



COVID-19 quarantine in adolescents with autoimmune rheumatic diseases: mental health issues and life conditions

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Abstract

Objectives To assess mental health and life conditions in adolescents with autoimmune rheumatic diseases (ARDs) and healthy controls quarantined during COVID-19 pandemic.

Method A cross-sectional study included 155 ARD adolescents and 105 healthy controls. Online survey included self-reported strengths and difficulties questionnaire (SDQ), and a semi-structured questionnaire with demographic data, daily home and school routine, physical activities, and COVID-19 information during the pandemic.

Results Among patients, 56% had juvenile idiopathic arthritis (JIA), 29% juvenile systemic lupus erythematosus (JSLE), and 15% juvenile dermatomyositis (JDM). No differences were found regarding sex, ethnicity, and current age between ARD patients and controls ($p > 0.05$). Abnormal emotional SDQ (38% vs. 35%, $p = 0.653$) were similar in both groups. Logistic regression analyses in ARD patients demonstrated that female (OR = 2.4; 95%CI 1.0–6.0; $p = 0.044$) was associated with severe emotional SDQ dysfunction, whereas sleep problems were considered as a risk factor for both worse total SDQ (OR = 2.6; 95%CI 1.2–5.5; $p = 0.009$) and emotional SDQ scores (OR = 4.6; 95%CI 2.2–9.7; $p < 0.001$). Comparisons between ARD patients with and without current prednisone use showed higher median scores of peer problems in the first group [3 (0–10) vs. 2 (0–7), $p = 0.049$], whereas similar median and frequencies between JIA, JSLE, and JDM ($p > 0.05$).

Conclusions Approximately one third of JIA, JSLE, and JDM patients presented abnormal total and emotional scores of SDQ during COVID-19 quarantine. Sleep problems were the main factor associated with emotional difficulties in these ARD adolescents. The knowledge of mental health issues rates in adolescents with ARD supports the development of prevention strategies, like sleep hygiene counseling, as well as the references of the affected patients to specialized mental health services, as necessary.

Key Points

- One third of ARD patients presented mental health issues during COVID-19 quarantine
- Sleep problems were associated with emotional difficulties.
- It is necessary to warn pediatric rheumatologists about the importance of sleep hygiene counseling.

Keywords COVID-19 · Autoimmune rheumatic diseases · Mental health issues · Life conditions

Introduction

The infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in pediatric populations may present a large clinical spectrum varying from

asymptomatic to severe involvement [1–3]. Coronavirus disease 2019 (COVID-19) occurs in approximately 2% of adolescents [4, 5], may impact mental health and life conditions, and may be related to increased incidence of behavioral changes and neurological manifestations [6].

Autoimmune rheumatic diseases (ARDs) include various chronic conditions with high morbidity and mortality rates, and an increased risk of infections, including the new COVID-19. Infections in ARD adolescents occur due

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to underlying diseases, immunological abnormalities, disease activity, comorbidities, as well as immunosuppressive drugs [7–9]. Moreover, infectious diseases and psychological issues may trigger ARD and their flares [10, 11].

During COVID-19 pandemic, measures of distancing and social isolation were adopted to reduce the spread of SARS-CoV-2 infection. Adolescents were extensively deprived of social interaction that usually happens during school, cultural, and sports activities [12–14]. Several problems already identified in adults during the pandemic may also occur in this population, such as psychological and psychiatric conditions, sleep and eating disorders, sedentary lifestyle, increased use of electronic devices, family violence, use of alcohol and illicit drugs, and negative financial impact [14–16].

It is possible that, during the quarantine, adolescents with ARD have higher levels of psychological distress, due to the concern about their underlying condition, use of immunosuppressants, reduction in their outpatient visits, and risk of severe forms of COVID-19 [17]. All these factors may consequently affect their mental health and life conditions [13, 14].

