Original Article
Anxiety and depression in graduating university students during the COVID-19 pandemic: a longitudinal study

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Abstract: Objective: To investigate the prevalence of anxiety and depression in graduating university students during the COVID-19 pandemic and determine the associated factors. Methods: A total of 681 graduating university students and 620 juniors enrolled in the first stage. The Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS) were used to measure anxiety and depression. In the second stage, 578 of the 681 graduating students completed the SAS and SDS questionnaires after graduation. Results: The average SAS score of the graduating university students was significantly higher than that of the juniors (47.66±12.86 vs. 43.97±10.42, $P<0.001$). Depression was more prevalent among the graduating university students than in the control groups (39.06% vs. 9.19%, $P<0.01$). The percentages of anxiety and depression significantly decreased after graduation ($t=8.602$, $P<0.001$). The anxiety of graduating university students was associated with gender (OR=1.62, 95% CI: 1.10-2.37), monthly family income (OR=0.05, 95% CI: 0.02-0.11), and weekly exercise time (OR=0.53, 95% CI: 0.35-0.08). Their depression was related to their family's monthly income (OR=0.09, 95% CI: 0.05-0.16) and father's educational status (OR=2.24, 95% CI: 1.17-4.30). Conclusion: Anxiety and depression were rife within the graduating Chinese university students during the period of the COVID-19 pandemic and were both associated with monthly family income. Treatments tailored to specific targets are needed for graduating university students with mental problems.

Keywords: Graduating university students, anxiety, depression, COVID-19 pandemic

Introduction

In recent years, the psychological state of graduating university students has aroused widespread concern throughout society. Graduating university students comprise a special population in an environment of social, economic, and cultural change. Their knowledge, ability, and personality mature in this stage, and their emotions deepen in a process of rapid development. During graduation season, graduating university students have to face employment pressure, social role changes, and life stress, especially during the COVID-19 pandemic [1]. In such a high-pressure situation, many students have anxiety, depression, and sleep disorders, with some students even suffering from gastrointestinal problems [2, 3]. Previous studies have shown that many college students suffer from mental disorders (typically depres-

sion and anxiety) [4, 5]. These health conditions may affect students' quality of life, substance use [6], and academic performance [7].

In China, approximately 8 million graduating university students face employment problems as reported by the Ministry of Education of China in 2019. The COVID-19 pandemic resulted in a decline in career options, prohibiting some university students from applying for desirable positions. As a result of the pandemic, the majority of employers have cancelled their face-to-face recruitment activities in many universities. During this special period, it adds an obstacle to the employment of university graduates. The government created some favorable incentives for graduating university students' employment, such as supporting flexible employment, encouraging enterprises to hire graduates, expanding employment chan-

nels, promoting innovation and entrepreneurship, increasing employment capacity, implementing phased measures, providing targeted assistance, and improving employment services. Under the dual pressure of COVID-19 and employment, attention and prevention strategies to the mental health of university graduates are insufficient.

Depression and anxiety occur frequently in university students. Anxiety is described as a fear of a future threat accompanied by an emotional reaction to a real or perceived impending threat [8]. Depression is a leading cause of disability worldwide. The WHO reported that, unipolar depressive disorders are considered a primary cause of illness burden [9]. University students have a higher rate of depression compared with the overall population [10], and it is rising in many countries [11]. If not treated appropriately, university graduates' mental problems may generally persist into future employment, which will have far-reaching repercussions [12]. No longitudinal research of anxiety and depression among graduating Chinese university students in the period of COVID-19 pandemic has been published to our knowledge.

Provided with the above background, we aimed to (1) investigate the prevalence of anxiety and depression in graduating university students before graduation, (2) assess the anxiety and depression of the same sample after graduation, and (3) identify the factors linked to anxiety and depression in graduating university students in the period of COVID-19 pandemic.

Methods

Participants and data collection

From January 2020 to March 2021, a questionnaire survey was conducted. For the first stage, we enrolled graduating students from Qiqihar University and Qiqihar Medical University in January 2020. These students came from 29 provinces, and represented the overall conditions of China. The students completed the general information, SAS and SDS questionnaires through We Chat. In stage two, the same sample completed SAS and SDS questionnaires in March 2021. All graduating university students were required to meet the following criteria: (1) age ≥18 years and (2) no mental diseases. All participants supplied their online informed consent to take part in the research. Anonymity was guaranteed during data processing.

