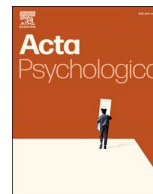




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Prevalence and associated factors of depressive symptoms among the young adults during the post-epidemic period — Evidence from the first wave of COVID-19 in Hubei Province, China

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ARTICLE INFO

Keywords:

COVID-19
Depressive symptoms
Young adults
Post-epidemic period
Hubei Province

ABSTRACT

Introduction: China emerged from the first wave of COVID-19 in a short period of time and returned to normal economic and living order nationwide, making China's entry into the post-COVID-19 epidemic period since April 2020. However, the COVID-19 epidemic had a great impact on young adults' psychological status and may continue into the post-epidemic period. The enormous economic, employment and entrepreneurship pressures of this period may exacerbate this negative impact. This study investigated the depression status of the young adults and put forward the suggestions on how to strengthen the psychological crisis intervention and social security to cultivate the resilience of the young adults after major public health emergencies.

Methods: This study conducted a questionnaire survey to identify the prevalence of depressive symptoms and explore the associated factors of depressive symptoms among 1069 young adults in X City, Hubei province in September 2020. And the multistage stratified random sampling method was used for sampling. Depressive symptoms were measured using the 10-item version of the Center for Epidemiological Studies Depression Scale (CES-D-10). Descriptive statistics and logistic regression analysis were adopted for statistical analysis.

Results: 1069 respondents (67.68% male; mean age = 28.87 ± 4.18 years; age range = 18–35 years) were included in final analyses. About 25.9% of the respondents reported depressive symptoms (CES-D-10 score = 7.28 ± 3.85). Age, marital status, employment status, monthly disposable income, the cognition, experience and social relationship of the COVID-19 epidemic, and regional discrimination were significantly associated with depressive symptoms. Being male ($P = 0.025$), age of 25–29 years ($P = 0.011$), having a household size with 4–5 ($P = 0.01$) and more than 8 ($P = 0.012$) family members, a little pessimism about the prospect of COVID-19 epidemic prevention and control ($P = 0.044$), often ($P = 0.018$) or always ($P = 0.009$) participation in anti-epidemic volunteer work were likely to lead to depressive symptoms.

Conclusions: In the post-COVID-19 epidemic period, the psychological status of young people is generally stable, but some of them are depressed. Life, work and mental stress affect the generation of depressive symptoms among the young adults.

1. Introduction

COVID-19 has spread to most countries and regions around the world (Organization, 2020). Countries around the world have widely adopted travel restrictions and border control measures to limit the spread of the epidemic. China has adopted extremely active policies and measures to prevent and control the COVID epidemic, which has basically brought

the epidemic under control in about three months. As the outbreak's epicentre, Wuhan took several nonpharmaceutical public health interventions (Lai et al., 2020), such as traffic restrictions, social distancing, home quarantine and concentrated isolation. These interventions have a positive impact on the improvement of the control of the COVID-19 epidemic (Chen, Yang, et al., 2020; Hsiang et al., 2020; Pan et al., 2020).

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<https://doi.org/10.1016/j.actpsy.2022.103577>

Received 11 August 2021; Received in revised form 23 March 2022; Accepted 24 March 2022

Available online 26 March 2022

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After no new case is detected for two weeks and all citizens' nucleic acid test structures are negative, Wuhan announced the lifting of the city lockdown on April 8, 2020, marking the return of normal order to all cities and entry into the post-COVID-19 epidemic period in China. In fact, as shown in Fig. 1, in the six months after April 2020, the number of new confirmed cases of COVID-19 in China dropped to a very low level, and a small number of new confirmed cases basically came from abroad and were quarantined in a timely and effective manner, which means that China had experienced the development, outbreak, and a relatively stable period (Yang et al., 2021), then has entered the post-epidemic period of the first wave of COVID-19. On January 17, 2022, Chinese President Xi Jinping delivered a speech at the 2022 World Economic Forum video conference entitled "Strengthen confidence, move forward courageously, and create a better world in the post-epidemic period", which further clarified that the world, especially the China is in a post-pandemic period (Xi, 2022). The post-COVID-19 epidemic period is an emergency management concept that refers to the minimization of damage from the COVID-19 epidemic due to the reconstruction of physical infrastructures, the restoration of public emotional and physical health, and the reduction of COVID-19 lethality due to mutation, helping the once-infected areas basically return to normal economic and living order (Mao et al., 2021).