Physical and mental health issues during COVID-19 quarantine was recently reported in a large population of adolescents with preexisting chronic immunocompromised diseases, including gastrointestinal, liver, ARD, and kidney conditions, and showed that approximately 30% of them had abnormal levels of psychopathology [18]. However, to our knowledge, there is no study focusing on the impact of social isolation on mental health issues and life conditions in a specific population of ARD, particularly comparing psychosocial functioning in three different conditions: juvenile idiopathic arthritis (JIA), juvenile systemic lupus erythematosus (JSLE), and juvenile dermatomyositis (JDM) patients.

Therefore, the objectives of the present study were:

- (a) To assess mental health and life conditions in adolescents with ARD quarantined during COVID-19 and to compare these findings to healthy controls;
- (b) To explore factors associated with abnormal psychosocial functioning among adolescents with ARD in general, as well as between specific diseases (JIA, JSLE, and JDM);
- (c) To evaluate the influence of immunosuppressants on abnormal psychosocial function.

Materials and methods

This is a cross-sectional study performed from July 2020 to October 2020 and involved 371 adolescents between 10 and 18 years old during COVID-19 pandemic in São Paulo metropolitan city, Brazil. Of them, 222 were adolescents

with preexisting ARD and 149 were healthy controls. Lifestyle restrictions, such as stay-at-home policy, social isolation, closure of schools, and face masks use, were mandatory and reinforced for all populations throughout this period.

Among the sample, all adolescents with preexisting ARD were recruited from the Pediatric Rheumatology Unit of a tertiary university hospital in Latin America. ARD patients were invited to participate in the study by telephone call. Patients who were not able to be contacted ($n=46$), who did not accept to participate ($n=9$) and/or did not answer the questionnaires ($n=12$) were excluded from the study. Thus, the final number of ARD patients included in the present study was 155: JIA ($n=86$), JSLE ($n=45$), and JDM ($n=24$), diagnosed according to the classification criteria for each disease [19–21].

The present study sample of healthy adolescents ($n=149$) was recruited by advertising on media such as radio, TV, newspaper, and social networking Web sites. Subjects who did not consent to participate in the research ($n=29$) or with incomplete survey data ($n=15$) were discounted. Therefore, 105 subjects comprised the study sample of healthy adolescents.

The survey was performed using Research Electronic Data Capture (REDCap), a Web application that permits building and managing online surveys and databases, and export data for statistical analysis. It can be edited by cell phone, computer, or tablet. The informed consent and assent terms were signed by parent/legal guardians and participants before starting the online questionnaire. The study was approved by National Ethical Committee (CONEP 4.081.961).

The questionnaire included two online surveys that assessed data in the last month. The first part was a semi-structured questionnaire including 38 questions about socio-demographic data, homeschooling, healthcare routine, impact of quarantine on mental health, and general information of COVID-19, and it was completed by both ARD and healthy control groups. For ARD group, there were also questions about their underlying ARD, including disease duration, adherence to treatment, and frequency of outpatient care during the pandemic. These 38 questions were of multiple choices, dichotomous, or visual analog scale (VAS), as previously reported [18].

The second part of the survey was the Portuguese validated version of Strengths and Difficulties Questionnaire (SDQ), a brief behavioral assessment tool, which allows mental health conditions screening in pediatric population. Prior Brazilian studies were performed and demonstrated that SDQ presented adequate psychometric properties measured for Brazilian population (Cronbach's alpha coefficient 0.8 for total difficulties score and 0.74–0.78 for emotional score) [22–27]. We used the self-report version

of the SDQ for teenagers, including 25 items and divided in five different domains: emotional, conduct, hyperactivity/inattention, and peer problems, as well as prosocial behavior. Each item of the response is ordinal on a Likert-like scale: not true, somewhat true, and certainly true (score ranging from 0 to 2). Total difficulties score include the emotional, conduct, hyperactivity/inattention, and peer problems domains (total score ranging from 0 to 40), allowing the classification of adolescents into 4 categories: close to average, slightly raised, high, and very high. According to total difficulties score of SDQ, adolescents with normal/borderline scores (ranging from 0 to 17) were grouped as normal and mild disorders (corresponding to close to average and slightly raised classification) and adolescents with abnormal scores (ranging to 18 to 40) were grouped as moderate/severe disorder (corresponding to high and very high classification). Concerning the emotional score of SDQ, adolescents were also grouped in normal or mild disorder (normal/borderline scores ranging 0 to 5) and moderate/severe disorder (abnormal scores ranging from 6 to 10) [28].