Measures

Demographic factors were among the personal data acquired through the questionnaire (including age, height, weight, education level, life habits, and family conditions). The participants' mental health knowledge was determined using the Mental Health Knowledge Questionnaire (MHKQ), which is widely used to assess mental health knowledge levels among Chinese adults. The questionnaire is comprised of 20 items concerning general mental health knowledge, mental disease prevention knowledge, and mental disease etiology knowledge. The total score of MHKQ is 20, with a higher score implying a high level of mental health awareness. The Cronbach's α of the MHKQ is 0.6.

The SAS was created to assess anxiety. Earlier studies have demonstrated that it has adequate validity and reliability [13, 14]. It includes 20 items to capture symptoms of anxiety. The responses yield a total score ranging from 20 to 80. The standard score equals the total score multiplied by 1.25. The standard score of 50 has been recommended to identify students with anxiety [15].

Depression status was evaluated using the SDS [16], which has been widely used to evaluate depressive symptoms. The SDS is composed of 20 items that describe symptoms of depression. The total score falls in the range of 4 to 80 points. Depression is classified as mild (53-62), moderate (63-72), or severe (≥72) [17].

Statistical analyses

The data were analyzed using SPSS 18.0 (SPSS Inc., Chicago, IL, USA). The independent t-test was used to analyze the demographic and outcome variables, which were described with means and standard deviations. The Chi-square test was used to determine the differences in the distribution of categorical variables between the graduating university students and juniors. The paired t-test and McNemar's test were used to examine the differences in anxiety and depression statuses among university graduates. Through logistic

Table 1. Demographics of graduating university students and juniors

Characteristics	Graduating university students (n=681)	Juniors (n=620)	χ^2/t	p value
Age, years	22.38±1.16	20.95±0.75	26.122	<0.001
Gender				
Male	352 (51.7%)	323 (52.1%)	0.022	0.88
Female	329 (48.3%)	297 (47.9%)		
BMI, kg/m^2	24.12±3.47	23.51±3.82	3.018	0.003
Cigarette smoking				
No	435 (63.88%)	359 (52.72%)	4.716	0.030
Yes	246 (6.12%)	260 (41.94%)		
Alcohol consumption				
No	464 (68.14%)	420 (67.74%)	0.023	0.879
Yes	217 (31.87%)	200 (32.26%)		
Monthly family income (RMB)				
<4000	114 (16.74%)	66 (10.65%)	14.726	0.001
4000-7000	354 (51.98%)	311 (50.16%)		
>7000	213 (31.28%)	243 (39.19%)		
Father educational status				
Primary school	72 (10.57%)	73 (11.77%)	3.515	0.319
Middle school	316 (46.40%)	271 (43.71%)		
High school	241 (35.39%)	240 (38.71%)		
University	52 (7.64%)	36 (5.81%)		
Mother educational status				
Primary school	90 (13.22%)	76 (12.26%)	2.767	0.429
Middle school	340 (49.92%)	318 (51.29%)		
High school	186 (27.31%)	181 (29.19%)		
University	65 (9.54%)	45 (7.26%)		
Weekly exercise time (hours)				
<1	379 (55.65%)	393 (63.39%)	8.045	0.018
1-3	221 (32.45%)	166 (26.77%)		
>3	81 (11.89%)	61 (9.84%)		
Having a boyfriend/girlfriend				
No	378 (55.51%)	341 (55%)	0.034	0.854
Yes	303 (44.49%)	279 (45%)		
Residence				
City	325	286	0.331	0.565
Rural	356	334		
Race				
Han	598	561	2.383	0.123
Not Han	83	59		
Only child in family				
Yes	595 (87.37%)	552 (89%)	0.858	0.354
No	86 (12.63%)	68 (11%)		
Subject type				
Liberal art	135 (19.82%)	141 (22.74%)	3.872	0.144
Science	324 (47.58%)	306 (49.35%)		
Medicine	222 (32.60%)	173 (27.90%)		

Physical condition				
Healthy	464 (68.14%)	420 (67.74%)	0.023	0.988
General	193 (28.34%)	178 (28.71%)		
Unhealthy	24 (3.52%)	22 (3.55%)		
Academic record				
Excellent	102 (14.98%)	96 (15.48%)	3.451	0.327
Good	209 (30.69%)	191 (30.80%)		
Medium	237 (34.80%)	235 (37.90%)		
Poor	133 (19.53%)	98 (15.80%)		
Work in spare time				
Yes	272 (39.94%)	241 (38.87%)	0.156	0.693
No	409 (60.06%)	379 (61.13%)		
Knowledge level of mental health scores				
0-16	552	508	0.166	0.684
17-20	129	112		

regression analysis, the life factors linked with graduating university students' anxiety and depression were identified. The *p*-value for statistical significance was fixed at 0.05.