Whilst the epidemic has been effectively controlled, the COVID-19 epidemic caused substantial psychological damage to residents especially the residents of Hubei Province who are hardest hit by the disaster (Dubey et al., 2020). On the one hand, residents suffer from depression due to the fear and anxiety of the epidemic. On the other hand, their depression has been further aggravated by economic difficulties and unemployment (Ayittey et al., 2020; Chakraborty & Maity, 2020). Although when people face the shock of a major crisis such as epidemic, anxiety is generated in a short period of time due to the uncertainty and the ambiguity of the future of the crisis, the long-term impact of crisis on the psychological state is more manifested in depression, especially in the post-epidemic period (Carnahan et al., 2021; Johnson et al., 2022). Studies conducted during multiple epidemics showed that the prevalence of depression in the population ranges from 14.6% to 48.3% (Xiong et al., 2020), which is higher than the predicted prevalence (3.6% to 7.2%) (Huang et al., 2019; Lim et al., 2018).

In 2022, the COVID-19 epidemic continues to spread rapidly around the world and rebounds in a small scope in China, which may cause the young adults to produce stress response and easily deteriorate their

psychological status. This is because young adults are more precarious, less resilient and less socially supportive, and the disruption brought on by the COVID-19 epidemic exacerbates loneliness and financial distress among young adults, bringing more prevalent depressive symptoms (Jinhee et al., 2021; Varma et al., 2021). Specifically, the reasons for this consequence mainly include: 1) Young adults are more vulnerable to social support and economic status than other groups, and are more difficult to cope with the impact of the epidemic, especially inflation and employment pressure (Hajek et al., 2022; Hsiang et al., 2020; Varma et al., 2021); 2) Young adults tend to have high levels of attention to the outbreak but less mature cognition than older adults (Wierenga et al., 2021), and are more likely to have negative expectations about the prospect for the epidemic and socioeconomic development, which increases their likelihood of developing depressive symptoms (Amicucci et al., 2021; Bucciarelli et al., 2022; Gallagher et al., 2021; I & K, 2021; She et al., 2022); 3) Many young adults in Hubei Province participated in volunteer work in combatting COVID-19 epidemic, concerns about infection during frontline work may make them depressed, and the experience of contracting COVID-19 may also increase their probability of developing depressive symptoms (Balakrishnan et al., 2022; Bucciarelli et al., 2022; Pera, 2020; Yu et al., 2021); and 4) Young adults have higher cross-regional mobility due to work or schooling, as the residents of the earliest eye of epidemic storm, they may experience more discrimination and distrust after order is restored in the post-pandemic period, which likely to worsen their social relationships and cause loneliness, stress and depression (Espinoza & Hernandez, 2022; Siu, 2008b).

Furthermore, the cognition and experience of the COVID-19 epidemic may have a negative impact on the psychological state of young adults and even lead to depression during the outbreak, and this effect may continue into the post-epidemic period (Ebrahimi et al., 2022; Gallagher et al., 2021). In addition, social connections, employment, and financial stress may exacerbate depressive symptoms in young adults in the post-pandemic period (Hajek et al., 2022; I & K, 2021; Jinhee et al., 2021). In the post-epidemic period, paying attention to the psychological status and demands of the young adults, strengthening psychological intervention and providing policy support can help the young adults participate in economic recovery and reconstruction.

Many studies focused on the psychological status, including anxiety, depression, insomnia, post-traumatic stress reaction, of the public during the COVID-19 epidemic (Luo et al., 2020), and the main research

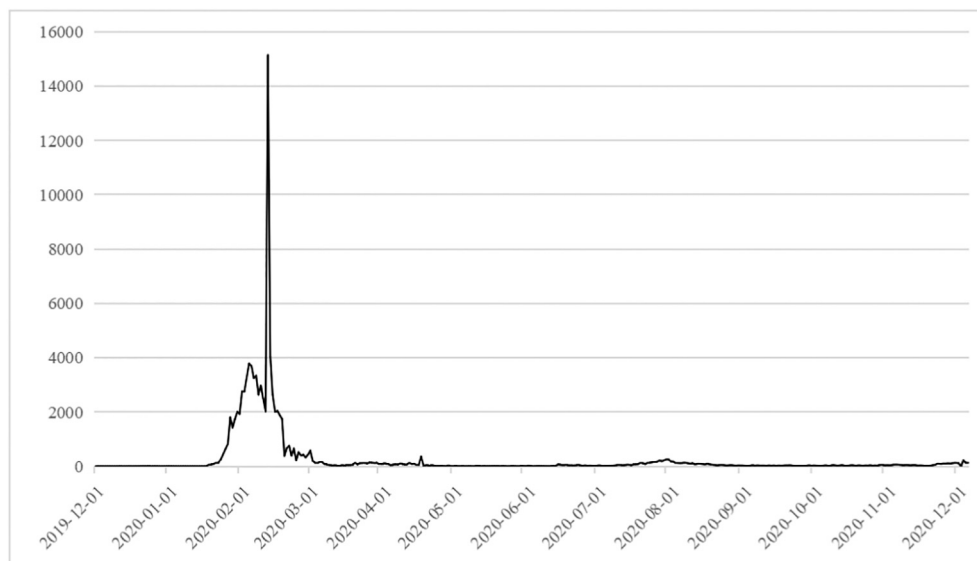


Fig. 1. Trend of new confirmed cases of COVID-19 in China in 2019–2020 (including imported cases)
Data source: Health Commission of the People's Republic of China.