Current use of immunosuppressive/disease-modifying antirheumatic drugs (DMARDs) (methotrexate, leflunomide, sulfasalazine, azathioprine, mycophenolate mofetil, cyclosporin, cyclophosphamide) and/or biological agents (etanercept, adalimumab, infliximab, abatacept, tocilizumab, rituximab, belimumab) were evaluated. Current use of prednisone was also recorded.

Statistical analysis

The sample size of 260 participants provided power of about 80% to find differences greater than 15.5% in the frequency of abnormal SDQ score among adolescents with ARD and healthy participants (Graphpad StatMate 1.01, GraphPad Software, Inc., CA, USA) [18, 26, 29]. Categorical variables were described as frequency (percentage), and their differences were evaluated by Fisher's exact test or Pearson's chi-square test. Continuous variables were presented as median (range) or mean \pm standard deviation (SD) according to abnormal or normal distribution and were compared using Mann–Whitney test or Student's *t* test, respectively. The Kruskal–Wallis test was used to compare continuous variables with non-normal distribution in three groups of ARD (JIA, JSLE, and JDM), followed by a post hoc analysis by Dunn's multiple comparison test to determine where the difference occurred between these three ARD. Possible risk or protection factors for abnormal rates of total difficulties and emotional scores of SDQ were evaluated by logistic regression analyses. Finally, correlations between disease duration, physical activity per week, sleep quality, fear of COVID-19, fear of disease activity, fear of immunosuppressive use, current age, disease duration and total difficulties

and emotional scores of SDQ were tested by the Spearman rank correlation coefficient, a nonparametric test, since ordinal and continuous variables were tested. A *p* value < 0.05 was considered statistically significant.

Results

Mental health and life condition of adolescents with ARD and healthy controls

Table 1 includes demographic and school data, SARS-Cov2 information, daily habits, and SDQ scores in adolescents with ARD and healthy controls during COVID-19 pandemic. The frequencies of participants who attended school before pandemic (84% vs. 92%, $p=0.043$), performed homework during pandemic > 3 h/day (42% vs. 55%, $p=0.047$) and homework > 1 h/day (28% vs. 47%, $p=0.002$) were significantly lower in the former group. The frequencies of adolescents that attended public schools (76% vs. 65%, $p=0.046$), agreed with stay-home policy (99% vs. 94%, $p=0.019$) and had confidence in information about COVID-19 (73% vs. 56%, $p=0.003$) were significantly higher in ARD patients versus controls. The frequencies of abnormal total difficulties score of SDQ (32% vs. 32%, $p=0.901$) and abnormal emotional problem score of SDQ (38% vs. 35%, $p=0.653$) were similar in adolescents with ARD compared to healthy controls. No differences were evidenced between the median of emotional problem ($p=0.818$), peer problems ($p=0.558$), conduct problem ($p=0.40$), hyperactivity/inattention issue ($p=0.085$), and prosocial behavior ($p=0.599$) in both groups, as well as the mean of total difficulties score of SDQ (Table 1).

Factor associated to abnormal SDQ total difficulties score in ARD adolescents

Further comparisons in adolescents with ARD with abnormal total difficulties scores of SDQ ($n=49$) compared to those with normal/borderline total difficulties scores ($n=106$) revealed that frequencies of COVID-19 in relatives (24% vs. 11%, $p=0.035$), sleep duration < 8 h/day (53% vs. 31%, $p=0.009$), sleep problems (53% vs. 27%, $p=0.002$), worsening in family financial situation (51% vs. 31%, $p=0.027$), and previous psychiatric disorders (20% vs. 8%, $p=0.020$) were significantly higher in the first group. The median of physical activity per week [0.7 (0–10) vs. 2.7 (0–10), $p=0.013$] and sleep quality [5.8 (0–10) vs. 8.6 (0–10), $p=0.007$] were significantly lower in adolescents with ARD with abnormal total difficulties scores of SDQ compared to those with normal/borderline scores (Table 2).