Results

Demographics information

The demographics, SAS and SDS questionnaires were completed by 681 graduating university students (response rate, 92.8%) and 620 juniors (response rate: 93.1%) in the first stage. The BMI of the graduating university students were significantly higher than those of the juniors (P = 0.003). The monthly family income and weekly exercise time of the graduating university students were significantly different from those of the juniors ($P<0.05$) (**Table 1**).

Anxiety and depression were common among graduating university students and juniors in stage one

In the first stage, 44.64% (304/681) and 30.06% (266/681) of the graduating university students had anxiety and depression problems, respectively. The mean SAS and SDS scores of the graduating university students were higher than those of the juniors ($P<0.001$) (**Table 2**).

Prevalence of anxiety and depression in graduating university students and juniors in stage two

In the second stage, 578 graduating university students (84.88%, 578/681) completed

the SAS and SDS questionnaires. SAS and SDS results revealed, 34.95% (202/578) of the graduating university students were diagnosed with anxiety at stage two, which was lower than in stage one ($P<0.001$). There were 20.93% (121/578) of graduating university students who still experienced depression in stage two. The percentages of depression were significantly reduced compared to those in stage one ($P<0.001$) (**Table 3**).

In the second stage, 307 graduates were already employed, 165 graduates had become master's degree candidates, and 106 graduates were not employed. The difference in their satisfaction with their current work or study was statistically significant (χ^2=233.05, $P<0.001$). As shown in **Figure 1B**, 87 of the employed graduates, 30 of the master's degree candidates, and 85 of unemployed graduates had anxiety problems. The difference between these groups was statistically significant (χ^2=121.73, $P<0.001$). There were 32, 19, and 71 graduates who experienced depression from the employed, master's degree candidate, and unemployed groups, respectively. There were statistically significant differences among the groups (χ^2=1614.12, $P<0.001$) (**Figure 1**).

Multivariate analysis of anxiety in graduating university students

We analyzed the factors that contribute to anxiety in graduating university students. The logistic regression results indicated that gender, monthly family income, and weekly exercise time were significantly associated with

Table 2. The prevalence of anxiety and depression in graduating university students and juniors

Characteristics	Graduating university students (n=681)	Juniors (n=620)	x^2/t	p value
SAS, scores				
<50	377 (55.36%)	499 (80.48%)	154.663	<0.001
50-59	106 (15.57%)	91 (14.68%)		
60-69	196 (28.78%)	29 (4.68%)		
≥70	2 (0.29%)	1 (0.16%)		
Mean ± SD	47.16±12.91	41.53±9.12	9.147	<0.001
SDS, scores				
<53	415 (60.94%)	563 (90.81%)	159.567	<0.001
53-62	168 (24.67%)	44 (7.10%)		
63-72	98 (14.39%)	12 (1.94%)		
≥72	0 (0%)	0 (0%)		
Mean ± SD	47.35±12.55	40.55±9.03	11.121	<0.001

Table 3. The prevalence of anxiety and depression in graduating university students

Characteristics	Graduating university students (n=578)		x^2/t	p value
	Stage 1	Stage 2		
SAS, scores				
<50	322 (55.71%)	376 (65.05%)	75.754	<0.001
50-59	90 (15.57%)	146 (25.26%)		
60-69	164 (28.37%)	56 (9.34%)		
≥70	2 (0.35%)	0 (0%)		
Mean ± SD	47.66±12.86	43.97±10.42	8.602	<0.001
SDS, scores				
<53	361 (62.46%)	457 (79.07%)	91.382	<0.001
53-62	138 (23.88%)	121 (20.93%)		
63-72	79 (13.67%)	0 (0%)		
≥72	0 (0%)	0 (0%)		
Mean ± SD	47.15±12.41	43.62±8.15	12.351	<0.001

graduating Chinese university students during the period of the COVID-19 pandemic. We discovered that anxiety and despair were more common among graduating students than among juniors. Their anxiety and depression eased after graduation. The results indicated that the graduating university students' anxiety was associated with gender, monthly family income, and weekly exercise time. Their depression was related to monthly family income and their father's educational status.

