

# Effects of the Early COVID-19 Pandemic on the Mental Health of International Students Stranded in China

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**Abstract: Background:** The sudden outbreak of the coronavirus disease 2019 (COVID-19) pandemic has had a dramatic negative impact on the lives and mental health of people living in countries around the world. International students were stranded in China because of the pandemic, and they have not received much research attention. This article attempts to address this research gap and help this special group avoid secondary disasters caused by sudden public health events by analyzing the mental health status of overseas students with various characteristics in China. **Methods:** At the beginning of the outbreak, a cross-sectional and anonymous online survey (N=1547) was used to collect information on participants' gender and educational background, whether they were about to graduate, whether they were part-time workers, whether they received financial support from their families, their geographic location and sources of information related to COVID-19. At the same time, the three subscales of the Depression, Anxiety and Stress Scale (DASS-21) were used to evaluate the mental health status of international students. Finally, descriptive statistics and regression analysis were performed by cross-tabulation analysis and ordered logistic analysis, respectively. **Results:** Among international students in China, the mental health of women and graduating students was at greater risk. Students whose financial resources were unstable, such as international students who did not receive support from their families or who lost their part-time jobs during the COVID-19 pandemic, were more vulnerable in regard to their mental health. The mental health of students from Southeast Asia was more at risk than that of students from East Asia, while students from South Asia and Africa were between the two groups. The mental health level of students who used the public social platform as their main information source was lower than that of students who used the World Health Organization as their main information source. **Conclusion:** Through the analysis of the mental health status of international students who were stranded in China during winter vacation in the early days of the COVID-19 pandemic, we found that women, PhD students and international students about to graduate were vulnerable to psychological problems. Furthermore, financial and information sources had a substantial impact on the mental health of international students in China during the pandemic. Based on these conclusions, we suggest that special groups such as international students should be given targeted assistance, including mental health interventions, livelihood support and COVID-19-related health courses, during major public health crises.

**Keywords:** COVID-19; Mental Health; International Students; China; Targeted Assistance.

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## 1. Introduction

The coronavirus disease 2019 (COVID-19) outbreak in December 2019 has been seen as a "black swan" event around the world. This sudden public health crisis has caused huge economic losses and deaths in countries around the world. The International Labor Organization estimates that global workers' incomes fell by 10% in the first nine months of 2020, equivalent to a loss of more than \$3.5 trillion [1]. As of March 31, 2021, the cumulative number of confirmed deaths was approximately 2.91 million (<https://ourworldindata.org/>). The continuous impact of the pandemic, the long-term isolation and the destruction of normal life have led to mass panic, anxiety, depression, suicide and other serious secondary disasters [2].

To alleviate the mental health problems caused by COVID-19, scholars from various countries have conducted studies on the mental health status of the general population [3]. Mythili Hazarika studied the effects of the pandemic on the psychological status of the general population in India and found that housewives, unmarried individuals, people who work in the public sector, people with a history of mental illness, and students experienced great psychological pressure [4]. Hans' research showed that students, women, young people and unmarried people in the general population of Ecuador suffered from high levels of depression, anxiety and

stress [5]. Abdallah Y. Naser et al. studied anxiety in the general Jordan population and found that college students were the most common population to experience anxiety, followed by medical professionals, and they suggested providing spiritual support for the psychological anxiety experienced by various vulnerable groups [6]. These studies all show that students are susceptible to psychological problems.

Among the students, there are two special groups that have received widespread attention, namely, medical students and Chinese overseas students. In research on the mental health of medical students, Nioi's research shows that they are an important group at risk of psychological symptoms during the pandemic, and their mental health conditions are more likely to be at risk of deterioration than those of other students [7]. Among medical students, nursing students, especially nursing interns, have more serious mental health problems. When the COVID-19 outbreak began, it was during the internship period of nursing interns. Due to the lack of practical experience and psychological preparation to deal with large-scale health crises, nursing interns experience significantly higher psychological pressure than other healthcare workers [8]. The concern about the mental health of Chinese overseas students originally came after Zhai and Du jointly published correspondence in the Lancet, which pointed out the mental health problems of Chinese overseas students, such as stress,

anxiety and fear caused by discrimination, prejudice and isolation [9]. Song et al. conducted a questionnaire survey among Chinese overseas students and found that nearly half of them reported moderate to severe anxiety related to their academic plans, economic pressure and health conditions [10]. At the same time, discrimination in social media, fear of COVID-19, and mixed messages from social relationships can exacerbate anxiety [11].