Logistic regression analysis of ARD patients included abnormal total difficulties score of SDQ as dependent variable and physical activity per week (OR 0.9; 95% CI 0.9–1.0;

Table 1 Demographic and school data, SARS-CoV-2 information, daily habits, and Strengths and Difficulties Questionnaire (SDQ) scores in adolescents with autoimmune rheumatic diseases and healthy controls during coronavirus disease 2019 (COVID-19) quarantine

Variables	Autoimmune rheumatic diseases (<i>n</i> = 155)	Healthy controls (<i>n</i> = 105)	<i>p</i>
Demographic data			
Current age, years	15 (10–18)	15 (10–18)	0.262
Female sex	113 (73)	67 (64)	0.119
Caucasian	79 (51)	62 (59)	0.199
School data			
Attended school before pandemic	130 (84)	97 (92)	0.043
Attended public school	118 (76)	68 (65)	0.046
Homework during pandemic > 3 h/day	65 (42)	58 (55)	0.047
SARS-CoV-2 information			
Media as information source about COVID-19	138 (89)	99 (94)	0.304
Confidence in information about COVID-19	113 (73)	59 (56)	0.003
Fear of COVID-19, VAS 0–10	6.7 (0–10)	5.2 (0–10)	0.106
COVID-19 in relatives	24 (16)	15 (14)	0.791
Daily habits during pandemic			
Agree with stay-home policy	154 (99)	99 (94)	0.019
Housework > 1 h/day	43 (28)	49 (47)	0.002
Elderly care > 1 h/day	24 (16)	14 (13)	0.762
Physical activity per week, VAS 0–10	2.2 (0–10)	2.9 (0–10)	0.356
Sleep duration < 8 h/day	59 (38)	45 (43)	0.439
Sleep after midnight	105 (68)	76 (72)	0.425
Poor sleep quality	55 (36)	41 (39)	0.559
Sleep quality, VAS 0–10	7.8 (0–10)	7.4 (0–10)	0.239
Screen time > 6 h/day	75 (48)	62 (59)	0.118
Increase of screen time	133 (86)	96 (91)	0.170
Worsening in family financial situation	58 (37)	46 (44)	0.366
Report of family violence	32 (21)	31 (30)	0.101
SDQ scores			
Emotional problems, 0–10	5 (0–10)	5 (0–10)	0.818
Emotional disorder, score ≥ 6	59 (38)	36 (35)	0.653
Peers problems, 0–10	2 (0–10)	2 (0–10)	0.558
Conduct problems, 0–10	2 (0–8)	2 (0–8)	0.401
Hyperactivity/inattention problems, 0–10	4 (0–10)	5 (0–9)	0.085
Total difficulties score, 0–40	14.3 ± 6.6	14.6 ± 5.8	0.808
Abnormal total difficulties, score ≥ 18	49 (32)	33 (32)	0.901
Prosocial behavior (0–10)	8 (4–10)	8 (1–10)	0.599

Results are presented in *n* (%) and median (range), mean ± standard deviation

SARS-CoV-2 severe acute respiratory syndrome coronavirus, VAS visual analogue scale in the last month (scale 0–10), *p* values in bold are considered statistically significant (*p* < 0.05)

p = 0.082), sleep problems (OR 2.6; 95% CI 1.2–5.5; *p* = 0.009) and worsening in family financial situation (OR 1.4; 95% CI 0.9–2.1; *p* = 0.052) as independent variables. Sleep problems were the only factors independently associated with abnormal SDQ total difficulties score.

