Letters

RESEARCH LETTER

Mental Health Status Among Children in Home Confinement During the Coronavirus Disease 2019 Outbreak in Hubei Province, China

As the coronavirus disease 2019 (COVID-19) epidemic progressed in Wuhan, Hubei province, China, the Chinese government ordered a nationwide school closure. More than 180 million students in China were restricted to their homes (http://www.chinanews.com/sh/2020/02-17/9094648.shtml). The COVID-19 infection has become a global pandemic. As of April 9, 2020, the infection has caused 188 countrywide closures around the world and has affected 1 576 021 818 learners (https://zh.unesco.org/themes/education-emergencies/coronavirus-school-closures). The caution about protecting the mental health of children in home confinement is warranted. This study investigated depressive and anxiety symptoms among students in Hubei province, China, which can help optimize interventions on the mental health of children for stakeholders in all countries affected by COVID-19.

Methods | In Hubei province, students in Wuhan were restricted to home from January 23, 2020, and those in Huangshi (a city about 52 mi [85 km] from Wuhan) started observing the restrictions on January 24, 2020. The students in the city of Huangshi remained at home until March 23, 2020, and those in Wuhan until April 8, 2020. A total of 2330 students in grades 2 through 6 in 2 primary schools in Hubei province, of whom 845 were from Wuhan and 1485 were from Huangshi, were invited to complete a survey between February 28 and March 5, 2020. This study was approved by the Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology. Students completed the investigation through an online crowdsourcing platform (https://www.wjx.cn/). The survey link was sent to the guardian's cellular telephone, and the statement "I permit my child to participate in the survey" was presented to the guardian before the survey. The students proceeded to the survey after their guardian had consented. All questionnaires were included in the analysis after a quality audit, with an effective rate of 100.0%.

Information included sex, school grade, optimism about the epidemic, whether they worried about being infected by COVID-19, and depressive and anxiety symptoms measured by the Children's Depression Inventory-Short Form (CDI-S) and the Screen for Child Anxiety Related Emotional Disorders, respectively. Both measures were validated for use in Chinese.[1-3] Generalized linear regressions were applied for continuous variables and logistic regressions for binary variables. Results were statistically analyzed with SPSS for Windows 22.0 (IBM) . Statistical significance was defined by *P* values less than .05.

Results | Among 2330 students, 1784 participants (1012 boys [56.7%]; 1109 children [62.2%] residing in Huangshi) completed the survey, yielding a response rate of 76.6% (**Table 1**). Students had been restricted to home for a mean (SD) of 33.7 (2.1) days when they completed this survey. A total of 403 students (22.6%) and 337 students (18.9%) reported depressive and anxiety symptoms, respectively. Students in Wuhan had significantly higher CDI-S scores than those in Huangshi (β, 0.092 [95% CI, 0.014-0.170]), with a greater risk of depressive symptoms (odds ratio, 1.426 [95% CI, 1.138-1.786]). Students who were slightly or not worried about being affected by COVID-19 had significantly lower CDI-S scores than those who were quite worried (β, −0.184 [95% CI, −0.273 to −0.095]), with a decreased risk of depressive symptoms (odds ratio, 0.521 [95% CI, 0.400-0.679]). Those who were not optimistic about the epidemic, compared with those who were quite optimistic, had significantly higher CDI-S scores (β, 0.367 [95% CI, 0.250-0.485]), with an increased risk of depressive symptoms (odds ratio 2.262 [95% CI, 1.642-3.117]). There was no significant association between demographic characteristics and anxiety symptoms (**Table 2**).

Table 1. Characteristics of Participants

Characteristic	Participants, No. (%)
Sex	
Male	1012 (56.7)
Female	772 (43.3)
Location of school	
Huangshi	1109 (62.2)
Wuhan	675 (37.8)
Grade	
2	373 (20.9)
3	329 (18.4)
4	406 (22.8)
5	298 (16.7)
6	378 (21.2)
Worry about being infected with coronavirus disease 2019	
Quite worried	665 (37.3)
Moderately worried	445 (24.9)
Slightly or not worried	674 (37.8)
Optimism about the coronavirus disease 2019 epidemic	
Quite optimistic	908 (50.9)
Moderately optimistic	665 (37.3)
Not optimistic	211 (11.8)
Children's Depression Inventory-Short Form	
Depressive symptoms	403 (22.6)
No depressive symptoms	1381 (77.4)
Screen for Child Anxiety Related Emotional Disorders	
Anxiety symptoms	337 (18.9)
No anxiety symptoms	1447 (81.1)
Total	1784 (100.0)

