic disease outcomes among patients with rheumatic diseases (RD). To describe and compare the perception of risk and effects of the COVID-19 pandemic on patients with RD from two health care centers compared with a control group.

Methods A retrospective case–control study was conducted. Patient respondents completed an online survey to measure risk perception and effects of the COVID-19 pandemic. The case group consisted of patients with a confirmed diagnosis of RD, coming from two third-level health care centers. The control group was a population group without RD from a public university.

Results A total of 3944 participants were included: 986 patients with an RD (cases) from the two hospital centers and 2958 controls without RD. A greater perception of risk severity and perception of contagion was observed in the group of patients with RD, OR: 1.70, 95% CI 1.44−2.01 and OR: 2.0, 95% CI 1.79−2.23, respectively; more significant deterioration in family life OR: 1.14, 95% CI 1.01−1.29; greater economic impact, OR 3.94, 95% CI 3.48−4.46; as well as negative emotions and feelings (alarmed, anxiety, depression, confusion, fear, isolation, and discrimination). This impact was maintained when the model was adjusted for comorbidities.

Conclusion In the face of an unexpected and catastrophic event such as the COVID-19 pandemic, patients with RD report apparently greater impact on their mental state and economic situation than the control population, as well as increased perception of discrimination.

Key Points
• *The multidisciplinary analyses of risk perception are required to promote actions that can enhance the preparedness and responses of public efforts for possible future pandemics in a way that considers the specific needs of vulnerable people like patients with rheumatic diseases.*
• *Identifying risk perceptions of possible effects of the pandemic, sources of communication, and opinions is essential to ensure self-care in rheumatic disease.*
• *The impact of COVID-19 has been much greater for people with rheumatic disease, especially in terms of the perceived severity of the pandemic, impacts on family and economy, preventive behaviors, and uncertainty.*

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Introduction

Several recently published systematic reviews and meta-analyses report that patients with rheumatic diseases (RD) are at higher risk of SARS-CoV-2 infection, but not at an increased risk of clinical complications or severe COVID-19 compared to the general population [1]. The slightly higher probability of disease among the RD population was associated with older age (over 65 years), sex, ethnicity, and presence of comorbidities such as high blood pressure, cardiovascular diseases, and diabetes, as well as conditions of social disadvantage [2].

Risk perception is conceptualized as an individual's ability to confront a set of assumptions about risk management and behaviors. In a situation like the COVID-19 pandemic, the risk phenomenon can be measured with variables of perceived severity and the high probability of contagion [3].

Due to their diagnosis and treatment, patients with RD have been documented to have a higher perception of COVID-19 risk [4]. In general, the perception of risk is more significant among women with social disadvantages than other RD patients with different sociodemographic characteristics [4]. However, there are few reports about the impact of the pandemic on the mental state and economic situation of patients with RD compared to the general population [5]. Additionally, risk perception and personal protective measures may vary among subjects from high-, middle-, and low-income countries [6]. Therefore, it is essential to measure these phenomena in different socioeconomic and cultural contexts, especially in developing countries often overlooked by research [6].

Therefore, we aim to document COVID-19 risk perception in a group of patients with RD, compared with the general population in Mexico. We additionally document how this perception of risk influences preventive measures and how it affects mental health, family life, and the economic situation of respondents.

We hypothesize that RD patients perceive a higher risk of SARS-CoV-2 infection and perceive the COVID-19 pandemic as more severe than the control group. Furthermore, that the impact of the pandemic on mental health, economy, and social life is more significant in RD patients.

Objective

To describe and compare the perception of risk and effects of the COVID-19 pandemic in patients with RD in two third-level hospital centers and a control group through a retrospective case–control study.

Methods

The cases were patients over 18 years of age diagnosed with RD receiving medical assistance in the rheumatology departments of two public hospitals in Mexico City who were invited to participate. Case study participants were recruited between August 10 and November 29, 2020, in hospital 1 and between June 24 and October 31, 2020, in hospital 2.