subjects are patients infected with COVID-19 (Lei et al., 2020), medical staff (Chen, Liang, et al., 2020; Kang, Li, et al., 2020; Kang, Ma, et al., 2020), students (Cao et al., 2020; Odriozola-Gonzalez et al., 2020; Zhai & Du, 2020), elderly (Yang et al., 2020), children (Xie et al., 2020) and other special groups. However, most studies focused on the psychological stress response of the public in the early stage and outbreak period of the COVID-19 epidemic, and few studies focused on the psychological state of the young adults in the post-epidemic period. In addition, in Hubei Province, the earliest centre of the COVID-19 epidemic storm, the residents' psychological damage and its restoration after experiencing the huge disaster should be noticed. In terms of the associated factors of depression in the context of the COVID-19 epidemic, most studies focused on demographic, social or economic factors (Duan et al., 2022; Tian et al., 2020; Wang et al., 2022; Zhao et al., 2021; Zhou et al., 2020) and ignored the effects of public cognition, employment situation, anti-epidemic experience and social relationship on depressive symptoms, causing lacking specific interventions for young adults' depressive symptoms.

Therefore, this study aimed to explore the depressive symptoms status of the young adults during the post-COVID-19 epidemic period and its associated factors and take the young adults in City X, Hubei Province as a typical case to put forward evidence and suggestions on how to strengthen the psychological crisis intervention and social security to cultivate the resilience of the young adults after major public health emergencies.

2. Methods and materials

2.1. Study design

In this study, the multistage stratified random sampling method was used for sampling. In the first stage, considering that X City is a county-level city that is composed of streets and towns, all streets and towns (18 in total), industrial parks, large-scale farm or fishery areas with large population (four in total) in X city were selected. In the second stage, all administrative villages (communities) in each township (street) were selected, and 2–3 young adults aged 18–35 years were selected from each administrative village (community), and 5–8 young adults aged 18–35 years were selected from industrial parks, farms and fishery areas due to the population of these areas is usually 2–4 times the community population. All respondents were determined by an equal-probability lottery. The respondents were all local permanent residents.

We designed a self-administered questionnaire on the basis of literature review and research purposes, including questions about the demographic and socioeconomic status, depression status, epidemic cognition, anti-epidemic experience, employment status and social relationship of young people in X City, A total of 218 items. The demographic and socioeconomic status included gender, age, educational background, household registration nature, monthly income, household size and employment status. Responses for most items were on a Likert-type scale with varying anchors i.e. 1, strongly disagree; 2, disagree; 3, general; 4, agree; 5, strongly agree). The depression status was measured using the 10-item version of The Center for Epidemiological Studies Depression Scale (CES-D-10) (Andresen et al., 1994). It should be noted that there are two versions of the commonly used CES-D. The initial version is 20-item, that is, CES-D-20, with a score of 0 to 60, and 16 is a critical value for judging whether there are depressive symptoms (Andresen et al., 1994). In a later improved version, 20-item was reduced to 10-item, that is, CES-D-10, which is widely used to measure depressive symptoms due to its convenience while ensuring accuracy (Adjaye-Gbewonyo et al., 2018; Andresen et al., 1994; Fahmi et al., 2019). In accordance with the respondents' self-assessment, the total score of CES-D-10 ranged from 0 to 30 points. A high score indicated evident depressive symptoms, and a total score ≥ 10 meant the presence of depressive symptoms (Andresen et al., 1994; Zhou et al., 2021).

2.2. Data collection

The investigation was carried in September 1–15, 2020. Before the formal investigation, 15 relevant personnel were invited to conduct a prequestionnaire survey. We dealt with ambiguous or incomprehensible questions or options in the feedback questionnaire to make them in line with the cognition and filling habits of the respondents. Then, under the guidance of the investigation team, township and street governments, residents' and villagers' committees summoned young adults identified by multistage stratified random sampling through telephone or door-to-door notification. One-to-one interviews were adopted to complete the survey by filling out the paper questionnaire offline. Trained investigators assisted respondents in filling out the questionnaire throughout the process.

We used the EpiData 3.1 software to input recovered paper questionnaires and used Microsoft Office Excel 2016 to summarise and clean the survey data. After eliminating the samples that did not meet the survey needs, 1069 valid samples were finally obtained.