Factors associated to abnormal SDQ emotional score of ARD adolescents

Additional comparisons in adolescents with ARD with abnormal (*n* = 59) and normal/borderline (*n* = 96) emotional scores

of SDQ showed that frequencies of female sex (85% vs. 66%, *p* = 0.009), housework > 1 h/day (42% vs. 19%, *p* = 0.002), sleep after midnight (78% vs. 62%, *p* = 0.033), sleep problems (59% vs. 21%, *p* < 0.0001), and report of family violence (29% vs. 16%, *p* = 0.049) were significantly higher in the former group. The median of physical activity per week [0.3 (0–10) vs. 2.7 (0–10), *p* = 0.020] and sleep quality [7.0 (0–10) vs. 8.7 (2–10), *p* = 0.020] were significantly lower in adolescents with ARD with abnormal emotional scores of SDQ compared to those with normal/borderline scores, whereas the median fear of COVID-19 [7.5 (0–10) vs. 5.7 (0–10), *p* = 0.022] was significantly higher (Table 3).

Table 2 Demographic data, daily habits, concerns, and disease follow-up of adolescents with autoimmune rheumatic diseases according to total difficulties score categorization of Strengths and Difficulties Questionnaire (SDQ) during coronavirus disease 2019 (COVID-19) quarantine

Variables	Abnormal (<i>n</i> = 49)	Normal/borderline (<i>n</i> = 106)	<i>P</i>
Demographic data			
Current age, years	15 (10–18)	16 (10–18)	0.228
Female sex	39 (80)	74 (70)	0.203
Caucasian	25 (51)	54 (51)	0.993
COVID-19 in relatives	12 (25)	12 (11)	0.035
Daily habits during pandemic			
Housework > 1 h/day	18 (37)	25 (24)	0.234
Elderly care > 1 h/day	9 (18)	15 (14)	0.662
Physical activity per week, VAS 0–10	0.7 (0–10)	2.7 (0–10)	0.013
Sleep duration < 8 h/day	26 (53)	33 (31)	0.009
Sleep after midnight	37 (76)	68 (64)	0.160
Poor sleep quality	26 (53)	29 (27)	0.002
Sleep quality, VAS 0–10	5.8 (0–10)	8.6 (0–10)	0.007
Screen time > 6 h/day	23 (47)	52 (49)	0.942
Increase of screen time	41 (84)	92 (87)	0.605
Worsening in family financial situation	25 (51)	33 (31)	0.027
Report of family violence	14 (29)	18 (17)	0.097
Concerns			
Fear of COVID-19, VAS 0–10	7.5 (0–10)	6.2 (0–10)	0.292
Fear of activity disease, VAS 0–10	7.1 (0–10)	5.1 (0–10)	0.133
Fear of immunosuppressive use, VAS 0–10	5.0 (0–10)	3.9 (0–10)	0.436
Disease follow-up data during pandemic			
Outpatient visits (<i>n</i> = 149)			0.495
Same frequency	18/46 (39)	31/103 (30)	
Less visits	16/46 (35)	45/103 (44)	
Without outpatient visits	12/46 (26)	27/103 (26)	
Forget medications ≥ 3 days/week (<i>n</i> = 133)	3/42 (7)	3/91 (3)	0.586
Previous psychiatric disorder (<i>n</i> = 18)	10 (20)	8 (8)	0.020
JIA	6 (12)	3 (3)	NA
JSLE	3 (6)	4 (4)	NA
JDM	1 (2)	1 (1)	NA

Results are presented in *n* (%) and median (range)

VAS visual analogue scale in the last month (scale 0–10), NA not applicable, *p* values in bold are considered statistically significant (*p* < 0.05)

Further logistic regression test was performed with ARD adolescents. Abnormal emotional problem score of SDQ was included as dependent variable, whereas female sex (OR 2.4; 95%CI 1.0–6.0; *p* = 0.044), sleep problems (OR 4.6; 95% CI 2.2–9.7; *p* < 0.001), physical activity per week (OR 0.9; 95% CI 0.9–1.0; *p* = 0.204), and report of family violence (OR 1.8; 95%CI 0.7–4.4; *p* = 0.200) were added as independent variables. Female sex and sleep problems were independently associated with abnormal emotional scores of SDQ.

