



## Research article

# Prevalence and risk factors for anxiety and depression among community dwelling patients with cervical spondylosis during the COVID-19 pandemic



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## ABSTRACT

**Background:** The emergence of COVID-19 and its unfavorable consequences lead to disease fear and other related mental health problems for individuals worldwide. This study aimed to analyze the prevalence and relevant factors of anxiety and depression among community dwelling cervical spondylosis (CS) patients, and to explore the relationship between fear of COVID-19 and anxiety and depression, so as to provide scientific basis for improving their mental health.

**Methods:** A community-based cross-sectional study was conducted among a cohort of 556 CS patients by using convenient sampling. These participants were asked to complete a demographic questionnaire, the Hospital Anxiety and Depression Scale (HADS), and the Fear of COVID-19 Scale (FCV-19S). The Chi-square test was used to determine the differences among categorical variables. Binary stepwise logistic regression was used to determine predictors of anxiety and depression.

**Results:** The median HADS-A score was 5 (interquartile interval 2–7), and the median HADS-D score was 4 (interquartile interval 2–8). In this study, the prevalence of anxiety and depression was 25.0% and 26.6%, respectively. Gender and comorbid chronic diseases were predictors of depressive symptoms. In addition, fear of COVID-19 was related to depression and anxiety among community dwelling CS patients.

**Conclusion:** Approximately one quarter of community dwelling CS patients were suffering depression or anxiety. Our findings could provide a basis for the development of psychological crisis intervention strategies for CS patients under public health emergencies in the future.

## 1. Introduction

On 30 January 2020, coronavirus disease 2019 (COVID-19) was declared a public health emergency of international concern [1]. With the rapid spread of the pandemic, this infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) has caused massive infections and deaths and attracted wide public attention worldwide [2,3]. Not only does the pandemic cause physical damage and economic losses, but it also has adverse consequences for mental health [4,5]. Previous epidemics have been linked to an increase in mental illness among affected populations. For example, the epidemic of SARS has been associated with an increase in depression, anxiety, and posttraumatic stress in the survivors of this disease [6]. Therefore, mental health problems are

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often the most prominent problem during public health emergencies. A cross-sectional study showed that the incidence rates of anxiety and depression among healthcare workers were 33.2% and 39.4%, respectively during the COVID-19 outbreak [7]. The symptoms of depression and anxiety were also widespread in the general population during the special period [8]. Notably, studies have shown that people with chronic diseases have been particularly affected by COVID-19 [9,10].

Cervical spondylosis (CS) is a condition caused by degenerative changes of cervical intervertebral disc and its accessory structure, which can further stimulate or oppress the spinal cord, nerves and blood vessels, resulting in a series symptoms and signs [11]. In recent years, CS incidence has been on the rise and is becoming more prevalent among the younger group [12]. A recent study showed that as high as 35.9% Chinese people are suffering chronic body pain, especially in head, neck/shoulder, and waist/back [13]. CS is mainly manifested as neck and back pain, limb weakness and difficulty in walking in the affected patients and all these manifestations seriously decrease the quality of life of the affected individuals [14]. Indeed, long-term CS symptoms have not only brought about physical distress, but also mental affliction, including anxiety and depression [15,16]. In spite of that, overall little attention has been paid to the psychological impact of this disease and related factors, no matter before or after the COVID-19 outbreak.

The public's unfavorable perception of emergencies directly influenced their emotional responses, and would cause mental symptoms, including depression and anxiety [17]. As a peculiar emotional response in the times of COVID-19 prevails, fear of COVID-19 has been documented to be a key and main predictor of increased negative emotions, such as anxiety, depression, and stress, and mental diseases [18–21]. A recent study conducted among pregnant women revealed that fear of COVID-19 triggered anxiety directly, and mental health disorders indirectly via affecting concerns of pregnancy in this population [22]. Sarker et al. in their study also found that higher COVID-19 fear was related to lower mental health among tertiary college students [23]. Despite these findings among other population, the attribution of fear of COVID-19 to anxiety and depression among CS patients was still elusive.