The controls were people over 18 years of age without an RD diagnosis, selected from a study conducted with students, faculty, and staff from a public university also located in Mexico City [7, 8]. Control study participants were recruited between April 6 and May 26, 2020. For each case, an algorithm randomly selected three subjects from the control database, paired by sex and ± 5 years of age.

The online questionnaire was administered on the LimeSurvey® platform. Cases had the assistance of a survey taker through mobile devices located at outpatient services at each hospital [7].

Measurements

Risk perception

This construct was measured through the validated OUSOCIAL-COVID-19 questionnaire. The OUSOCIAL-COVID-19 questionnaire was developed based on the adaptation of the UNIV-Influenza questionnaire, followed by a new validation. Additionally, some questions from previous studies conducted in China (Hong Kong) and the UK on the public response to the UK government recommendations on COVID-19 were included. The questions were translated and adapted to the Mexican context; authorization was obtained in writing from the authors of both questionnaires [7]. The original questionnaire consisted of nine dimensions divided into 55 questions. However, for this analysis, the following sections were selected: (1) sociodemographic characteristics of the population (7 questions); (2) perception of risk and the severity of the epidemic (5 questions); (3) effects on mental health (20 questions); (4) the economic impact of the epidemic; (5) current health condition, COVID-19 disease in individuals, social network, and comorbidities (4 questions).

Emotions were measured with each variable presented as a 5-point Likert scale. In this current manuscript, all emotion variables were dichotomized as "not felt" for the first three values (two negative responses and one neutral response) and "felt" for the remaining two values (positive responses) having the emotion if the answer was one of the two positives. For more information on the design, please consult [8].

Patients with RD participated during the creation and validation of this questionnaire.

Ethical aspects

The study was conducted according to the guidelines in the Declaration of Helsinki and approved by the Ethics, Research and Biosafety Committees at the Hospital General de Mexico "Dr. Eduardo Liceaga" (DI/20/301/03/22) and the National Autonomous University of Mexico (UNAM); the recommendations of the Pan American Health Organization for conducting Public Health research during the COVID-19 pandemic were also followed (PAHO 2020). Informed consent was obtained from all subjects involved in the study.

Statistical analysis

The variable responses were reported as categorical, except for age, which was reported as a continuous variable. It is relevant to mention that age and sex were included as paired variables and therefore not included in the analysis.

The descriptive statistics of the categorical variables were presented, reporting the total number of subjects per variable and the frequency concerning the total of each group. Categorical variables with multiple response options (Likert scale) were dichotomized to analyze the effects of each variable on the case and control populations and whether these are identical in both people through the Cochran Q test [9, 10].

Cramer's V test [11] was applied to evaluate the association level between the variables in each of the samples (cases and controls). Finally, an odds ratio (OR) test was performed using the model for paired cases and controls and contingency tables for calculation and, adjusted by comorbidities, with a 95% confidence interval (2-tailed test).

Results

A total of 3944 participants were included: 986 patients with an RD (cases) from the two hospital centers and 2958 controls without rheumatic diseases. The mean age was 46.3—with a standard deviation (SD) of 14.8 years—for the cases and 45.7 years (SD 14.9) for the controls (Table 1). The 86% of both the cases ($n = 845$) and the controls ($n = 2,535$) were women. In the case group, the most frequent confirmed diagnoses were rheumatoid arthritis ($n = 379$, 38.0%), systemic lupus erythematosus ($n = 358$, 36.0%), spondyloarthritis ($n = 42$, 4.2%),

systemic vasculitis ($n = 36$, 4.0%), systemic sclerosis ($n = 40$, 4.0%), inflammatory myopathies ($n = 29$, 3.0%), gout ($n = 19$, 1.9%), and others ($n = 85$, 8.6%) (Supplemental Table).

The comparisons between cases and controls showed significant differences. The RD group reported a greater perception of the severity of the pandemic and the probability of contagion, as well as more significant economic impact and greater comorbidities. RD patients expressed feeling bored, depressed, fearful, and discriminated against, while the predominant emotions in the control group were being alert and worried (Table 2).