Demographics and SDQ score among adolescents with JIA, JSLE, and JDM

Among ARD patients, 86/155 (56%) presented JIA, 45/155 (29%) JSLE, and 24/155 (15%) JDM. Female sex occurred

similarly in ARD patients [JIA *n* = 60/86 (70%) vs. JSLE *n* = 36/45 (80%) vs. JDM *n* = 17/24 (71%), *p* = 0.477]. The median disease duration was significantly different in ARD patients [9 (3–18) for JIA, 5 (0–16) for JSLE, and 6.5 (2–18) years for JDM, *p* < 0.0001], and post hoc test demonstrated differences between adolescents with JIA compared to JSLE (*p* < 0.0001), as well as between JIA versus JDM (*p* = 0.012). The median and frequencies of SDQ scores and domains were similar between these three ARD (Table 4).

No Spearman rank correlation coefficient occurred between SDQ total difficulties or emotional scores and: physical activity per week by VAS, sleep quality by VAS, current age, disease duration, and fear of COVID-19 by VAS (*p* > 0.05).

Table 3 Demographic data, daily habits, concerns, and disease follow-up of adolescents with autoimmune rheumatic diseases according to emotional score categorization of Strengths and Difficulties Questionnaire (SDQ) during coronavirus disease 2019 (COVID-19) quarantine

Variables	Abnormal (<i>n</i> =59)	Normal/borderline (<i>n</i> =96)	<i>p</i>
Demographic data			
Current age, years	15 (10–18)	15 (10–18)	0.818
Female sex	50 (85)	63 (66)	0.009
Caucasian	33 (56)	46 (48)	0.332
COVID-19 in relatives	12 (20)	12 (13)	0.190
Daily habits during pandemic			
Housework > 1 h/day	25 (42)	18 (19)	0.002
Elderly care > 1 h/day	13 (22)	11 (12)	0.123
Physical activity per week, VAS 0–10	0.3 (0–10)	2.7 (0–10)	0.020
Sleep duration < 8 h/day	26 (44)	33 (34)	0.228
Sleep after midnight	46 (78)	59 (62)	0.033
Poor sleep quality	35 (59)	20 (21)	<0.0001
Sleep quality, VAS 0–10	7.0 (0–10)	8.7 (2–10)	0.020
Screen time > 6 h/day	27 (46)	48 (50)	0.728
Increase of screen time	52 (88)	81 (84)	0.515
Worsening in family financial situation	27 (46)	31 (32)	0.130
Report of family violence	17 (29)	15 (16)	0.049
Concerns			
Fear of COVID-19, VAS 0–10	7.5 (0–10)	5.7 (0–10)	0.022
Fear of activity disease, VAS 0–10	7.1 (0–10)	5.0 (0–10)	0.067
Fear of immunosuppressive use, VAS 0–10	5.0 (0–10)	3.8 (0–10)	0.350
Disease follow-up data during pandemic			
Outpatient visits (<i>n</i> =149)			0.573
Same frequency	15/54 (28)	34/95 (36)	
Less visits	23/54 (43)	38/95 (40)	
Without outpatient visits	16/54 (30)	23/95 (24)	
Forget medications ≥ 3 days/week (<i>n</i> =133)	4/51 (8)	2/82 (2)	0.302
Previous psychiatric disorder	9 (15)	9 (9)	0.267

Results are presented in *n* (%) and median (range)

VAS visual analogue scale in the last month (scale 0–10), *p* values in bold are considered statistically significant (*p* < 0.05)

Influence of immunosuppressants on abnormal mental health

Comparisons between ARD adolescents with and without current immunosuppressive/DMARDs (methotrexate, leflunomide, sulfasalazine, azathioprine, mycophenolate mofetil, cyclosporin, cyclophosphamide) and/or biological agents use (etanercept, adalimumab, infliximab, abatacept, tocilizumab, rituximab, belimumab) showed similar median of total difficulties score of SDQ (*p*=0.515), emotional problem (*p*=0.475), peer problems (*p*=0.672), conduct problem (*p*=0.400), hyperactivity/inattention issue (*p*=0.304), and prosocial behavior (*p*=0.534).