However, current research on the mental health of students ignores a very special group: international students who have left their countries to come to China for educational purposes. In early January 2020, winter vacation was approaching for Chinese universities. Due to the pandemic, some international students studying in China were unable to return home. Special circumstances, such as being the first to be exposed to the pandemic, being in a different culture, lacking reliable information and lacking psychological intervention, resulted in these students experiencing greater psychological pressure than other students. This article attempts to fill the research gap in this area and analyzes the mental health of international students in China by considering their unique characteristics to help this special group avoid secondary disasters caused by sudden public health incidents.

## 2. Materials and Methods

### 2.1. Participants and Procedure

A cross-sectional and anonymous online survey was conducted using Wenjuanxing, which is an online platform providing functions equivalent to those of Amazon Mechanical Turk [12]. The online survey was conducted from May 1 to May 7, 2020. A total of 1609 students studying in China during the winter vacation period completed the questionnaire. All students came from colleges and universities in Nanjing. Sixty-two samples were omitted from this article because there were fewer than 9 students from the same country in these samples, which is not representative. Therefore, the remaining 1547 questionnaires were included in the analysis of this article.

### 2.2. Measures

This study used snowball sampling to issue questionnaires. The questionnaire included the Depression, Anxiety and Stress Scale (DASS-21) for psychological measurement and collected personal characteristics (such as gender, educational background, time until graduation, part-time work status, family financial support received and home country). In addition, considering the impact of media reports on mental health [13-14], this study added the factor of information sources. The sample characteristics are shown in Table 1.

Table 1. Sample feature description

Variable		n/(%)
Total		1547 (100%)
Gender	Men	637 (41.2%)
	Women	910 (58.8%)
Education	Bachelor	227 (14.7%)
	Master	1001 (64.7%)
	Doctor	319 (20.6%)
Time Until Graduation	Non-graduates	967 (62.5%)
	Graduates	580 (37.5%)
Part-time Job	Have	1149 (74.3%)
	Have not	398 (25.7%)
Family Financial Support Received	Have	852 (55.1%)
	Have not	695 (44.9%)
Geographic location	Southeast Asia	455 (29.4%)
	South Asia	319 (20.6%)
	Europe	180 (11.6%)
	Africa	342 (22.1%)
	East Asia	251 (16.2%)
Information Sources	National official	238 (15.4%)
	Public social platform	364 (23.5%)
	WHO	945 (61.1%)

#### 2.2.1. Psychological Measurement Scale

The DASS-21 was used to assess the mental health of international students, and the language of the questionnaire

was English. The questionnaire consists of three subscales measuring depression, anxiety and stress. Each subscale is composed of seven items, and the scores for each answer

range from 0 to 3, where 0 indicates "not applicable to me" and 3 indicates "applicable to me most of the time" [15]. The depression subscale is evaluated by items 3, 5, 10, 13, 16, 17, and 21. The anxiety subscale is evaluated by items 2, 4, 7, 9, 15, 19, and 20. The stress subscale is evaluated by items 1, 6, 8, 11, 12, 14, and 18. The total scores of the three scales are divided into mild (0-7), moderate (8-14) and severe (15-21).

### 2.2.2. Personal Characteristics

Personal characteristics included gender, educational background, time until graduation, part-time work status, family financial support received and home country. Among them, educational background included bachelor's, masters and doctoral degrees. Variables such as gender, time until graduation, part-time work status, and family financial support received were dichotomous. The international students interviewed were mainly from East Asia, Southeast Asia, South Asia, Europe and Africa. The international students interviewed from East Asia were from South Korea (n=120) and Japan (n=131); those from Southeast Asia were from Thailand (n=141) and Vietnam (n=314); those from South Asia were from Pakistan (n=229) and India (n=90); those from Europe were from Russia (n=122) and Italy (n=58); and those from Africa were from Kenya (n=147) and Uganda (n=195).

### 2.2.3. Information Sources

Under normal circumstances, official reports should be used as the main information source during a pandemic. However, due to the differences in personal perception and

cognition [16], some people choose public social platforms as their main source of information [14]. Through interviews with some international students, this paper obtained their main information sources, which included national officials, public social platforms (mainly YouTube, Twitter, and Facebook) and the WHO.