Table 3 presents the associations of different variables—including feelings and emotions and the impacts on family life and economy—for patients with RD compared to the control group, expressed in OR unadjusted and adjusted by comorbidities (with 95% CI).

We observed that the variables with the greatest association in the group of RD patients were the perception of higher odds of contagion (OR 2.09; 95% CI 1.88 to 2.34), feeling more bored (OR 2.98; 2.62 to 3.39), more significant economic impact (OR 3.71; 3.28 to 4.18), and feeling discriminated against (OR 1.99; 1.57 to 2.53). The associations were slightly changed in the model's feelings/emotions (alarmed, anxious, and isolated) when the OR was adjusted for comorbidities.

Figure 1A and B illustrate the degree of association obtained with Cramer's V test between the variables measured in the two study groups. An increase may be observed in the degree of association of the emotions presented in the case group (Fig. 1B).

Discussion

The perception of risk—measured by the severity of the pandemic and probability of contagion—was higher in the group with RD, as was the impact on mental health, family life, and economic situation.

This impact is important when caring for patients with RD due to the difficulties that have arisen during the pandemic, such as the shortage and access to medicines and the conversion of hospitals to prioritize the care of patients with COVID-19 over those with chronic or noncommunicable diseases. In addition, the impact on mental health requires actions directed to improve these patients' conditions. Data on the economic impact demonstrate the precariousness of patients with RD. Although the current pandemic impacted the entire population studied, the effect was more significant in the RD group [12].

The impact on mental health described in the group of RD patients is consistent with that reported in other

Table 1 Case–control study. Comparison of different variables measured to assess participants' perceptions of the severity of the pandemic, probability of contagion, emotional state, impact on family life, and economic impact during the COVID-19 pandemic

Variable	Case 986 (25%)	Control 2958 (75%)	Percentage difference [%]	Cochran's Q	p value
Control variables					
Age *	46.3 (0.00)	45.7 (0.00)	0.57	3	0.392
Male sex	141 (14.30)	423 (14.30)	0.00	---	---
Pandemic effects and perceptions					
Perception of pandemic severity	900.00 (91.28)	2528.00 (85.46)	5.81	28.47	<0.001
Perception of probability of contagion	468.00 (47.46)	912.00 (30.83)	16.63	103.84	<0.001
Impact on family life	245.00 (24.85)	656.00 (22.18)	2.67	5.16	0.16
Economic impact	736.00 (74.65)	1317.00 (44.52)	30.12	275.93	<0.001
COVID positive diagnosis	125.00 (12.68)	618.00 (20.89)	− 8.22	30.66	<0.001
Comorbidities					
DM	92.00 (9.33)	167.00 (5.65)	3.68	44.99	<0.001
HBP	215.00 (21.81)	293.00 (9.91)	11.90	99.64	<0.001
Cancer	17 (1.72)	18 (0.61)	1.12	11.06	0.011
Emotions					
Alarmed	366.00 (37.12)	1044.00 (35.29)	1.83	6.82	0.078
Alert	653.00 (66.23)	2194.00 (74.17)	− 7.94	16.69	<0.001
Anxious	428.00 (43.41)	1242.00 (41.99)	1.42	5.34	0.149
Bored	379.00 (38.44)	514.00 (17.38)	21.06	182.93	<0.001
Confused	276.00 (27.99)	753.00 (25.46)	2.54	7.2	0.066
Depressed	251.00 (25.46)	560.00 (18.93)	6.52	36.22	<0.001
Discriminated against	71.00 (7.20)	124.00 (4.19)	3.01	20.32	<0.001
Fearful	392.00 (39.76)	924.00 (31.24)	8.52	37.50	<0.001
Isolated	451.00 (45.74)	1330.00 (44.96)	0.78	3.53	0.317
Worried	605.00 (61.36)	1946.00 (65.79)	− 4.43	10.16	0.017

*Age shows average value

studies [13–15], having found increased symptoms of anxiety (43% of cases) and depression (25% of cases). In terms of negative feelings and emotions, a different and more intense pattern was observed in patients with RD (see Fig. 1A and B), which could be interpreted as experiencing greater suffering.