To sum up, given a lack of research on prevalence and relevant factors of anxiety and depression among community dwelling CS patients during the COVID-19 pandemic, this study aimed to address this issue via inclusion of a range of potentially salient demographic variables. In addition, considering the widespread and prolonged prevalence of the pandemic, the association between fear of COVID-19 and anxiety and depression was also specifically examined.

## 2. Methods

### 2.1. Setting and sample

The sample size was calculated based on Kendall's principle, that is, sample size should be 5–10 times of the number of variables. There were ten variables in total in the present study and thus the estimated minimum sample size was 59–118 on the basis of consideration of 15% potential sample loss. In the end, a total of 556 patients with CS were included by convenience and snowball sampling method from February to September 2021 in two cities (Jinzhou and Liaoyang) of Liaoning Province, China. All the study samples were obtained via diverse channels and settings, including residential areas, public places (e.g., park), and community health service centers or stations where CS patients were referred. All participants volunteered for the study and gave their written informed consent to complete the survey. Inclusion criteria were as follows: at least 18 years of age; meeting the clinical diagnostic criteria of CS; literate enough to understand the items in the questionnaire. Those with severe cognitive disorders were excluded from this study. The study was reviewed and approved by the Ethics Committee of Jinzhou Medical University and complied with the 1964 Helsinki declaration and its later amendments.

### 2.2. Measures

#### 2.2.1. Demographic questionnaire

Given the lack of related previous report regarding predisposing factors of anxiety and depression in CS patients, the analyses in the field of study were exploratory in nature, only some generic demographic variables that are potentially associated with negative emotions were tentatively included for analysis. These demographic characteristics included age, gender, marital status, educational level, employment status, and monthly income, and whether having comorbid chronic diseases.

#### 2.2.2. Fear of COVID-19 scale (FCV-19S)

FCV-19S was used to assess the severity of the fear of COVID-19 in public [24]. It consists of 7 items with each rated from 1 (strongly disagree) to 5 (strongly agree). The total scale scores ranged from 7 to 35, with higher scores indicating more severe fear of COVID-19. The scale exhibited strong psychometric properties. In this study, Cronbach's  $\alpha$  coefficient of internal consistency of this scale was 0.891.

#### 2.2.3. Hospital anxiety and depression scale (HADS)

HADS was used to assess levels of anxiety (HADS-A) and depression (HADS-D) [25]. The scale consists of 14 items, including two subscales of anxiety and depression. Each subscale has 7 items. All the items used a four-point scoring ranging from 0 to 3, with the total score ranging from 0 to 21. The higher the total score of the scale, the more severe the anxiety or depression. A score of 8 was used as the threshold for anxiety or depression [26]. That is, a score less than 8 means no anxiety or depression symptoms, and a score greater than or equal to 8 means the presence of anxiety or depression symptoms. This scale has been proved to have sufficient reliability and validity in China by Li et al. [27]. In their study, a two-factor construct (for patients:  $\chi^2 = 248.35$ , CFI = 0.962, RMSEA = 0.061, SRMR = 0.032; for family caregivers:  $\chi^2 = 338.59$ , CFI = 0.935, RMSEA = 0.075, SRMR = 0.040) and acceptable concurrent

validity in regard to the Chinese version of Medical Outcomes Study 12-item Short Form (C-SF-12) of this scale was supported in Chinese cultural background. An earlier study by Leung et al. also pointed out that the Chinese version of HADS demonstrated comparable equivalence to the English original [28]. The Cronbach's  $\alpha$  coefficient of internal consistency of HADS, HADS-A, and HADS-D in the current sample were 0.852, 0.761, and 0.755, respectively.