## 2.3. Statistical Analysis

IBM SPSS for Windows, version 19.0, was used for statistical analysis. First, this paper used cross-tabulation analysis for descriptive statistics in addition to difference analysis. The behavioral characteristics of the cross-tabulation were listed as the degree of depression, anxiety and stress symptoms. The analysis results are shown in Tables 2-4. Then, an ordered logistic regression with a 95% confidence interval (CI) was performed to determine the significant association between the dependent variable and the independent variable, which can avoid multicollinearity. Among them, personal characteristics and information sources were the independent variables, and depression, anxiety and stress were the dependent variables. The analysis results are shown in Table 5.

## 3. Results

### 3.1. Cross-tabulation Analysis Results

In general, the percentages of moderate-to-high depression, anxiety and stress among international students in China were 73.56%, 85.19% and 50.03%, respectively.

**Table 2.** Depression Symptoms and Cross-analysis table of sample characteristics (n=1547)

Variable		Depression Symptoms			$\chi^2$	p
		Mild n/(%)	Moderate n/(%)	Severe n/(%)		
Gender	Men	159(24.96%)	296(46.47%)	182(28.57%)	7.329	0.026
	Women	250(27.47%)	455(50.00%)	205(22.53%)		
Education	Bachelor	45(19.82%)	114(50.22%)	68(29.96%)	24.594	0.000
	Master	250(24.98%)	512(51.15%)	239(23.88%)		
	Doctor	114(35.74%)	125(39.18%)	80(25.08%)		
Time Until Graduation	Non-graduates	261(26.99%)	467(48.29%)	239(24.72%)	0.499	0.779
	Graduates	148(25.52%)	284(48.97%)	148(25.52%)		
Part-time Job	Have	295(25.67%)	580(50.48%)	274(23.85%)	7.381	0.025
	Have not	114(28.64%)	171(42.96%)	113(28.39%)		
Financial Support	Have	170(19.95%)	398(46.71%)	284(33.33%)	84.438	0.000
	Have not	239(34.39%)	353(50.79%)	103(14.82%)		
Geographic location	Southeast Asia	80(17.58%)	228(50.11%)	147(32.31%)	170.689	0.000
	South Asia	68(21.32%)	160(50.16%)	91(28.53%)		
	Europe	113(62.78%)	55(30.56%)	12(6.67%)		
	Africa	68(19.88%)	182(53.22%)	92(26.90%)		
	East Asia	80(31.87%)	126(50.20%)	45(17.93%)		
Information Sources	National official	91(38.24%)	91(38.24%)	56(23.53%)	67.143	0.000
	Public social platform	56(15.38%)	171(46.98%)	137(37.64%)		
	WHO	262(27.72%)	489(51.75%)	194(20.53%)		

The results of the cross-analysis of depression symptoms and measured characteristics are shown in Table 2. Depression symptoms varied by gender ( $\chi^2=7.329$ ,  $p=0.026$ ), educational background ( $\chi^2=24.594$ ,  $p=0.000$ ), geographic location ( $\chi^2=170.689$ ,  $p=0.000$ ) and information source ( $\chi^2=67.143$ ,  $p=0.000$ ), with significant differences among international students. The depression symptoms of international students with part-time work ( $\chi^2=7.381$ ,  $p=0.025$ ) and family financial support ( $\chi^2=84.438$ ,  $p=0.000$ ) varied significantly.

The cross-analysis results of anxiety symptoms and

measured characteristics are shown in Table 3. Anxiety symptoms varied by educational background ( $\chi^2=17.169$ ,  $p=0.002$ ), student status ( $\chi^2=6.717$ ,  $p=0.035$ ), geographic location ( $\chi^2=43.194$ ,  $p=0.000$ ) and information source ( $\chi^2=50.801$ ,  $p=0.000$ ), with significant differences among international students. The anxiety of foreign students who worked part time ( $\chi^2=65.040$ ,  $p=0.000$ ) and of those who received family financial support ( $\chi^2=211.751$ ,  $p=0.000$ ) differed significantly from that of students who did not.