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Table 2. Characteristics of Participants, According to Depressive Symptoms and Anxiety Symptoms

Characteristic	Depressive symptoms					Anxiety symptoms				
	Affected participants, No. (%)[a]	Odds ratio (95% CI)[b]	*P* value	β (95% CI)[c]	*P* value	Affected participants, No. (%)[a]	Odds ratio (95% CI)[b]	*P* value	β (95% CI)[c]	*P* value
Sex										
Male	228 (22.5)	1 [Reference]	NA	1 [Reference]	NA	186 (18.4)	1 [Reference]	NA	1 [Reference]	NA
Female	175 (22.7)	1.008 (0.806 to 1.261)	.95	0.000 (−0.077 to 0.077)	>.99	151 (19.6)	1.080 (0.851 to 1.371)	.53	0.022 (−0.050 to 0.094)	.55
Location of school										
Huangshi	224 (20.2)	1 [Reference]	NA	1 [Reference]	NA	205 (18.5)	1 [Reference]	NA	1 [Reference]	NA
Wuhan	179 (26.5)	1.426 (1.138 to 1.786)	.002	0.092 (0.014 to 0.170)	.02	132 (19.6)	1.072 (0.841 to 1.367)	.58	−0.018 (−0.091 to 0.056)	.64
Grade										
2	51 (13.7)	1 [Reference]	NA	1 [Reference]	NA	70 (18.8)	1 [Reference]	NA	1 [Reference]	NA
3	69 (21.0)	1.676 (1.126 to 2.492)	.01	0.214 (0.090 to 0.337)	.001	62 (18.8)	1.005 (0.688 to 1.469)	.98	0.022 (−0.093 to 0.136)	.71
4	98 (24.1)	2.009 (1.384 to 2.916)	<.001	0.229 (0.114 to 0.345)	<.001	77 (19.0)	1.013 (0.707 to 1.451)	.94	−0.005 (−0.113 to 0.103)	.93
5	69 (23.2)	1.902 (1.276 to 2.837)	.002	0.216 (0.090 to 0.341)	.001	57 (19.1)	1.024 (0.694 to 1.510)	.91	−0.017 (−0.134 to 0.101)	.78
6	116 (30.7)	2.795 (1.936 to 4.037)	<.001	0.356 (0.240 to 0.473)	<.001	71 (18.8)	1.001 (0.694 to 1.444)	>.99	−0.024 (−0.135 to 0.087)	.67
Worry about being infected with COVID-19										
Quite a lot	184 (27.7)	1 [Reference]	NA	1 [Reference]	NA	130 (19.5)	1 [Reference]	NA	1 [Reference]	NA
Moderate	107 (24.0)	0.828 (0.628 to 1.090)	.18	−0.094 (−0.191 to 0.003)	.06	78 (17.5)	0.875 (0.641 to 1.193)	.40	−0.045 (−0.138 to 0.047)	.34
Slight or none	112 (16.6)	0.521 (0.400 to 0.679)	<.001	−0.184 (−0.273 to −0.095)	<.001	129 (19.1)	0.974 (0.743 to 1.278)	.85	−0.011 (−0.093 to 0.072)	.80
Optimism about the COVID-19 epidemic										
Quite a lot	193 (21.3)	1 [Reference]	NA	1 [Reference]	NA	189 (20.8)	1 [Reference]	NA	1 [Reference]	NA
Moderate	130 (19.5)	0.900 (0.702 to 1.155)	.41	0.004 (−0.078 to 0.085)	.92	116 (17.4)	0.804 (0.622 to 1.039)	.10	−0.087 (−0.164 to −0.101)	.03
None	80 (37.9)	2.262 (1.642 to 3.117)	<.001	0.367 (0.250 to 0.485)	<.001	32 (15.2)	0.680 (0.452 to 1.024)	.07	−0.037 (−0.153 to 0.078)	.53

Abbreviations: COVID-19, coronavirus disease 2019; NA, not applicable.