### 2.3. Statistical analysis

SPSS version 20.0 was used for data analysis (IBM Corporation, Armonk, NY, USA). Kolmogorov-Smirnov test was used to test the normal distribution. Continuous variables were expressed as mean  $\pm$  standard deviation (SD) and median (interquartile interval). Nominal and category variables were expressed as frequency and percentage (%). The Chi-square test was used to determine the differences among categorical variables. Spearman correlation coefficient was used to analyze the correlation of each variable. The strength can be interpreted based on the general guidelines, i.e.,  $0.1 < |r| < 0.3$ ,  $0.3 < |r| < 0.5$ , and  $|r| > 0.5$  representing weak, moderate, and strong correlation, respectively [29]. Using FCV-19S and statistically significant variables from univariate analysis as independent variables, binary stepwise logistic regression was used to determine the predictive variables of HADS-A and HADS-D. If the two-tailed probability value is less than 0.05, it is considered statistically significant.

## 3. Results

### 3.1. Descriptive statistics

The study included 556 participants, with their sociodemographic details displayed in Table 1. The age of the participants ranged from 18 to 68, with most of them under 50. The majority of the participants were female (75.7%) and unmarried (67.8%). 79.7% of participants had at least bachelor-level education. The median scores for HADS-A, HADS-D, and FCV-19S were 5 (2–7), 4 (2–8), and 19 (15–23), respectively.

### 3.2. Prevalence of fear to COVID-19

Previously it was shown the optimal cutoff scores of the C-FCV-19S was 17.5 [30]. Based on this criterion, a 59.9% (95% CI: 55.8%–64.0%) prevalence of fear to COVID-19 was found among the current respondents.

### 3.3. Prevalence of depression and anxiety

According to the previously determined cut-off value of 8 [26], the prevalence of anxiety and depression in the current sample was 25.0% (95% CI: 21.4%–28.6%) and 26.6% (95% CI: 22.9%–30.3%), respectively. As shown in Table 2, the score of HADS-A was

**Table 1**  
Frequency distribution of demographic characteristics (n = 556).

Variables	Frequency	Percentage
Gender		
Male	135	24.3
Female	421	75.7
Age		
<50	523	94.1
$\geq$ 50	33	5.9
Marital status		
Single	377	67.8
Married	171	30.8
Divorced	8	1.4
Education level		
Primary school	21	3.8
Secondary school	41	7.4
High school	51	9.2
University degree and above	443	79.7
Employment status		
Employee	505	90.8
Retirement	41	7.4
Unemployed	10	1.8
Monthly income		
<2000	329	59.2
2000–3000	65	11.7
>3000	162	29.1
Comorbid chronic diseases		
No	544	97.8
Yes	12	2.2

significantly different in the following sociodemographic variables: gender ( $\chi^2 = 7.829, p = 0.005$ ), age ( $\chi^2 = 3.877, p = 0.049$ ), education ( $\chi^2 = 15.381, p = 0.002$ ), marriage ( $\chi^2 = 8.066, p = 0.018$ ), and comorbid chronic diseases ( $\chi^2 = 5.565, p = 0.018$ ). Among all variables, there were statistically significant differences in the scores of HADS-D in gender ( $\chi^2 = 14.584, p < 0.001$ ), age ( $\chi^2 = 8.587, p = 0.003$ ), education level ( $\chi^2 = 24.029, p < 0.001$ ), marital status ( $\chi^2 = 13.250, p = 0.001$ ), and comorbid chronic diseases ( $\chi^2 = 8.084, p = 0.004$ ) (Table 3).

### 3.4. Correlation analysis

Since the scores of FCV-19S, HADS-A and HADS-D were all non-normally distributed according to the Kolmogorov-Smirnov test results (all  $p < 0.001$ ), Spearman correlation coefficient was used to analyze the correlation among FCV-19S, HADS-A and HADS-D. HADS-A was significantly and strongly associated with HADS-D ( $r = 0.681, p < 0.001$ ). In addition, FCV-19S scores exhibited weak-to-moderate and positive correlations with those of HADS-A ( $r = 0.365, p < 0.001$ ), and HADS-D ( $r = 0.311, p < 0.001$ ).