**Table 3.** Anxiety Symptoms and Cross-analysis table of sample characteristics (n=1547)

Variable		Anxiety Symptoms				
		Mild n/(%)	Moderate n/(%)	Severe n/(%)	$\chi^2$	p
Gender	Men	103(16.17%)	319(50.08%)	215(33.75%)	4.319	0.115
	Women	126(13.85%)	432(47.47%)	352(38.68%)		
Education	Bachelor	24(10.57%)	102(44.93%)	101(44.49%)	17.169	0.002
	Master	170(16.98%)	489(48.85%)	342(34.17%)		
	Doctor	35(10.97%)	160(50.16%)	124(38.87%)		
Time Until Graduation	Non-graduates	160(16.55%)	466(48.19%)	341(35.26%)	6.717	0.035
	Graduates	69(11.9%)	285(49.14%)	226(38.97%)		
Part-time Job	Have	161(14.01%)	501(43.60%)	487(42.38%)	65.040	0.000
	Have not	68(17.09%)	250(62.81%)	80(20.10%)		
Financial Support	Have	161(18.90%)	512(60.09%)	179(21.01%)	211.751	0.000
	Have not	68(9.78%)	239(34.39%)	388(55.83%)		
Geographic location	Southeast Asia	58(12.75%)	239(52.53%)	158(34.73%)	43.194	0.000
	South Asia	57(17.87%)	148(46.39%)	114(35.74%)		
	Europe	23(12.78%)	67(37.22%)	90(50.00%)		
	Africa	57(16.67%)	194(56.73%)	91(26.61%)		
	East Asia	34(13.55%)	103(41.04%)	114(45.42%)		
Information Sources	National official	57(23.95%)	91(38.24%)	90(37.82%)	50.801	0.000
	Public social platform	57(15.66%)	216(59.34%)	91(25.00%)		
	WHO	115(12.17%)	444(46.98%)	386(40.85%)		

**Table 4.** Stress Symptoms and Cross-analysis table of sample characteristics (n=1547)

Variable		Stress Symptoms				
		Mild n/(%)	Moderate n/(%)	Severe n/(%)	$\chi^2$	p
Gender	Men	341(53.53%)	182(28.57%)	114(17.9%)	40.227	0.000
	Women	432(47.47%)	387(42.53%)	91(10%)		
Education	Bachelor	79(34.8%)	125(55.07%)	23(10.13%)	46.744	0.000
	Master	523(52.25%)	353(35.26%)	125(12.49%)		
	Doctor	171(53.61%)	91(28.53%)	57(17.87%)		
Time Until Graduation	Non-graduates	432(44.67%)	409(42.3%)	126(13.03%)	35.666	0.000
	Graduates	341(58.79%)	160(27.59%)	79(13.62%)		
Part-time Job	Have	648(56.4%)	364(31.68%)	137(11.92%)	73.608	0.000
	Have not	125(31.41%)	205(51.51%)	68(17.09%)		
Financial Support	Have	284(33.33%)	375(44.01%)	193(22.65%)	261.536	0.000
	Have not	489(70.36%)	194(27.91%)	12(1.73%)		
Geographic location	Southeast Asia	137(30.11%)	239(52.53%)	79(17.36%)	176.137	0.000
	South Asia	137(42.95%)	137(42.95%)	45(14.11%)		
	Europe	124(68.89%)	45(25%)	11(6.11%)		
	Africa	194(56.73%)	91(26.61%)	57(16.67%)		
	East Asia	181(72.11%)	57(22.71%)	13(5.18%)		
Information Sources	National official	113(47.48%)	102(42.86%)	23(9.66%)	35.053	0.00
	Public social platform	159(43.68%)	125(34.34%)	80(21.98%)		
	WHO	501(53.02%)	342(36.19%)	102(10.79%)		

The cross-analysis results of stress symptoms and measured characteristics are shown in Table 4. Stress symptoms varied by gender ( $\chi^2=40.227$ ,  $p=0.000$ ), educational background ( $\chi^2=46.744$ ,  $p=0.000$ ), student status ( $\chi^2=35.566$ ,  $p=0.000$ ), geographic location ( $\chi^2=176.137$ ,  $p=0.000$ ) and information source ( $\chi^2=35.053$ ,  $p=0.000$ ), with significant differences between international students. The stress symptoms of those with part-time jobs ( $\chi^2=73.608$ ,  $p=0.000$ ) and those receiving family financial support ( $\chi^2=261.536$ ,  $p=0.000$ ) differed significantly from those without a part-time job or family financial support.

### 3.2. Ordinal Logistic Regression Results

Ordinal logistic regression analysis was used to measure the relationship between sample characteristics as independent variables and depression, anxiety and stress as dependent variables, as shown in Table 5.