Another significant impact on patients with RD was the deterioration in family life. The current recommendations to stay at home negatively affect domestic interactions, including a documented increase in family violence [7, 16], which could include impacts toward women with RD.

The most significant negative impact on the group of patients with RD was observed in the economic aspect (74.65% vs. 43.14%), which could be explained by a higher proportion of informal jobs among this population and the lack of unemployment insurance in Mexico. Another aspect to consider specifically for patients with RD is that, in the face of a catastrophic event such as the COVID-19 pandemic, they can be left in a critical situation in terms of income and present impoverishment, especially in the context of informal jobs and the

implementation of sanitary measures by the authorities such as lockdown or confinement.

Comorbidities such as diabetes mellitus and high blood pressure predominated in patients with RD. As has been documented in several studies, these two comorbidities, especially high blood pressure, are associated with higher morbidity and mortality with COVID-19, which was perceived as increased risk by the group of patients with RD [13, 17]. In addition, high blood pressure was associated with a greater perception of the severity of the pandemic but not with a greater perceived probability of infection. After adjusting for comorbidities, the most significant impact on the RD group is maintained in all the variables measured except in some emotions such as alarmed, anxiety, and isolation, which have similar effects in the two study populations.

The percentage of patients with RD who developed COVID-19 in this study was low (9%), though higher than the 1.1% reported by the REUMAVID study [14].

It is crucial to document regional variations in the impact of COVID-19 in patients with RD to contribute to global challenges of care for vulnerable populations. The sum of

Table 2 Comparison of different variables measured to assess perceptions of the severity of the pandemic, probability of contagion, emotional state, impact on family life, and economic impact during the COVID-19 pandemic. Controls paired by age and sex

Variable name	Case 986 (25%)	Control 2958 (75%)	Percentage difference [%]	Cochran's Q	p value
Pandemic effects and perceptions					
Perception of pandemic severity	900.00 (91.28)	2528.00 (85.46)	5.81	28.47	< 0.001
Perception of probability of contagion	468.00 (47.46)	912.00 (30.83)	16.63	103.84	< 0.001
Impact on family life	245.00 (24.85)	656.00 (22.18)	2.67	5.16	0.16
Economic impact	736.00 (74.65)	1317.00 (44.52)	30.12	275.93	< 0.001
COVID positive diagnosis	125.00 (12.68)	618.00 (20.89)	− 8.22	30.66	< 0.001
Emotions					
Alarmed	366.00 (37.12)	1044.00 (35.29)	1.83	6.82	0.078
Alert	653.00 (66.23)	2194.00 (74.17)	− 7.94	16.69	< 0.001
Anxious	428.00 (43.41)	1242.00 (41.99)	1.42	5.34	0.149
Bored	379.00 (38.44)	514.00 (17.38)	21.06	182.93	< 0.001
Confused	276.00 (27.99)	753.00 (25.46)	2.54	7.2	0.066
Depressed	251.00 (25.46)	560.00 (18.93)	6.52	36.22	< 0.001
Discriminated against	71.00 (7.20)	124.00 (4.19)	3.01	20.32	< 0.001
Fearful	392.00 (39.76)	924.00 (31.24)	8.52	37.50	< 0.001
Isolated	451.00 (45.74)	1330.00 (44.96)	0.78	3.53	0.317
Worried	605.00 (61.36)	1946.00 (65.79)	− 4.43	10.16	0.017

[*] Age shows average values and standard deviation

[**] Other comorbidities included pulmonary disease, heart attack, other cardiovascular diseases, cerebral vascular disease, anemia, asthma, ischemic, cardiopathy, blindness, depression, dyslipidemia, diverticulosis, peptic acid, epilepsy, ERC, HAP, hernia hiatal, hyperthyroidism, hypercortisolism, hypothyroidism, renal ithiasis, myomas, chronic pneumopathy, osteoporosis, vitiligo, HPV, GI ulcer, other GI disease