### 3.5. Predictors of depression and anxiety

Binary stepwise logistic regression analysis was used to identify predictors of HADS-A or HADS-D. Table 4 showed that FCV-19S was an independent risk factor for HADS-A among community dwelling CS patients (OR, 1.099; 95% CI, 1.059–1.141;  $p < 0.001$ ). As shown in Table 5, being males (OR, 1.719; 95% CI, 1.082–2.732;  $p = 0.022$ ), having comorbid chronic diseases (OR, 4.294; 95% CI, 1.023–18.033;  $p = 0.047$ ), and higher FCV-19S score (OR, 1.080; 95% CI, 1.042–1.120;  $p < 0.001$ ) were all significantly associated with the increased risk of depression among community dwelling CS patients.

## 4. Discussion

The purpose of this study was to examine the level of depression and anxiety and related factors among community dwelling CS patients. We found that more than a quarter of patients had depression and/or anxiety symptoms. Correlation analysis showed that COVID-19 fear was positively related to HADS-A and HADS-D. Binary stepwise logistic regression analysis found that FCV-19S was correlated with HADS-A, whereas gender, having comorbid chronic diseases, and FCV-19S were predictors of HADS-D.

Anxiety and depression remain major mental disorders at the COVID-19 post-pandemic age and severely affected the quality of life [31,32]. Our study found that the incidence rate of anxiety and depression was 25.0% and 26.6%, respectively among community dwelling CS patients. A previous study showed that in the Chinese general population, the prevalence rates of anxiety and depression as determined by HADS cut-off value of 7 were 14.15% and 17.35% during the rapid development of COVID-19 [33]. The much higher incidence of anxiety and depression in CS patients than that in the general population emphasizes that intensified psychological interventions should be conducted among the mentally vulnerable CS patients, so as to improve their mental well-being.

**Table 2**  
Univariate analyses of HADS-A among CS patients in the community (n = 556).

Variables	HADS-A		$\chi^2$	P
	Yes (n = 139)	No (n = 417)		
Gender			7.829	0.005
Male	46 (33.1)	89 (21.3)		
Female	93 (66.9)	328 (78.7)		
Age			3.877	0.049
<50	126 (90.6)	397 (95.2)		
≥50	13 (9.4)	20 (4.8)		
Marital status			8.066	0.018
Single	82 (59.0)	295 (70.7)		
Married	53 (38.1)	118 (28.3)		
Divorced	4 (2.9)	4 (1.0)		
Education level			15.381	0.002
Primary school	10 (7.2)	11 (2.6)		
Secondary school	17 (12.2)	24 (5.8)		
High school	16 (11.5)	35 (8.4)		
University degree and above	96 (69.1)	347 (83.2)		
Employment status			1.279	0.528
Employee	127 (91.4)	378 (90.6)		
Retirement	11 (7.9)	30 (7.2)		
Unemployed	1 (0.7)	9 (2.2)		
Monthly income			1.993	0.369
<2000	76 (54.7)	253 (60.7)		
2000–3000	20 (14.4)	45 (10.8)		
>3000	43 (30.9)	119 (28.5)		
Comorbid chronic diseases			5.565	0.018
No	132 (95.0)	412 (98.8)		
Yes	7 (5.0)	5 (1.2)		

**Table 3**  
Univariate analyses of HADS-D among CS patients in the community (n = 556).

Variables	HADS-D		$\chi^2$	P
	Yes (n = 148)	No (n = 408)		
Gender			14.584	<0.001
Male	53 (35.8)	82 (20.1)		
Female	95 (64.2)	326 (79.9)		
Age			8.587	0.003
<50	132 (89.2)	391 (95.8)		
≥50	16 (10.8)	17 (4.2)		
Marital status			13.250	0.001
Single	83 (56.1)	294 (72.1)		
Married	63 (42.6)	108 (26.5)		
Divorced	2 (1.4)	6 (1.5)		
Education level			24.029	<0.001
Primary school	11 (7.4)	10 (2.5)		
Secondary school	19 (12.8)	22 (5.4)		
High school	20 (13.5)	31 (7.6)		
University degree and above	98 (66.2)	345 (84.6)		
Employment status			1.367	0.505
Employee	131 (88.5)	374 (91.7)		
Retirement	14 (9.5)	27 (6.6)		
Unemployed	3 (2.0)	7 (1.7)		
Monthly income			2.898	0.235
<2000	84 (56.8)	245 (60.0)		
2000–3000	23 (15.5)	42 (10.3)		
>3000	41 (27.7)	121 (29.7)		
Comorbid chronic diseases			8.084	0.004
No	140 (94.6)	404 (99.0)		
Yes	8 (5.4)	4 (1.0)		