The depression and anxiety of women were higher than those of men. The degree of depression and anxiety symptoms was 0.817 in men (odds ratio [OR] = 0.817; 95% CI = [0.684, 0.976]) and 0.779 in women (OR = 0.779; 95% CI = [0.640, 0.948]).

The depression, anxiety and stress of doctoral students were higher than those of undergraduates. The degrees of depression, anxiety, and stress symptoms of undergraduate students were 0.357 (OR = 0.357; 95% CI = [0.236, 0.541]), 0.374 (OR = 0.374; 95% CI = [0.193, 0.722]) and 0.406 (OR = 0.406; 95% CI = [0.324, 0.510]), respectively.

Graduating students had higher levels of depression, anxiety and stress than students who were not graduating. The degrees of depression, anxiety and stress symptoms of nongraduating students were 0.788 (OR =0.788; 95% CI = [0.642, 0.966]), 0.498 (OR = 0.498; 95% CI = [0.266, 0.931]) and 0.776 (OR =0.776; 95% CI = [0.623, 0.967]), respectively.

Students with part-time jobs had higher levels of anxiety and stress than those without part-time jobs. The degree of anxiety and stress symptoms of students with part-time jobs was 3.580 (OR =3.580; 95% CI = [1.533, 8.358]) and 3.797 times those of students without part-time jobs (OR =3.797; 95% CI = [1.774, 8.129]), respectively.

Students whose families provided financial support had lower levels of depression, anxiety and stress than those who did not receive such support. The degrees of depression, anxiety and stress symptoms of students who received

financial support from their families were 0.441 (OR =0.441; 95% CI = [0.209, 0.928]), 0.183 (OR =3.797; 95% CI = [0.044, 0.762]) and 0.226 (OR =3.797; 95% CI = [0.090, 0.566]), respectively.

Compared with students from East Asia, students from Southeast Asia had higher depression, anxiety and stress levels, with the levels of students from South Asia and Africa between the two former groups. The degrees of depression, anxiety and stress symptoms among Southeast Asian students were 5.942 (OR =5.942; 95% CI = [1.421, 24.854]), 4.539 (OR =4.539; 95% CI = [1.575, 13.083]) and 3.836 times those of students from East Asia (OR = 3.836; 95% CI = [1.677, 8.774]), respectively. The degrees of depression, anxiety and stress in students from South Asia were 2.559 (OR =5.942; 95% CI = [1.202, 5.446]), 2.918 (OR =4.539; 95% CI = [1.311, 6.493]) and 3.181 (OR =3.836; 95% CI = [1.319, 7.672]), respectively. The degrees of depression, anxiety and stress in students from Africa were 2.366 (OR =2.366; 95% CI = [1.943, 2.882]), 2.264 (OR =2.264; 95% CI = [1.280, 4.004]) and 2.613 (OR =2.613; 95% CI = [1.436, 4.754]), respectively.

**Table 5.** Ordinal logistic regression results (n=1547)

	<b>Model I: Depression</b>	<b>Model II: Anxiety</b>	<b>Model III: Stress</b>
	<b>OR [95% CI]</b>	<b>OR [95% CI]</b>	<b>OR [95% CI]</b>
Gender			
Men	0.817* [0.684, 0.976]	0.779* [0.640, 0.948]	0.916 [0.822, 1.020]
Women	1.00 (ref)		
Education			
Bachelor	0.357*** [0.236, 0.541]	0.374*** [0.193, 0.722]	0.406*** [0.324, 0.510]
Master	0.982 [0.958,1.006]	0.952 [0.838, 1.082]	0.940 [0.867, 1.020]
Doctor	1.00 (ref)		
Time Until Graduation			
Non-graduates	0.788* [0.642, 0.966]	0.498* [0.266, 0.931]	0.776* [0.623, 0.967]
Graduates	1.00 (ref)		
Part-time Job			
Have	3.948 [0.863, 18.057]	3.580*** [1.533, 8.358]	3.797*** [1.774, 8.129]
Have not	1.00 (ref)		
Financial Support			
Have	0.441* [0.209, 0.928]	0.183* [0.044, 0.762]	0.226*** [0.090, 0.566]
Have not	1.00 (ref)		
Geographic location			
Southeast Asia	5.942* [1.421, 24.854]	4.539** [1.575, 13.083]	3.836*** [1.677, 8.774]
South Asia	2.559* [1.202, 5.446]	2.918* [1.311, 6.493]	3.181* [1.319, 7.672]
Europe	1.092 [0.975, 1.222]	1.081 [0.990, 1.181]	1.096 [0.884, 1.358]
Africa	2.366*** [1.943, 2.882]	2.264** [1.280, 4.004]	2.613** [1.436, 4.754]
East Asia	1.00 (ref)		
Information Sources			
National official	0.733 [0.476, 1.128]	0.582 [0.292, 1.159]	0.558 [0.265, 1.175]
Public social platform	1.978* [1.154, 3.391]	2.178**[1.294, 3.666]	1.857** [1.202, 2.868]
WHO	1.00 (ref)		