2.3. Statistical analysis

In this study, descriptive statistical methods were used to summarise the sociodemographic characteristics of the respondents and the respondents' depression status, epidemic cognition, anti-epidemic experience, employment status and social relationship. Data were presented as the frequency (n) and percentage (%) of the classification variable. The Chi-square test was used to analyse the differences in explanatory variables between depressive and nondepressive symptom groups. The logistic regression was adopted to explore the associated factors of depressive symptoms. Results of the regression analysis were presented as adjusted OR with corresponding 95% CIs. The statistical significance test level was set to 0.05 (two-tailed). The Statistical Package for the Social Sciences software (Version 19.0; IBM Corp) was used for descriptive statistics, and the Stata 12SE was used for the chi-square test and logistic regression analysis.

3. Results

3.1. Prevalence of depressive symptoms and background characteristics

Table 1 shows the depressive symptoms, cognition, experience and social relationship during the COVID-19 epidemic and the socio-demographic characteristics of the respondents. About 25.91% of respondents (277/1069) reported depressive symptoms, with a mean CES-D-10 score of 7.28 ± 3.85 . A total of 339 females (32.32%) and 710 males (67.68%) were included. The reason why there are fewer females than men is likely that females are more sensitive to the existence of economic opportunities and regional differences than males in China, and are more inclined to migrate to large and economically developed cities (He & Gober, 2003). X City is a small-scale city and is adjacent to the provincial capital city-Wuhan City, one of the largest cities in central China. The developed light manufacturing and service industries in Wuhan City have a stronger siphon effect on female young adults in X City. About 49.47% of respondents (471/952) were 30–35 years old. Sixty percent of the respondents (641/1064) were married, whereas 37.5% of the respondents (399/1064) were unmarried. Nearly half of the respondents (49.25%, 526/1068) accepted college education. About 61.86% (657/1062) and 18.74% (199/1062) of the respondents had 4–5 and 6–8 family members, respectively. In terms of social and economic characteristics, most of the respondents (82.34%, 863/1048) were from rural areas, and about 10% of respondents' (107/1067) households were or used to be recognised as poor households by the local government. More than half of the respondents' disposable income per month was 2000–3999 yuan. In terms of employment status, 60.1% (641/1066), 20.1% (214/1066), 5.6% (60/1066) and 9.3% (99/1066) of the respondents were employed, entrepreneurs, students and unemployed,

Table 1
Background characteristics and depressive symptoms of the young adults.

Variables	Total	Without depressive symptoms	Depressive symptoms	χ^2	P-value
	N(%)	N(%)	N(%)		
Socio-demographic characteristics					
Gender				1.88	0.17
Female	339 (32.3)	242(31.2)	97(35.7)		
Male	710 (67.7)	535(68.8)	175(64.3)		
Age				16.35	<0.001
18–24	151 (15.9)	125(17.4)	26(11.1)		
25–29	330 (34.6)	224(31.3)	106(45.1)		
30–35	471 (49.5)	368(51.3)	103(43.8)		
Marital status				9.58	0.008
Unmarried	399 (37.5)	280(35.5)	119(43.3)		
Married	641 (60.2)	495(62.7)	146(53.1)		
Else	24 (2.3)	14(1.8)	10(3.6)		
Education				0.73	0.695
Junior school	219 (20.5)	159(20.1)	60(21.7)		
High school/vocational school	323 (30.2)	237(29.9)	86(31.2)		
College education	526 (49.3)	396(50)	130(47.1)		
Family scale				5.12	0.163
≤ 3 people	186 (17.5)	149(19.0)	37(13.4)		
4–5 people	657 (61.9)	479(61.0)	178(64.3)		
6–8 people	199 (18.7)	144(18.3)	55(19.8)		
≥8 people	20 (1.9)	13(1.7)	7(2.5)		
Poor households				1.94	0.379
Currently poor households	43 (4.0)	28(3.6)	15(5.4)		
Used to be poor households	64 (6.00)	47(5.9)	17(6.2)		
Not poor households	960 (90.0)	716(90.5)	244(88.4)		
Household registration				1.38	0.24
Urban	185 (17.7)	131(16.8)	54(20.0)		
Rural	863 (82.3)	647(83.2)	216(80.0)		
Disposable income per month(yuan)				33.44	<0.001
<2000	156 (14.7)	127(16.1)	29(10.6)		
2000–2999	286 (26.9)	224(28.4)	62(22.7)		
3000–3999	300 (28.3)	198(25.1)	102(37.4)		
4000–4999	146 (13.7)	95(12.0)	51(18.7)		
5000–5999	77 (7.3)	60(7.6)	17(6.2)		
≥6000	97 (9.1)	85(10.8)	12(4.4)		
Employment				38.83	<0.001
Students	60 (5.6)	55(7)	5(1.8)		
Employed	641 (60.1)	499(63.1)	142(51.6)		
Entrepreneurs	214 (20.1)	127(16.1)	87(31.6)		