**Table 4**  
Binary stepwise logistic regression analysis for the predictors of HADS-A (n = 556).

Variables	B	SE	WALS	P	OR	95% CI
Gender (Ref. = Female)						
Male	0.404	0.244	2.743	0.098	1.498	0.929–2.417
Age (Ref. = < 50)						
≥50	−0.123	0.468	0.069	0.792	0.884	0.353–2.213
Marital status (Ref. = Married)						
Divorced	0.324	0.757	0.183	0.669	1.383	0.313–6.100
Single	0.248	0.291	0.726	0.394	1.282	0.724–2.270
Education level (Ref. = Primary school)						
Secondary school	−0.036	0.583	0.004	0.950	0.964	0.307–3.025
High school	−0.310	0.580	0.286	0.593	0.733	0.235–2.285
University degree and above	−0.481	0.566	0.722	0.396	0.618	0.204–1.876
Comorbid chronic diseases (Ref. = No)						
Yes	1.185	0.691	2.940	0.086	3.272	0.844–12.685
FCV-19S	0.095	0.019	24.434	<0.001	1.099	1.059–1.141

SE, standard error; WALS, weighted-average least squares; OR, odds ratio; CI, confidence interval.

In this study, the median FCV-19S score and prevalence rate was 19 (interquartile interval 15–23) and 59.9%, both being higher than the values of 17.5 (7–35) and 51.1% revealed among caregivers of children with cerebral palsy [34]. Studies have found that FCV-19S was associated with a lack of resilience, high-frequency use of maladaptive emotion regulation strategies, and impaired quality of life [35,36]. Furthermore, fear to COVID-19 pandemic was documented to predispose to depression and/or anxiety symptoms among both general and clinical population [37–39]. Correlation analysis in this study showed that fear of COVID-19 was positively and moderately correlated with anxiety and depression. This result seems plausible. On the one hand, individuals in a prolonged state of fear will feel the threat of the Novel Coronavirus, which will further heighten the sense of anxiety and depression [18]. On the other hand, fear and anxiety are of two quite distinct psychological constructs although both of them are aroused by perceived threatening situations [40]. Generally, fear of COVID-19 emerges in an immediate manner, while anxiety a sustained manner lasting over a relatively long time. Our present study was conducted in the context of the post-pandemic ages of COVID-19, when urgent and large-scale infectious events have been well contained in China. In contrast, the impact of pandemic crisis and corresponding normalized prevention and control measures, such as social distancing and activity restriction created an unpleasant atmosphere of vigilance and alarm and caused uncertainty, social isolation and loneliness, and financial loss, thereby potentially triggering a range of negative emotional responses in the general population and patients with COVID-19 and/or other chronic conditions, including anxiety and depression [41–43]. This might explained the significant but weak-to-moderate association between

**Table 5**  
Binary stepwise logistic regression analysis for the predictors of HADS-D (n = 556).

Variables	B	SE	WALS	P	OR	95% CI
Gender (Ref. = Female)						
Male	0.542	0.236	5.254	0.022	1.719	1.082–2.732
Age (Ref. = < 50)						
≥50	−0.039	0.457	0.007	0.932	0.962	0.393–2.353
Marital status (Ref. = Married)						
Divorced	−1.151	0.894	1.659	0.198	0.316	0.055–1.823
Single	0.088	0.282	0.097	0.756	1.092	0.628–1.896
Education level (Ref. = Primary school)						
Secondary school	0.008	0.584	0.000	0.989	1.008	0.321–3.165
High school	−0.150	0.576	0.068	0.795	0.861	0.278–2.663
University degree and above	−0.590	0.565	1.091	0.296	0.554	0.183–1.677
Comorbid chronic diseases (Ref. = No)						
Yes	1.457	0.732	3.963	0.047	4.294	1.023–18.033
FCV-19S	0.077	0.018	17.623	<0.001	1.080	1.042–1.120