\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.005

Goodness-of-fit of the model I:  $\chi^2=17.123$ ,  $p<0.017$ . p-value for the parallel lines assumption:  $p=0.676$ .

Goodness-of-fit of the model II:  $\chi^2=17.137$ ,  $p<0.017$ . p-value for the parallel lines assumption:  $p=0.831$ .

Goodness-of-fit of the model III:  $\chi^2=27.430$ ,  $p<0.000$ . p-value for the parallel lines assumption:  $p=0.537$ .

Graduates: Refers to seniors, graduates and doctorate students. Chinese universities require four years for undergraduates, three years for postgraduates, and four years for doctoral degrees.

The depression, anxiety, and stress of students whose main source of information was public social platforms were higher than those whose main source of information was the WHO. The degrees of depression, anxiety, and stress symptoms of students who used social media platforms as their main information source were 1.978 (OR = 1.978; 95% CI = [1.154, 3.391]), 2.178 (OR = 2.178; 95% CI = [1.294, 3.666]) and 1.857 (OR = 1.857; 95% CI = [1.202, 2.868]) times those of students who used the WHO as their main source of information, respectively.

## 4. Discussion

### 4.1. Overall Mental Health of the Sample

The purpose of this study was to assess the psychological impact of the COVID-19 pandemic on international students stranded in China during winter vacation. Mental health was measured using the DASS-21. Based on the descriptive statistics, the percentages of moderate-to-high depression, anxiety and stress among international students in China were 73.56%, 85.19% and 50.03%, respectively. Each of these indicators was over 50%, with the rates of moderate-to-high levels of depression and anxiety above 70% and 80%, respectively. The mental health of international students in China was found to be more severely affected than in the study by Song et al., which found that nearly half of Chinese students experienced moderate to severe anxiety.

### 4.2. Mental Health of Samples with Different Personal Characteristics

Consistent with the research of other scholars, we examined the impact of gender, educational background, time until graduation, family financial support, and part-time job on the mental health of international students in China [17-19]. In addition, we analyzed other factors that need to be explored, such as information source, country and region.

Among the international students in China who were surveyed, 41.2% were males and 58.8% were females. The study showed that depression and anxiety were higher in women than in men. This conclusion is consistent with those of other studies [20-21]. Some scholars claim that this phenomenon is related to the biological characteristics of gender and the socially defined roles of men and women [22]. Various studies have shown that women are more sensitive, less tolerant of uncertainty, and exhibit less effective coping strategies [23]. Women are also more likely to experience affective disorders in response to stressful conditions, while men are more likely to experience behavioral disorders in response to stressful conditions [24].

The depression, anxiety and stress of PhD students studying in China were higher than those of undergraduates. Liu et al. reached the same conclusion when studying the

mental health of Chinese college students during the pandemic. They found that the self-rating anxiety scale (SAS) scores of masters and doctoral students were significantly higher than those of undergraduates in their freshman to junior years ( $t=2.970$ ,  $p<0.05$ ) [25]. This phenomenon may be related to the higher scientific research pressure and stronger risk awareness of masters and doctoral students [26].

In addition, we found that the depression, anxiety and stress of international students who were about to graduate were higher than those who were not near graduation, which was largely due to the double pressure of graduation and employment [27]. The two-month lockdown in China that began on January 23 affected the progress of international students' courses and papers [28], and the subsequent increased unemployment rate also put international students who were about to graduate under great pressure [1].