Table 3 Odds ratio (OR) obtained for comparison between the hospital case group and the control group

Variable	Unadjusted OR (95% CI two-sided)	Adjusted OR* (95% CI two-sided)
Perception of pandemic severity	1.88 (1.59–2.21)	1.78 (1.39–2.27)
Perception of probability of contagion	2.09 (1.88–2.34)	2.05 (1.77–2.38)
Impact on family life	1.10 (0.98–1.24)	1.05 (0.89–1.25)
Economic impact	3.71 (3.28–4.18)	3.86 (3.27–4.54)
COVID positive diagnosis	0.61 (0.53–0.70)	0.60 (0.48–0.74)
Alarmed	1.19 (1.07–1.33)	1.17 (1.00–1.36)
Alert	0.76 (0.68–0.84)	0.71 (0.61–0.83)
Anxious	1.13 (1.02–1.26)	1.14 (0.98–1.32)
Bored	2.98 (2.62–3.39)	2.86 (2.44–3.37)
Confused	1.20 (1.07–1.34)	1.24 (1.05–1.47)
Depressed	1.66 (1.46–1.89)	1.68 (1.41–2.00)
Discriminated against	1.99 (1.57–2.53)	1.84 (1.35–2.50)
Fearful	1.56 (1.39–1.74)	1.50 (1.29–1.75)
Isolated	1.15 (1.03–1.27)	1.14 (0.98–1.32)
Worried	0.81 (0.73–0.91)	0.79 (0.68–0.92)
DM	2.49 (1.99–3.11)	-
HBP	2.68 (2.29–3.14)	-
Cancer	2.83 (1.66–4.85)	-
Other comorbidities	1.43 (1.25–1.62)	-

[*] Adjusted for all comorbidities including cancer, DM and HBP, pulmonary disease, heart attack, other cardiovascular diseases, cerebral vascular disease, anemia, asthma, ischemic, cardiopathy, blindness, depression, dyslipidemia, diverticulosis, peptic acid, epilepsy, ERC, HAP, hernia hiatal, hyperthyroidism, hypercortisolism, hypothyroidism, renal lithiasis, myomas, chronic pneumopathy, osteoporosis, vitiligo, HPV, GI ulcer, other GI diseases