Table 1 (continued)

Variables	Total	Without depressive symptoms	Depressive symptoms	χ^2	P-value
	N(%)	N(%)	N(%)		
Unemployment	99 (9.3)	72(9.1)	27(9.8)		
Other	52 (4.9)	38(4.8)	14(5.1)		
The cognition, experience, and social relationship in COVID-19 epidemic					
The degree of concerned about the COVID-19 epidemic				86.56	<0.001
Not at all	6(0.5)	2(0.3)	4(1.5)		
Not too concerned	29 (2.4)	12(1.5)	17(6.2)		
General	131 (10.6)	58(7.4)	67(24.6)		
A little	438 (35.6)	296(37.7)	88(32.2)		
Very	626 (50.9)	417(53.1)	97(35.5)		
Epidemic infection histories				3.9	0.048
No	1150 (93.4)	47(6)	26(9.5)		
Yes	81 (6.6)	736(94)	247(90.5)		
Confidence in the epidemic prevention and control prospect				52.93	<0.001
Very pessimistic	7(0.6)	3(0.4)	2(0.7)		
A little pessimistic	10 (0.8)	2(0.3)	7(2.6)		
General	99 (8.0)	42(5.3)	46(16.9)		
Optimistic	579 (47.0)	380(48.3)	127(46.5)		
Very optimistic	537 (43.6)	359(45.7)	91(33.3)		
Participation in anti-epidemic volunteer work				20.09	<0.001
Never	206 (19.6)	134(17.2)	72(26.4)		
Occasionally	410 (39.0)	319(41.0)	91(33.3)		
Often	152 (14.5)	101(13.0)	51(18.7)		
Always	283 (26.9)	224(28.8)	59(21.6)		
“I often suffer discrimination in social interactions because I am from Hubei”				23.31	<0.001
Strongly disagree	80 (7.7)	68(8.9)	12(4.4)		
Disagree	250 (24.1)	204(26.6)	46(17)		
Neither agree nor disagree	417 (40.2)	304(39.6)	113(41.7)		
Agree	221 (21.3)	145(18.9)	76(28.0)		
Strongly agree	70 (6.7)	46(6)	24(8.9)		
“I think most people can be trusted”				4.82	0.306
Strongly agree	64 (6.2)	47(6.1)	17(6.3)		
Agree	301 (29.0)	210(27.3)	91(33.6)		
Neither agree nor disagree	423 (40.7)	318(41.4)	105(38.7)		
Disagree	198 (19.1)	150(19.5)	48(17.7)		
Strongly disagree	53 (5.1)	43(5.6)	10(3.7)		

respectively. As shown in Table 1, the age, marital status and disposable income per month were significantly different between the groups with and without depressive symptoms ($P < 0.05$). Those aged 25–29, married and with disposable income per month of 3000–3999 yuan had a higher tendency of depressive symptoms compared with other groups.

About half of the respondents (626/1058) were very concerned

about the epidemic, whereas less than 1% (6/1058) said they were not concerned. About 6.58% of the respondents (81/1056) had an infection history during the COVID-19 epidemic outbreak period. Most (90.59%, 943/1059) respondents were optimistic about the prevention and control prospect of the epidemic. About 80% of respondents (845/1051) participated in voluntary work for the prevention and control of the epidemic. In terms of social relationship, 28% of the respondents (291/1038) believed that “I often suffer discrimination in social interactions because I am from Hubei”, and only 24.2% (251/1039) believed that most people can be trusted. Among the variables, the concern and confidence in the COVID-19 epidemic, infection history, regional discrimination and the social trust were significantly different between groups with and without depressive symptoms ($P < 0.05$).

3.2. Associated factors of depressive symptoms

The results of the logistic regression analysis (without dummy variable model) are shown in Table 2. The degree of concern about the COVID-19 epidemic ($OR = 0.50$, $95\% CI = 0.39-0.63$), confidence in the epidemic prevention and control prospect ($OR = 0.61$, $95\% CI = 0.47-0.80$) and being married ($OR = 0.63$, $95\% CI = 0.42-0.96$) were protective factors for the respondents' depressive symptoms, and the participation in anti-epidemic volunteer work ($OR = 1.25$, $95\% CI = 1.04-1.50$) and regional discrimination ($OR = 1.44$, $95\% CI = 1.21-1.72$) were risk factors for the respondents' depressive symptoms.