Further comparisons between ARD patients with and without current prednisone use showed significantly higher median scores of peer problems in the former group [3 (0–10) vs. 2 (0–7), *p*=0.049]. The median of total difficulties score of SDQ (*p*=0.741), emotional problem (*p*=0.425), conduct problem

(*p*=0.438), hyperactivity/inattention issue (*p*=0.352), and prosocial behavior (*p*=0.245) were similar in both groups.

Discussion

This is the first report to assess psychosocial functioning and life conditions of adolescents with preexisting ARD during the COVID-19 quarantine. Sleep problems were the main factor associated with total and emotional difficulties.

We extended previous studies [18] and demonstrated that one third of JIA, JSLE, and JDM patients presented abnormal total difficulties and emotional scores of SDQ, and these findings were similar to the control group. Even though ARD adolescent patients present more stressor factors related to their underlying condition, it is possible that they have a more resilient attitude that may help them to face additional health-related stressor [17], minimizing

Table 4 Demographic data and Strengths and Difficulties Questionnaire (SDQ) scores reported by adolescents with JIA versus JSLE versus JDM during quarantine of coronavirus infectious disease 2019 (COVID-19) pandemic

SDQ domains (score)	JIA (n=86)	JSLE (n=45)	JDM (n=24)	p
Demographic data				
Current age, years	15 (10–18)	16 (11–18) ^a	14 (10–18)	0.034
Disease duration, years	9.0 (3–18) ^b	5.0 (0–16)	6.5 (2–18)	<0.0001
Female sex	60 (70)	36 (80)	17 (71)	0.477
SDQ scores				
Emotional problems, 0–10	4.5 (0–10)	5.0 (0–9)	4.5 (0–9)	0.487
Emotional disorder, score ≥ 6	34 (40)	17 (38)	8 (33)	0.857
Peers problems, 0–10	2.0 (0–10)	2.0 (0–8)	1.5 (0–5)	0.179
Conduct problems, 0–10	2 (0–8)	2 (0–6)	2 (0–6)	0.367
Hyperactivity/inattention problems, 0–10	4 (0–10)	4 (0–9)	4 (0–9)	0.916
Total difficulties score, 0–40	14.8 \pm 6.7	14.0 \pm 6.6	13.2 \pm 6.6	0.524
Abnormal total difficulties, score ≥ 18	26 (30)	15 (33)	8 (33)	0.918
Prosocial behavior (0–10)	8 (4–10)	8 (4–10)	9 (4–10)	0.678

Results are presented in n (%), median (range), mean \pm standard deviation

JIA juvenile idiopathic arthritis, JSLE juvenile systemic lupus erythematosus, JDM juvenile dermatomyositis, p values in bold are considered statistically significant ($p < 0.05$)

^aDifference between JSLE and JDM ($p = 0.01$)

^bDifferences between JIA and JSLE (< 0.0001) and between JIA and JDM ($p = 0.012$)

differences to the control group. Our findings were similar to a Turkish study in which the level of psychological distress of adult patients with rheumatologic conditions were similar to the control group included.

Despite the fact that ARD patients and controls had similar scores for psychological suffering, it was possible to observe some differences between these groups. Patients had lower school attendance before the pandemic, demonstrating the impact of their underlying condition on their routine, which also justifies that this group dedicates less time to housework activities. In addition, both groups considered media, such as television, radio, and Internet, as the main source of information about COVID-19; however, ARD adolescents trusted this information more than controls, which could reflect their greater health concerns, possibly also justifying the greater compliance with stay-home policy.

Concerning the patients classified with abnormal levels of total difficulties score of SDQ, it was observed that this group presented a significantly higher frequency of sleep problems. Several studies showed that stressful events, such as this pandemic health crisis, can precipitate sleep disorders, including insufficient sleep and poor sleep quality [30, 31]. Some North American studies revealed that insufficient sleep, as short sleep duration and later bedtime, represent risk factors for adolescents' health, with several repercussions such as attention deficit, reduced school performance, increased risk of obesity, cardiometabolic conditions, and mood disorders [32–34]. Furthermore, a recent systematic review showed that 20% of children and 55% of adolescents reported sleep difficulty, and an increased proportion of sleep disturbances during the lockdown [35].