Fig. 1 A and **B** Heatmaps representing Cramer's V association values used to describe the level of relationship between the variables. The highest association level is the brightest expressing the relation between two variables. The heatmap is presented for the control group and the cases group
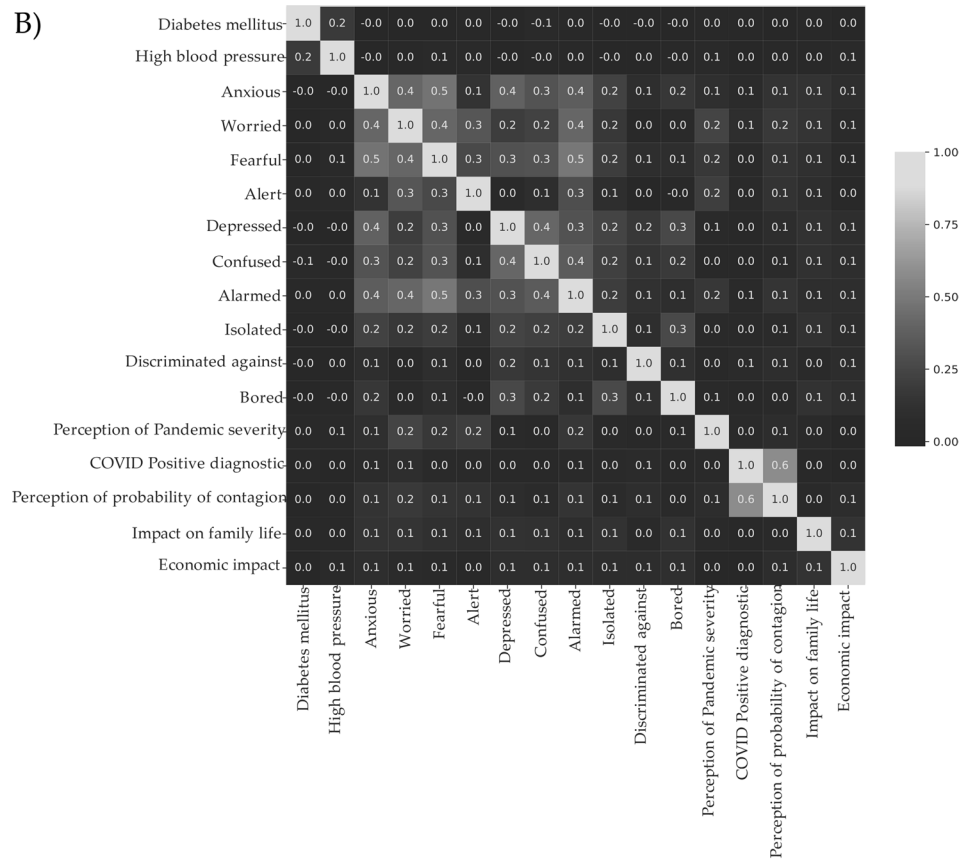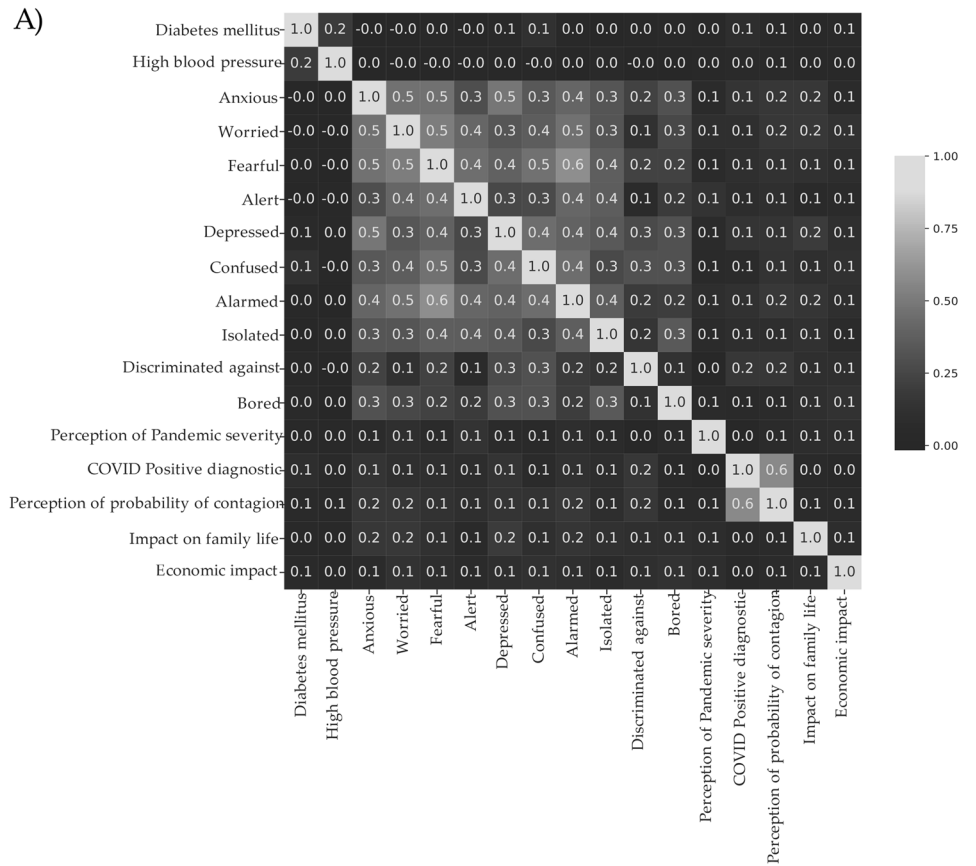
adverse conditions that COVID-19 has produced demonstrates the vulnerability of patients with RD compared to people without these conditions, a situation that had not been previously documented in patients from low- and middle-income countries like Mexico [12, 17]. In Mexico, having an RD (individual vulnerability), being a woman (gender vulnerability), and not having a paying job (socioeconomic vulnerability) are all factors that increase the risk of COVID in patients with rheumatic diseases, which has been interpreted as a palimpsest of exposure. This phenomenon was previously reported in Mexico [18].