Our research established dummy variables for the logistic regression analysis to analyse the protective and risk factors of the responders' depressive symptoms comprehensively. Results are shown in Table 3. Specifically, being male ($OR = 1.58$, $95\% CI = 1.06-2.37$, $P = 0.025$), being 25–29 years old ($OR = 2.42$, $95\% CI = 1.22-4.81$, $P = 0.011$), having a household size of 4–5 ($OR = 2.04$, $95\% CI = 1.19-3.50$, $P = 0.010$) and more than 8 ($OR = 4.44$, $95\% CI = 1.39-14.20$, $P = 0.012$) family members, being a little pessimistic about epidemic prevention and control prospect ($OR = 23.19$, $95\% CI = 1.09-495.48$, $P = 0.044$), often ($OR = 1.93$, $95\% CI = 1.12-3.31$, $P = 0.018$) or always ($OR = 2.02$, $95\% CI = 1.19-3.45$, $P = 0.009$) participation in volunteer work for the epidemic prevention and control and strong regional discrimination ($OR = 6.56$, $95\% CI = 2.42-17.76$, $P < 0.001$) were the risk factors for respondents' depressive symptoms. Being married ($OR = 0.53$, $95\% CI = 0.33-0.83$, $P = 0.006$), students ($OR = 0.2$, $95\% CI = 0.05-0.87$, $P = 0.032$) and having a disposable income per month of 6000 yuan ($OR = 0.22$, $95\% CI = 0.08-0.59$, $P = 0.003$) were the protective factors for respondents' depressive symptoms. The COVID-19 epidemic infection history and education level had no significant effect on the respondents' depressive symptoms ($P > 0.05$).

Table 2
Associated factors of depressive symptoms among the young adults.

Variables	OR	95% CI	P-value
Gender	0.72	0.50–1.04	0.083
Age	1.29	0.96–1.73	0.090
Marital status	0.63	0.42–0.96	0.031
Education	0.99	0.79–1.26	0.992
Family scale	1.22	0.95–1.58	0.122
Disposable income per month (yuan)	0.93	0.82–1.05	0.257
concerned about COVID-19	0.50	0.39–0.63	<0.001
Epidemic infection histories	1.18	0.60–2.32	0.637
Confidence in the epidemic prevention and control prospect	0.61	0.47–0.80	<0.001
Frequency of volunteering	1.25	1.04–1.50	0.020
Because I am from Hubei, I am discriminated against in employment	1.44	1.21–1.72	<0.001
Employment	1.21	0.99–1.46	0.055

Table 3

Detailed risk and protective factors of depressive symptoms among the young adults.

Variables	OR	95% CI	P-value
Gender			
Female	1	Reference	
Male	1.58	1.06–2.37	0.025
Age			
18–24	1	Reference	
25–29	2.42	1.22–4.81	0.011
30–35	1.99	0.94–4.22	0.073
Marital status			
Unmarried	1	Reference	
Married	0.53	0.33–0.83	0.006
Else	1.78	0.42–7.49	0.43
Education			
Junior school	1	Reference	
High school/ vocational school	0.8	0.48–1.33	0.383
Further education	0.96	0.57–1.60	0.861
Family scale			
≤3 people	1	Reference	
4–5 people	2.04	1.19–3.50	0.01
6–8 people	1.46	0.76–2.80	0.259
≥8 people	4.44	1.39–14.20	0.012
Disposable income per month (yuan)			
≤2000 yuan	1	Reference	
2000–3000 yuan	0.63	0.33–1.21	0.166
3000–4000 yuan	1.22	0.65–2.30	0.528
4000–5000 yuan	1.34	0.66–2.73	0.418
5000–6000 yuan	0.46	0.18–1.16	0.101
≥6000 yuan	0.22	0.08–0.59	0.003
concerned about COVID-19			
Not at all	1	–	–
Not too concerned about	4.44	1.56–12.62	0.005
General	4.29	2.34–7.85	<0.001
A little	1.45	0.91–2.31	0.115
Very	1	Reference	
Epidemic infection histories			
No	1	Reference	
Yes	0.82	0.40–1.71	0.602
Confidence in the epidemic prevention and control prospect			
Very pessimistic	1	Reference	
A little pessimistic	23.19	1.09–495.48	0.044
Unclear	3.19	0.25–39.90	0.368
Optimistic	1.29	0.11–15.38	0.842
Very optimistic	0.97	0.08–11.78	0.978
Frequency of volunteering			
Occasionally	1	Reference	
Never	1.15	0.68–1.93	0.604
Often	1.93	1.12–3.31	0.018
Always	2.02	1.19–3.45	0.009
Because I am from Hubei, I am discriminated against in employment			
Strongly disagree	1	Reference	
Disagree	1.28	0.54–3.04	0.574
Neither agree nor disagree	2.00	0.87–4.60	0.103
Agree	2.25	0.96–5.27	0.063
Strongly agree	6.56	2.42–17.76	<0.001
Employment			
Unemployment	1	Reference	
Students	0.20	0.05–0.87	0.032
Employed	0.69	0.37–1.28	0.235
Entrepreneurs	1.19	0.59–2.41	0.62
Else	0.70	0.23–2.14	0.535