Graduating university students are a special population in a critical transition period. Most people believe that obtaining a bachelor's degree and applying for an ideal job is the best way to succeed [12]. Every graduating university student carries both personal and family expectations. The impacts of COVID-19 caused employment opportunities for graduating Chinese university students to dwindle. The government enacted several positive measures to avoid the diminishing numbers of students, but the circumstances of the pandemic still raised the psychological pressure on graduating university graduates. Our results demonstrated that 106 (15.57%), 196 (28.78%), and 2 (0.29%) graduating university students had mild, moderate, and sever anxiety, respectively. There were 168 (24.67%) and 98 (14.39%) graduating university students who had mild and moderate depression, respectively. The graduating university students' mean scores of the SAS and SDS were significantly higher than those of the juniors group. Previous reports have demonstrated that college students have high incidence rates of psychological problems, particularly depression and anxiety [18-20].

anxiety in the graduating university students' group (*P*<0.05) (**Table 4**).

Multivariate analysis of depression in graduating university students

The logistic regression analysis also demonstrated that the graduating university students' monthly family income and their father's educational status were significantly associated with depression (*P*<0.05) (**Table 5**).

Discussion

This is the first longitudinal study to investigate anxiety, depression, and associated factors in
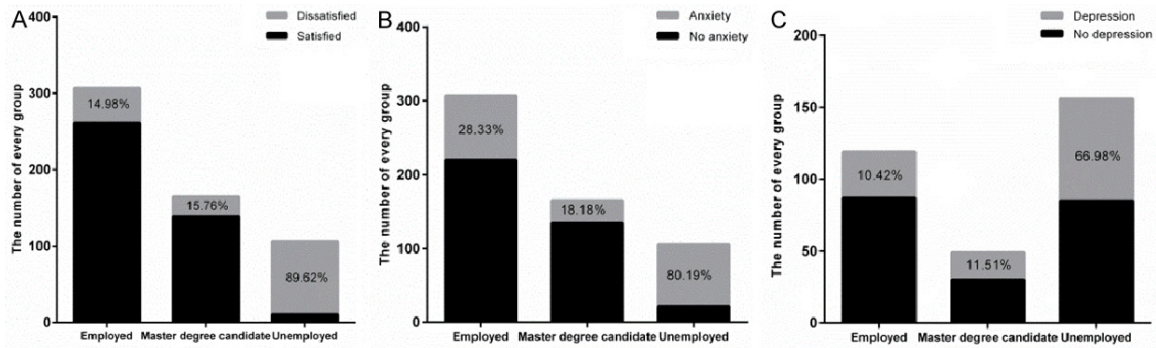
Figure 1. Graduating university students' (A) satisfaction with their current condition, (B) anxiety status, and (C) depression status from the second stage of the survey.

Table 4. Multivariate analysis predicting the factors associated with anxiety in graduating university students

Variable	Wald χ^2	OR	95% CI	p value
Gender				
Male	Ref			
Female	5.99	1.62	1.10-2.37	0.014
Age	1.76	1.11	0.95-1.28	0.185
Monthly family income (RMB)				
<4000	Ref			
4000-7000	45.94	0.05	0.02-0.11	<0.001
>7000	106.26	0.01	0.01-0.15	<0.001
Father's educational status				
Primary School	Ref			
Middle School	0.42	0.82	0.44-1.51	0.521
High School	2.32	0.61	0.32-1.16	0.134
University	2.77	0.47	0.19-1.15	0.102
Weekly exercise time (hours)				
<1	Ref			
1-3	9.07	0.53	0.35-0.80	0.030
>3	16.27	0.25	0.13-0.49	<0.001

At the second stage of the study, 578 of 681 graduating university students (84.88%) completed the same questionnaires after graduation. The results revealed that the prevalence of anxiety and depression were less than in stage one. In the first phase of the survey, conducted early in the COVID-19 pandemic, most graduates had not yet found jobs. The economic impact of the pandemic has reduced employment opportunities, especially affecting graduates [21]. During the second stage, in which the pandemic was more under control, the graduates either found employment, remained unemployed, or became master's degree candidates. Most of the graduates completed a shift in social roles, which may have resulted in partial relief of their anxiety and depression. Some unemployed graduates continued to experience anxiety and depression. During the pandemic, university graduates often faced greater pressure than other people, needing to focus on graduation, work, and life challenges [22, 23]. It is important to pay attention to the psychological health struggles of this particular group, especially how they develop and transform over time. When such mental concerns develop into severe mental disorders, targeted intervention treatment is required.