We observed that worsening in family financial situation was associated with abnormal SDQ total difficulties scores, although logistic regression analysis demonstrated only a tendency. This finding may be due to the poverty levels increased by economic recession and with the chance of developing psychological disorders. A prior study demonstrated mental issues of children and adolescents in poverty positions, such as distress in neighborhood, poor quality schools, limited supply of nutritious food, family income, family structure, and parental psychological factors [36]. During the pandemic, especially in developing countries such as Brazil, social inequality worsened significantly, which may impact patients' psychosocial functioning [37, 38].

Regarding emotional problems domain of SDQ, it was found that among patients with abnormal scores there was a predominance of female sex. This result must be carefully interpreted, since there was a marked predominance of women in our sample, due to fact that female sex is more prevalently than men in ARD. However, the predominance of female sex was noted only in the emotional domain and it was not observed in SDQ total score. As well established in previous studies, women present a higher prevalence of anxiety and mood disorders than men [39]. Furthermore, sleep problems emerged as a risk factor also for emotional problems, as previously seen and discussed in relation to SDQ total score.

Of note, we verified association between peer problems domain and current prednisone use. Several side effects attributed to corticosteroids use, such as weight gain, acne, growth retardation, and Cushingoid features, can influence the self-esteem of adolescents with ARD, and may be contributing with peer problems, like exclusion or rejection

[40–42]. Although the study participants were not in contact with their peers during the quarantine, the effect of previous and current corticosteroids use still affect their self-esteem. In fact, we noted that many ARD adolescents patients in our clinics were afraid to return to school and social activities after school opening in Brazil (data not shown), which must be the subject of further studies. This must be a warning regarding the impact of corticosteroids use in adolescents and highlights the importance of early withdrawing of this medication. In addition, the use of other immunosuppressants did not interfere with psychosocial functioning, probably due to these medications do not impact physical appearance.

The main strengths of this study are the mental health evaluation of a group of ARD adolescents on a tertiary hospital during COVID-19 pandemic quarantine, through the use of SDQ Brazilian Portuguese validated instrument, which presents high reliability to assess psychosocial functioning in adolescents [23–27]. Additionally, life conditions and the influence of immunosuppressants use on mental health were also evaluated, contributing to the characterization of daily habits of this group during this period, and to the identification of risk factors for emotional difficulties. These findings may help to identify individuals with a specific demand for treatment and follow-up in mental health services, in addition to emphasizing the importance and needs for prevention strategies.

This study has some limitations. The cross-sectional design does not allow detecting causal relationships, since we only have data from one period of COVID-19 pandemic. Moreover, it was not possible to objectively compare this data to the previous period before the pandemic. Also, ARD adolescent convenience sample is not nationally representative. Additionally, it was not possible to detect differences among the diseases studied, which may be achieved with a large sample size. During the study period, adolescents were overloaded with online activities that may have affected the ratio of response to the questionnaires. Disease activity parameters were not evaluated herein either, since these ARD patients were quarantined due to pandemic.

Conclusions

In conclusion, our findings showed that approximately one third of adolescents with JIA, JSLE, and JDM presented abnormal total difficulties and emotional scores of SDQ, which was similar to healthy controls. Additionally, sleep problems were the main factor associated with poor mental health and emotional difficulties in the ARD adolescents.

We emphasized the importance of recognizing rates of mental health issues in adolescents with ARD, which may support the development of prevention strategies, such as sleep hygiene

counseling, as well as the reference of affected patients to specialized mental health services for follow-up, as necessary.

Further studies concerning the effects of mental health issues on ARD might be necessary, as well as researches regarding the influence of immunosuppressants on abnormal psychosocial functioning, particularly on peer problems.

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Declarations

Conflict of interest The authors declare no competing interests.

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