4. Discussion

4.1. Principal findings

Overall, this study shows that about 74% of the young adults group is stable in X City do not show depressive symptoms, whereas 26% of the respondents report depressive symptoms. Most young adults are concerned about the COVID-19 epidemic and are confident about the prospect of prevention and control of the epidemic. However, the prevalence of depressive symptoms in respondents is higher than the depressive symptoms rate of the young adults under 35 years during the

epidemic period (22.1%) (Yha & Ning, 2020), which may be because the young adults is in the shadow of damage and recurrence of COVID-19 epidemic and are uneasy about job hunting and economic and social recovery in the post-epidemic period.

According to the results of statistical analysis, the cognition, experience and social relationship during the COVID-19 epidemic and socio-demographic characteristics significantly affect the depressive symptoms of the young adults. Being unmarried, male, 25–29 years old, having low income and employment pressure, pessimistic attitude towards the prospect of epidemic prevention and control and the regional discrimination are actively associated with depressive symptoms among the young adults in X City during the post-COVID-19 epidemic period.

The results of this study show that males are more prone to depressive symptoms during post-COVID-19 epidemic period than females, and this finding is in contrast to the research results of public psychological state during the outbreak of the epidemic (Wang et al., 2020). This difference may be due to differences in how males and females respond to depression. Specifically, males tended to deal with depression primarily by enhancing outdoor and physical activities, while females tended to handle it through emotional release, diverse social networks or religion (Guo et al., 2021; Zhao et al., 2021). However, outdoor and physical activities were greatly restricted due to the COVID-19 epidemic, which may exacerbate depressive symptoms in females (Qi et al., 2021; Zhao et al., 2021). Furthermore, in traditional Chinese concepts, males face higher family responsibilities and financial pressure and carry heavier expectations in the society than females (Guo et al., 2021; Qi et al., 2021). At the same time, compared with the outbreak of the COVID-19 epidemic, the focus of attention in the post-epidemic period has shifted to work and development, whereas the economic downturn has increased the psychological and economic double burden on males. Unmarried young adults are likely to suffer from depressive symptoms, and this finding is consistent with the results of the study on depressive symptoms in the post-SARS epidemic period (Liu et al., 2012). Compared with married individuals, unmarried individuals have more uncertainty in their future life, relatively lack of opportunities to share emotions and mutual encouragement with their partners and face life challenges alone during the post-COVID-19 epidemic period. This finding reminds authorities that intervention measures should pay attention to the psychological status for young adults who are male and unmarried during the post-COVID-19 epidemic period and relieve their mental pressure by providing psychological counselling services and carrying out social interaction activities among the young adults.

Furthermore, results show that the employment status affects the depressive symptoms of the respondents. Compared with students, unemployed individuals are more likely to report depressive symptoms, and this finding is consistent with the results in previous studies (Jahanshahi et al., 2020). Prospective studies showed that unemployment is a key risk factor for depressive symptoms (Ng et al., 2013), and students generally do not face employment pressure, resulting in improved psychological status. This finding is further confirmed by the fact that people aged between 25 and 29 years are more prone to depressive symptoms than those aged between 18 and 24 years because the former are generally facing the pressure of entering society after graduation and have a more intuitive feeling of the impact of COVID-19 on society than the latter. Respondents with high monthly income show a weak tendency of depressive symptoms, further confirming that the economic downturn caused by the epidemic also aggravates the negative effect of the instability of basic living security on depressive symptoms. On the employment and economic pressure of young people, authorities should further stabilise the market economy and ensure employment security for steady economy momentum (XINHUA, February 16, 2022a) by giving policy supply to the normal operation of enterprises and institutions, basic living security of the young adults, employment and entrepreneurship and physical and mental recovery for the young adults.

A pessimistic attitude towards the prospect of epidemic prevention and control is closely related to the occurrence of depressive symptoms. The pessimistic prospect of epidemic prevention and control will make people always feel a serious threat in their health, which may cause them to feel uneasy, anxious and fearful. This phenomenon can lead to depressive symptoms and other mental health problems over time. Prospective studies showed that the mental health problems of the population rise during the outbreak of the COVID-19 epidemic (Kamara et al., 2017). Given the fear of COVID-19 and the concerns of social stability, large-scale “coronaphobia” appears among the population (Dubey et al., 2020). The young adults of Hubei Province spent longer periods of time studying online, working online and social distancing than other groups, which may make them feel more lonely and helpless, leading to a pessimistic attitude towards the pandemic and higher depression level (Gallagher et al., 2021). Therefore, authorities should take measures to improve the confidence of those who hold a pessimistic attitude towards the epidemic. For example, authorities should report anti-epidemic results and the research and development progress of the vaccine and drug for COVID-19 through the Internet and television timely. Improving the level of epidemic prevention hardware, such as workplace disinfection and tracking workers' health, is the key for restoring the optimism of the young adults (XINHUA, February 16, 2022b).

