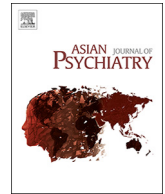




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## Letter to the Editor

## Prevalence of and factors associated with mental health problems and suicidality among senior high school students in rural China during the COVID-19 outbreak

## 1. Introduction

Coronavirus disease 2019 (COVID-19) started to spread rapidly throughout China at the beginning of 2020 and subsequently reached almost every country in the world with an exponentially increasing number of new confirmed cases (WHO, 2020). In addition to its negative influence on physical well-being, COVID-19 also exerted an enormous impact on the mental well-being of the public. The psychological impact of COVID-19 on adolescents is a crucial but overlooked issue (Wang et al., 2020).

In response to the outbreak, the Chinese government has taken numerous measures to prevent the spread of viruses (Wang et al., 2020). Although the measures are imperative and effective, the prolonged closure of school, home confinement, restriction of movement and more obesogenic behaviors might have an adverse influence on adolescents (Tandon, 2020a, b), and rural adolescents who are more susceptible to mental health problems (Zhang et al., 2011) might suffer more under these circumstances. Although several studies regarding the psychological impact of COVID-19 have been conducted, evidence regarding the impact of COVID-19 on senior high school students in rural areas is limited. This cross-sectional study aimed to investigate the mental health problems and suicidality among senior high school students in rural China during the COVID-19 outbreak and explore the potential influential factors.

## 2. Methods

Ethical approval was obtained from the Research Ethics Commission of Navy Medical University. Fifteen classes from 5 senior high schools in rural areas of Anhui Province were selected using random cluster sampling. Subjects self-reported the frequency with which they participated in “physical activities that at least moderately enhance your heart rate for at least 20 min” (high/low). The 9-item Patient Health Questionnaire (PHQ-9), the 7-item Generalized Anxiety Disorder Scale (GAD-7), and the Impact of Events Scale - Revised (IES-R) were used to measure depression, anxiety and posttraumatic stress disorder (PTSD) symptoms, respectively. The cutoff points for screening symptoms of depression, anxiety and PTSD were 10, 8, and 26, respectively (Kader Maideen et al., 2015; Lai et al., 2020). Suicidal ideation and suicidal attempts were evaluated with two items (Achenbach, 1991): “I thought about killing myself” (Yes/no) and “I deliberately tried to kill myself” (Yes/no).

## 3. Results

A total of 859 high school students were recruited in the study; 524 students were left-behind children. Most participants were males (61.4 %) and aged 16 years and below (79.4 %). A total of 87.1 % had

siblings, 54.9 % reported poor academic records, and 67.4 % reported low exercise frequencies. The results indicated that 71.5 %, 54.5 % and 85.5 % presented symptoms of depression, anxiety and PTSD, respectively; 31.3 % and 7.5 % reported suicidal ideation and attempts, respectively.

As shown in Table 1, multivariate logistic regression revealed that being female and having poor academic records were associated with severe depression and anxiety, suicidal ideation and suicidal attempts, while being a left-behind child was only associated with severe depression. Having siblings was a risk factor for PTSD but was a protective factor against suicidal ideation. Higher exercise frequency was associated with fewer symptoms of depression and anxiety.

## 4. Discussion

To the best of our knowledge, this is the first study to explore mental health and suicidality among senior high school students in rural China during COVID-19. The results of the present study suggested that senior high school students in rural China reported a high prevalence of depression, anxiety and PTSD symptoms, and a considerable proportion of students presented suicidal ideation and suicidal attempts during the COVID-19 outbreak. The possible mechanisms underlying the psychological impact of COVID-19 on senior high school students might be complicated. First, in traditional Chinese culture, education is highly valued and regarded as the main path to success. As a result, senior high school students are put under great pressure to prepare for the National College Entrance Examination (Sun et al., 2013). Thus, prolonged school closure and concern about academic progress might aggravate the detrimental impacts of COVID-19 on mental well-being. Second, in rural China, considerable families suffer from poverty without sources of stable income, which might result in concern about family financial loss (Wang et al., 2020). Finally, fears of being infected, being intolerant of uncertainty, a lack of contact with friends and boredom might also be stressors that contributed to the pressure during the epidemic (Taha et al., 2013; Wang et al., 2020).