[a] The number and percentage of the students who reported depressive or anxiety symptoms.

[b] The odds ratios (95% CI) were derived from the binary logistic regression.

[c] The β values (95% Wald CI) were derived from generalized linear regression (gamma distribution).

Discussion | In this study, 22.6% of students reported having depressive symptoms, which is higher than other investigations in primary schools of China (17.2%).[4] During the outbreak of COVID-19, the reduction of outdoor activities and social interaction may have been associated with an increase in children's depressive symptoms. Our study found that 18.9% of students reported anxiety symptoms, which is higher than the prevalence in other surveys.[5] Severe acute respiratory syndrome in 2003 was also associated with several psychological symptoms among students in China.[6] These findings suggest that serious infectious diseases may influence the mental health of children as other traumatic experiences do. A limitation is that our current study could not evaluate whether these outcomes will be long-lasting after the COVID-19 outbreak. We will continue to follow up with these participants to improve our understanding about how long those outcomes will last. A better understanding of how the epidemic affects students' mental health can help guide future interventions.

Xinyan Xie, BA
Qi Xue, MPH
Yu Zhou, BA
Kaiheng Zhu, BA
Qi Liu, MS
Jiajia Zhang, PhD, MS
Ranran Song, PhD, MS

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Author Affiliations: Department of Maternal and Child Health and Ministry of Education Key Laboratory of Environment and Health, School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China (Xie, Xue, Zhou, Zhu, Liu, Song); Department of Epidemiology and Biostatistics, Arnold School of Public Health, University of South Carolina, Columbia (Zhang).

Acceptance Date: April 14, 2020.

Corresponding Author: Ranran Song, PhD, MS, Department of Maternal and Child Health and Ministry of Education Key Laboratory of Environment and Health, School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, No. 13 Hangkong Rd, Wuhan 430030, Hubei, China (songranran@hust.edu.cn).

Published Online: April 24, 2020. doi:10.1001/jamapediatrics.2020.1619

Author Contributions: Dr Song had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Mss Xie and Xue contributed equally.
Concept and design: Xie, Xue, Song.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Xie, Xue, Zhou, Zhu, Liu.
Critical revision of the manuscript for important intellectual content: Zhang, Song.
Statistical analysis: Xie, Xue, Zhou, Zhu, Liu, Zhang.
Obtained funding: Song.
Administrative, technical, or material support: Song.
Supervision: Song.

Conflict of Interest Disclosures: None reported.

Funding/Support: This work was supported by the National Natural Science Foundation of China (grant 81673194 [Dr Song]).

Role of the Funder/Sponsor: The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Additional Contributions: We thank the families and the children that participated in this study. They were in the first epicenter of the coronavirus disease 2019 outbreak, but they were willing to complete the investigation.

1. Guo J, Chen L, Wang X, et al. The relationship between Internet addiction and depression among migrant children and left-behind children in China. *Cyberpsychol Behav Soc Netw*. 2012;15(11):585-590. doi:10.1089/cyber.2012.0261

2. Wang K, Lin-Yan SU, Zhu Y. Norms of the Screen for Child Anxiety Related Emotional Disorders in Chinese urban children. *Chin J Clin Psychol*. 2002;10(4):270-272.

3. Hale WW III, Crocetti E, Raaijmakers QA, Meeus WH. A meta-analysis of the cross-cultural psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED). *J Child Psychol Psychiatry*. 2011;52(1):80-90. doi:10.1111/j.1469-7610.2010.02285.x

4. Xu DD, Rao WW, Cao XL, et al. Prevalence of depressive symptoms in primary school students in China: a systematic review and meta-analysis. *J Affect Disord*. 2020;268:20-27. doi:10.1016/j.jad.2020.02.034

5. Magiati I, Ponniah K, Ooi YP, Chan YH, Fung D, Woo B. Self-reported depression and anxiety symptoms in school-aged Singaporean children. *Asia Pac Psychiatry*. 2015;7(1):91-104. doi:10.1111/appy.12099

6. Main A, Zhou Q, Ma Y, Luecken LJ, Liu X. Relations of SARS-related stressors and coping to Chinese college students' psychological adjustment during the 2003 Beijing SARS epidemic. *J Couns Psychol*. 2011;58(3):410-423. doi:10.1037/a0023632

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