Participation in anti-epidemic volunteer work during the COVID-19 outbreak period also has a continuously significant effect on the depressive symptoms of the young adults during the post-COVID-19 epidemic period. During volunteer services, they come into contact with patients with COVID-19, making them involuntarily affected and resulting in vicarious traumatization (Zi et al., 2020). Most volunteers are not professional medical personnel, and the lack of medical professional knowledge leads to increased fear for COVID-19, contributing to more negative psychological state in volunteers than that in frontline medical personnel. Intervention measures should focus on the psychological status of young people who provided volunteer services during the epidemic period. These measures include provision of timely psychological assistance, enhanced publicity of volunteers' deeds to enhance their sense of honour and provision of appropriate material rewards.

As Hubei Province is the earliest epicentre of the COVID-19 epidemic storm, residents of Hubei Province may be discriminated against when working and living in different places due to the public fear of the close contacts of COVID-19. The strong regional discrimination in life and work is likely to lead to depressive symptoms, which has also appeared in the post-SARS epidemic period (Siu, 2008a). The reason is that regional discrimination may lead to the restriction of their living and working spaces and even employment difficulties or unemployment. Authorities should strengthen contact tracing and patient treatment at the origin of the COVID-19 epidemic and promptly show the results of the intervention to the public to eliminate regional discrimination.

Finally, the whole society needs to provide psychological counselling and treatment services for young people with evident tendency of depressive symptoms. Previous studies showed a negative correlation between social support and depressive symptoms (Thompson et al., 2016). Thus, social support measures should be adopted to alleviate the depressive symptoms of the population. This study hopefully provides evidence for strengthening the psychological intervention of young people, alleviating the survival pressure of young people, boosting the confidence of economic recovery and ensuring the orderly recovery of social order during the post-COVID-19 epidemic period.

5. Limitations

One such limitation is the cross-sectional nature of our data, results indicate an association between the variables, and further research is needed to support the findings on causal pathways. Given the lack of survey results before and during the initial and outbreak periods of the

COVID-19 epidemic, demonstrating fully the negative impact of COVID-19 epidemic on the depressive symptoms of young people is impossible.

6. Conclusions

Our findings indicate that some of young adults suffer from depressive symptoms in China during the post-COVID-19 epidemic period. The overall prevalence of depressive symptoms during this period is slightly higher than that in the outbreak stage. The COVID-19 epidemic has a negative impact on young adults' depressive symptoms, and the fear of COVID-19 and regional discrimination in life and work exerts remarkable psychological pressure on young people. At the same time, the impact of the COVID-19 epidemic on social and economic order and employment makes young people face high pressure to survive. As an important part of society and the future pillar of every family, the young adults should be provided comprehensive psychological interventions. Authorities need to implement national employment assistance policies, provide diversified psychological assistance services, promote positive social interaction among young people and provide material and spiritual rewards for young volunteers during the epidemic period to help them relieve depressive symptoms, regain confidence and participate in economic recovery and social reconstruction.

Abbreviations

COVID-19 Corona Virus Disease 2019

CES-D-10 The 10-item version of the Center for Epidemiological Studies Depression Scale

Declaration of competing interest

The authors declare that they have no conflict of interests.

Acknowledgments

The authors would like to thank the National Social Science Foundation of China and the National Natural Science Foundation of China for funding this study. We also thank to all the officials and professionals of the X City, Hubei Province who participated in this study.

Funding

This research was supported by the National Social Science Fund of China (grant number: 20ZDA038, 21AZZ013), and the National Natural Science Foundation of China (grant numbers: 71734002, 72042016). The funders had no role in the design of the study; the collection, analysis, and interpretation of data; or the writing of the manuscript.

Availability of data and materials

The datasets used and/or analysed during the current research available from the corresponding author on reasonable request.

Author contributions

ZW was involved in the conceptualization, methodology, data analysis, writing of the original Draft. QZ was involved in the data curation, investigation, methodology, visualization, writing reviewing and editing. All authors revised the manuscript.

Ethics approval

Ethics approval for the study was obtained from Ethics Committee of Huazhong university of science and technology. All procedures performed in our research involving human participants were under the ethics approval of the Ethics Committee of Huazhong university of

science and technology and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to participate

Informed consent was obtained from the participants enrolled in the semi-structured interviews, and the respondents were assured that their participation was voluntary and that they could withdraw from the study at any time.

Consent for publication

Not applicable.

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