The source of income had a substantial impact on the mental health of international students in China during the pandemic. The research in this article shows that the anxiety and stress of students with part-time jobs were higher than those without part-time jobs; and the depression, anxiety and stress of students whose families provided financial support were lower than those of students who did not receive such support. According to statistics from the Ministry of Education of China, the proportion of scholarships for international students in China does not exceed 15% ([http://www.moe.gov.cn/jyb\\_xwfb/gzdt\\_gzdt/s5987/201904/t20190412\\_377692.html](http://www.moe.gov.cn/jyb_xwfb/gzdt_gzdt/s5987/201904/t20190412_377692.html)). Moreover, 44.9% of the samples in our survey received no family financial support, and 74.3% of the students were engaged in part-time work, which indicates that part-time work is an important source of income for international students. The lockdown during the pandemic reduced the financial resources of foreign students with part-time jobs, which affected the ability of some international students to pay tuition, meet their living expenses, and pay rent, resulting in higher anxiety and stress. International students who received family financial support indicated fewer worries about these issues, so they experienced lower levels of depression, anxiety and stress.

Differences in the perception of COVID-19 risk between countries and regions have been confirmed [29]. Risk perception has a great impact on mental health. The higher the risk perception, the greater the challenge to mental health [30]. Our results show that the degrees of depression, anxiety and stress among East Asian students studying abroad were the lowest, and those of European students were slightly higher than those of East Asian students, although the regression results were not significant. These results are consistent with the risk perception level obtained by Riehm et al. They measured the risk perception of people in 10 countries, including Europe, Asia, North America and Oceania, and found that South Korea, Japan, Italy and Mexico had the lowest risk perception [29]. In addition, our results show that the degrees of depression, anxiety and stress were highest among international students from Southeast Asia, followed by those from South Asia and Africa. A study by Brigati et al. showed that people who had been exposed to the virus or had similar experiences were more anxious [31]. Therefore, a reasonable guess is that past experience with SARS may increase the depression, anxiety, and stress levels of this community. In fact, during the SARS outbreak, Southeast Asia was most affected, followed by South Asia and Africa, while East Asia (South Korea and Japan) and Europe were

almost unaffected [32].

### 4.3. Mental Health of Samples with Different Information Sources

In this study sample, 61.1% of international students in China obtained information related to COVID-19 from the WHO; that is, the official report of the WHO was the main channel through which international students obtained information, which is consistent with the research of other scholars [33-34]. In addition, the depression, anxiety, and stress levels of students whose main source of information was social media platforms were higher than those whose main source was the WHO. This conclusion validates Johal's research, which shows that obtaining unofficial information further promotes unnecessary anxiety and panic [35]. On the one hand, there are many rumors, false information and scams on social media platforms about the cause, outcome, prevention and treatment of the disease. For people who did not know much about the virus in the early days, this misleading information could have caused great anxiety and panic [36]. On the other hand, people living in isolation or at risk of infectious disease may become more interested in virus-related information. Some social media platforms will report many anecdotes to win the attention of the audience. This information is usually not representative, but it can be easily believed by the target population, causing panic [37]. As a result, students who use social media platforms as their main source of information will have higher depression, anxiety and stress levels [38]. This is also the main reason social media platforms such as YouTube prohibited social media coverage of COVID-19 for a period of time [39-40].

### 5. Limitations

This study has the following limitations: (1) The samples were selected from universities in Nanjing rather than Wuhan, the epicenter of the pandemic. Therefore, the overall depression, anxiety and stress levels of international students in China may not be well received, but they have a certain reference value. (2) Only some countries in Asia were included, so the findings cannot be generalized to the entire continent. (3) Because the study used cross-sectional data, the data represent a single moment in time. Future research should consider increasing the amount of data and introducing a time dimension for time series regression to make the sample more representative and to analyze depression, anxiety and stress levels at various time points. (4) This article did not consider the factor that parents accompany international students to China, and this factor may affect the depression, anxiety and stress of international students to a large extent. We will take this factor into consideration in subsequent studies.

### 6. Conclusion

Through analysis of the mental health status of international students who were stranded in China during winter vacation in the early days of the COVID-19 pandemic, we found that women, PhD students and international students near graduation were vulnerable to psychological problems. Furthermore, sources of income and information had a substantial impact on the mental health of international students in China during the pandemic. Based on these conclusions, we suggest that special groups, such as international students, should be given targeted assistance in

the event of a major public health crisis, including mental health interventions, livelihood support and COVID-19-related health courses.

### Data Availability Statement

The data that support this study are not publicly available due to privacy or ethical restrictions.

### Conflict of Interest

The authors declare no conflict of interest.

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