Based on the findings, psychological interventions for depression, anxiety and suicidality should be prioritized to help vulnerable senior high school students in rural China, especially females, left-behind children, and those with lower academic records. Interventions for PTSD should be directed to the students who have siblings, while more attention should be paid to the suicidal ideation of those without siblings. Moreover, an increase in exercise frequency should be recommended to help maintain mental well-being during the COVID-19 outbreak.

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**Table 1**  
Risk factors for psychological impact of COVID-19, adverse mental health status and suicidal ideation and attempts during the pandemic ( $N = 857$ ).

Variable	No. of severe cases/No. of total cases (%)	Adjusted OR (95 % CI)	P value	
			Category	Overall
<b>PHQ-9, depression</b>				
Gender				
Male	143/527 (27.1)	1 [Reference]	NA	0.009
Female	122/332 (36.7)	1.51 (1.11 – 2.05)	0.009	
Academic record				
Good	95/387 (24.5)	1 [Reference]	NA	< 0.001
Poor	170/472 (36.0)	1.72 (1.27 – 2.34)	< 0.001	
Exercise frequency				
Low	199/579 (34.4)	1 [Reference]	NA	0.008
High	66/280 (23.6)	0.64 (0.46 – 0.89)	0.008	
Left-behind student				
Yes	174/524 (33.2)	1 [Reference]	NA	0.032
No	91/335 (27.2)	0.73 (0.53 – 0.99)	0.032	
<b>GAD-7, anxiety</b>				
Gender				
Male	126/527 (23.9)	1 [Reference]	NA	0.041
Female	107/332 (32.2)	1.39 (1.01 – 1.91)	0.041	
Academic record				
Good	91/387 (23.5)	1 [Reference]	NA	0.049
Poor	142/472 (30.1)	1.37 (1.00 – 1.86)	0.049	
Exercise frequency				
Low	177/579 (30.6)	1 [Reference]	NA	0.004
High	56/280 (20.6)	0.60 (0.42 – 0.85)	0.004	
<b>IES-R, PTSD</b>				
Having siblings				
No	31/111 (27.9)	1 [Reference]	NA	0.047
Yes	283/748 (37.8)	1.57 (1.01 – 2.45)	0.047	
<b>Suicidal ideation</b>				
Gender				
Male	134/527 (25.4)	1 [Reference]	NA	< 0.001
Female	135/332 (40.7)	2.00 (1.47 – 2.73)	< 0.001	
Academic record				
Good	99/387 (25.6)	1 [Reference]	NA	0.002
Poor	170/472 (36.0)	1.61 (1.19 – 2.18)	0.002	
Having siblings				
No	42/111 (37.8)	1 [Reference]	NA	0.033
Yes	227/748 (30.3)	0.62 (0.41 – 0.96)	0.033	
<b>Suicidal attempt</b>				
Gender				
Male	23/527 (4.4)	1 [Reference]	NA	< 0.001
Female	41/332 (12.3)	2.95 (1.69 – 5.15)	< 0.001	
Academic record				
Good	17/387 (4.4)	1 [Reference]	NA	0.007
Poor	47/472 (10.0)	2.23 (1.25 – 3.98)	0.007	

#### Declaration of Competing Interest

No conflict of interest exists in the submission of this manuscript.

The authors declare that they have no conflict of interest.

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Tian-ya Hou, Xiao-fei Mao, Wei Dong, Wen-peng Cai\*,  
Guang-hui Deng\*  
Faculty of Psychology, Second Military Medical University, #800 Xiangyin  
Road, Shanghai 200433, China  
E-mail addresses: liumi9512@126.com (T.-y. Hou),  
maoxiaofeipsy@126.com (X.-f. Mao),  
sophiedongwei@163.com (W. Dong), wpc@smmu.edu.cn (W.-p. Cai),  
bfbedu@126.com (G.-h. Deng).

\* Corresponding authors.