The logistic analysis revealed that gender was an influencing factor for anxiety, which is consistent with findings reported in Bernhardsdóttir et al. and Eberhart et al. [24, 25]. Females tend to be more introverted and reach mental maturity earlier than males. Females also prefer to be involved in society and enhance their individual competency. However, many positions are more likely to be offered to males. Female graduates face more pressure when searching for jobs, and may need additional help from several different sectors. Our results suggested that graduating university students from families with high monthly incomes were less likely to have anxiety and may face less economic pressure, similar to the results reported by Cao et al. [26]. Graduating students from families with lower incomes may face more pressures that can slow the progress of role shifts. The logistic analysis also showed that weekly exercise time

Table 5. Multivariate analysis predicting the factors associated with depression in graduating university students

Variable	Wald χ^2	OR	95% CI	p value
Gender				
Male		Ref		
Female	0.05	1.04	0.72-1.51	0.821
Age	1.85	1.11	0.96-1.28	0.174
Monthly family income (RMB)				
<4000		Ref		
4000-7000	57.53	0.09	0.05-0.16	<0.001
>7000	130.56	0.01	0.01-0.02	<0.001
Father's educational status				
Primary School		Ref		
Middle School	5.86	2.24	1.17-4.30	0.021
High School	5.34	2.22	1.13-4.39	0.019
University	1.58	1.80	0.72-4.53	0.212
Weekly exercise time (hours)				
<1		Ref		
1-3	0.02	1.03	0.68-1.56	0.884
>3	1.91	1.51	0.84-2.74	0.168

was a protective factor against anxiety for graduating university students. A previous study reported the positive effect of exercise on psychological disorders such as anxiety [27]. Gordon et al. also indicated that resistance exercise training may significantly improve anxiety symptoms [28].

The multivariate analysis revealed that the graduating university students' depression was associated with their family's monthly income and their father's educational status (*P*<0.05). A high monthly family income was linked to a lower risk of depression. Students from financially unstable families were prone to exhibit symptoms of depression and anxiety [29]. Some families suffered from different degrees of economic problems during the COVID-19 pandemic. Families' economic condition may be a factor in students' mental health. We also found that the graduating university students whose fathers had middle and high school educations were less likely to have depression. With the father as a core member of the family, his level of education may affect the children's mental health [30].

This study illustrated depression and anxiety conditions in the graduates before and after graduation during the COVID-19 pandemic. We believe that these results may help to elucidate

the mental health of graduating students and juniors. It may be beneficial for universities in addressing students' mental health and requirements. By developing an understanding of the influence factors of anxiety and depression in university graduates, this study can provide direction for psychological intervention. Based on above, these results may lead society and government to pay emphasis on the psychological health problems of graduating university students, especially during special periods. Another important implication of this research is that universities must implement a systematic and continual evaluation and monitoring of their students' psychological health. Helping graduating university students to find an ideal job and complete their role change smoothly may be necessary. One study reported a rising trend of psychological disorders among university students [31]. A majority of college students experience psychological distress, which may result in one or more high-risk behaviors, severely affecting the students' subsequent development and lives [32, 33]. The university counseling centers should collaborate with students' psychological counseling departments and share information to reduce the psychological challenges faced by university students.

This study had several limitations. Graduating university students were not divided by their majors. Employment opportunities are different for those in different fields. The study samples were from Qiqihar city, of which two universities are general universities. Caution is recommended when generalizing these results to other populations. Customs, family conditions, lifestyles, and personal characteristics might also indirectly affect the results of the study.

Conclusion

The COVID-19 pandemic has caused many people to suffer psychological distress. Anxiety and depression of graduating university students, as a particular population, were prevalent during the pandemic. Multiple factors, such as gender, monthly family income, fre-

quency of exercise, and father's educational status, may be influencing factors for anxiety and depression. These findings contribute to our understanding of graduating Chinese university students' mental health during the COVID-19 pandemic. Appropriate psychological interventions for graduating university students are essential.

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None.

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