An aspect to highlight is that patients with RD reported greater discrimination, which was surprising. It could lead to the hypothesis that individuals with RD may be discriminated against either because they have an apparent physical disability or due to unobservable discomfort such as the pain suffered by people with RD that the COVID-19 pandemic unleashed. Given this phenomenon, specific studies must be conducted in patients with RD as crucial to the social coexistence of this group.

It is very important to mention that the relevance of these results occurred during the first wave of the pandemic in Mexico and that due to the rapidity with which the pandemic occurred, the type of mutation, the rate of infection, non-vaccination, and other relevant variables could jeopardize the validity of these results.

Strengths

The strengths of this study include the fact that it was able to draw from a large sample from the control group, the pairing by age and sex, and obtaining three controls per case. A relevant aspect observed in the present study is the greater participation of women in both groups studied. It has been documented that women tend to participate more in studies [19], and additionally, the rheumatic diseases studied are more prevalent among women [14].

Limitations

This study has several limitations. The retrospective case–control study means that causal associations cannot be established. In addition, regarding the selection of the control group, ideally, they should be subjects close to the controls, which was not possible due to the conditions inherent to the pandemic, accessibility to subjects close to the cases, the sanitary measures adopted by the authorities, and the potential risk of contagion for field personnel, in addition to funding issues. Therefore, it was

decided to consider the participants of the UNAM study as a control group—with the inherent basic risks of this group—because there were similarities in the evaluation of the perception aspects of COVID-19. Another relevant aspect was that the questionnaires were administered online, which could produce a potential participation bias due to accessibility to technology without ruling out the possibility of memory bias. The other potential bias is the time of collection of the information. The control group was recruited at the beginning of the increase in cases in Mexico and continued during the time of recruitment in hospitals. This may have generated a potential bias in the perception of risk by patients, since the number of cases was greater during the time the survey was conducted with this group. An additional relevant factor in the study that may have an effect on the results is the possibility of residual confounding, in other words, the failure to completely control confounding factors or variables by adjusting the statistical analyses. In the present study, we were only able to perform bivariate analysis, and it was not possible to perform a multivariate analysis that would allow us to identify possible residual confounding. Based on the above and not being able to determine the possibility of the presence of residual confounding, the results obtained in the present study should be taken with great caution.

The measurement of depression and anxiety was self-reported for patients, while the Hospital Anxiety and Depression Scale (HADS) scale was applied to the case population. When comparing the direct question of feeling anxious and depressed, a high correlation was observed between both ways of asking. The use of different questionnaires to identify depression could have affected the estimation of the effect of this variable in the groups studied. It was decided to leave only the specific question in this report because it was easier and faster to answer a question at several of the scales.

In addition, comorbidities were recorded differently: they were self-reported in the control group and reported by the physician for the patients.

Conclusion

In the face of an unexpected and catastrophic event such as the COVID-19 pandemic, mental and economic vulnerability, and the perception of discrimination, were apparently greater, among RD patients than the control population.

Declarations

Ethics approval The study was conducted according to the guidelines in the Declaration of Helsinki and approved by the Ethics, Research and Biosafety Committees at the Hospital General de Mexico "Dr. Eduardo Liceaga" (DI/20/301/03/22) and the National Autonomous University of Mexico (UNAM); the recommendations of the Pan American Health Organization for conducting Public Health research during the COVID-19 pandemic were also followed (PAHO 2020).

Consent to participate Informed consent was obtained from all subjects involved in the study.

Disclosures None.

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