SE, standard error; WALS, weighted-average least squares; OR, odds ratio; CI, confidence interval.

fear and anxiety/depression among community dwelling CS patients. Thus our findings in combination with extant evidence have practical implications for future mental health intervention strategies. In addition to reducing fear in CS patients, local healthcare institutions and professionals are advised to focus more on the pandemic-related long-lasting unfavorable emotional status.

Previous findings demonstrated that across observed years of 1997–2015, women generally had a stably higher prevalence of a range of chronic morbidities, including musculoskeletal diseases, headaches, peripheral vascular diseases, and anxiety and depression [44]. It has also been proposed that depression is twice prevalent in women than in men [45]. In contrast to these arguments, of the demographic variables, we found that male gender was associated with increased incidence of depression. The finding of higher incidence of depression in males may be due to the fact that men are not only under more pressure to work during the COVID-19 pandemic, but they are also under significantly more pressure to take care of their families [46]. Following the long-lasting COVID-19 pandemic, financial insecurity or financial losses have become a major concern and correspondingly would trigger numbers of mental health problems such as depression [47]. The double pressure of work and family has increased the psychological burden on men. Consistent with our results, a previous study also found a higher prevalence of depression in male patients with chronic obstructive pulmonary disease (COPD) [48]. Therefore, the intervention on CS patients for negative emotions should focus more on males.

The results showed that the risk of depression in CS patients with comorbid chronic diseases was 3.294 times higher than that in population without comorbid chronic diseases. Accumulating evidence has supported that physical and/or psychological chronic diseases can be regarded as important stressors in the affected individuals and result in or exacerbate symptoms of mental problems, including depression [49–51]. CS is a chronic stressful event and not only leads to physical suffering [52–54] but also an increase in anxiety and depression symptoms [55]. Thus it would not be surprising to see the increased incidence rate of depression in CS patients with additional chronic conditions in the present study. In line with this, a most recent Brazilian study has also revealed the worsened anxiety and depression symptoms caused by multimorbidity during the COVID-19 pandemic [32]. Along these lines, we previously showed that comorbid chronic diseases predisposed patients with lumbar herniation disc to low level of resilience [56], a trans-diagnostic protective factor against mental problems associated with chronic pain [57]. In addition, people with chronic diseases are prone to adverse psychological reactions due to the fear of the epidemic itself, resulting in the decline of individual physical and mental functions, and eventually depression symptoms [58]. Therefore, attention should be paid to the psychological support of CS patients accompanied by additional chronic diseases in order to improve their quality of life.

#### 4.1. Limitations and implications

There are several limitations in this study. Firstly, this study adopted a cross-sectional approach, and no causal relationship could be established from our data. Secondly, future studies should include more variables and expand the sample size to explore influencing factors of anxiety and depression among community dwelling CS patients. Thirdly, convenience sampling was used to collect questionnaires in this study, which may have contributed to the selection bias. Fourthly, due to the deficiency of related report on this topic, we fail to make a proper comparison between pre-pandemic and post-pandemic data. According to our present study, approximately one quarter of community dwelling CS patients were suffering depression or anxiety during the COVID-19 pandemic. More attention should be paid on the mental health of male CS patients, especially those with comorbid chronic diseases. Relief of fear of COVID-19 is also beneficial to their emotional state.

#### Author contribution statement

Yuying Chu: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Xue Wang: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Hongliang Dai: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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### Data availability statement

Data will be made available on request.

### Declaration of interest's statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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