Depression, Anxiety, and Stress Among Chinese People During the Omicron Outbreak and Its Impact on Sleep Quality and Alcohol Dependency

ABSTRACT

Objective: The present study aims to assess the mental health of Chinese people during the Omicron variant outbreak in March 2022. This study also explores how coronavirus disease 2019 (COVID-19) exposure history, vaccination status, sleep quality, and alcohol dependency symptoms influence mental health outcomes.

Methods: The data were collected from 1049 Chinese people through Tencent using a structured questionnaire utilizing convenience sampling technique. The online cross-sectional study included the Chinese version of the Depression, Anxiety and Stress Scale 21, the Alcohol Use Disorder Identification Test, Fear of COVID-19 Scale, Warwick Edinburgh Mental Well-being Scale, and Pittsburgh Sleep Quality Index to assess depression, anxiety, stress, alcohol dependency, fear of COVID-19, and sleep quality, respectively. Statistical analyses included independent sample t-tests and χ^2 tests to assess the differences in study variables across demographic characteristics, and multiple linear regressions to assess the effect of the experience of COVID-19 infection, vaccination, and mental health variables on sleep quality and alcohol dependency.
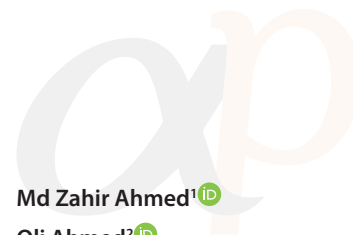
Results: Results showed that 11.5% to 32.4% of the participants had a poor mental health symptoms. Males had significantly higher depressive symptoms ($\chi^2 = 12.283$, df $= 4$, $P = .015$) and alcohol dependency symptoms ($\chi^2 = 66.604$, df $= 3$, $P < .001$), and females had significantly lower mental well-being ($\chi^2 = 12.742$, df $= 2$, $P = .002$). Additionally, findings showed that stress ($\beta = .250$, $P < .001$), mental well-being ($\beta = -.166$, $P < .001$), and fear of COVID-19 ($\beta = .061$, $P = .029$) predicted poorer sleep quality, and anxiety ($\beta = .115$, $P = .035$) and mental well-being ($\beta = -.097$, $P = .002$) predicted alcohol dependency symptoms.

Conclusion: Since the pandemic-induced mental health challenges persist for a prolonged period, the findings of these relationships offer guidance for mental health professionals to formulate therapeutic interventions to help people cope with psychological crises.

Keywords: COVID-19, depression, anxiety, stress, sleep quality, alcohol dependency

Md Zahir Ahmed[1] iD
Oli Ahmed[2] iD
Sang Hanbin[3] iD
Pei Xie[4] iD
Mary C. Jobe[5] iD
Weijian Li[1] iD

[1]School of Psychology, Zhejiang Normal University, Jinhua, China
[2]Department of Psychology, University of Chittagong, Chattogram, Bangladesh
[3]School of Teacher Education, Qiongtai Normal University, Haikou, China
[4]School of Psychology, Northwest Normal University, Lanzhou, China
[5]Department of Psychological and Brain Sciences, The George Washington University, Washington D.C, USA

Corresponding author:
Md Zahir Ahmed
✉ ahmedzahirdu@gmail.com

Introduction

A highly infectious new coronavirus variant emerged in South Africa in November 2021 and appeared to be a pervasive variant—a quality that was exemplified from other variants.[1] Later, on November 26, 2021, the World Health Organization (WHO) denominated that strain as Omicron (B.1.1.529).[2] In 2022, the Omicron wave swept around the globe and within just a quarter of that year caused a sharp increase in coronavirus disease 2019 (COVID-19) cases. Almost 2 years after COVID-19's initial peak, the Omicron variant was found in most countries, after relaxing public health and pandemic restrictions.[3] The number of cases skyrocketed at the beginning of March 2022 and reached more than 3000 in a day, compared to very few cases in February 2022, in China. Since the Wuhan outbreak in early 2020, China has confronted its deadliest epidemic wave, which kept millions of people on lockdown to curb the transmission of COVID-19. As of April 4, 2022, China reported 25 724 active cases of COVID-19; among them 99.8% were in mild health condition.[4]

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Psychological Impact of Omicron Variant's Outbreak

In conjunction with the physical health risks COVID-19 and infectious variants can impose, research has demonstrated that pandemic conditions can also have adverse impacts on one's psychological health. At the start of the pandemic, China was successful in limiting the transmission through the zero-COVID strategy. However, in late March 2022, the Omicron variant (BA.2) outbreak in 31 provinces of China was considered the most widespread outbreak since the pandemic's start.[5] A previous study demonstrates the exacerbated mental health toll (i.e., anxiety, depression, fear, alcohol dependency, and problems with sleep quality) of the pandemic.[6] Predominantly, healthcare professionals and associated emergency management workers have been found with elevated mental health issues;[7] however, it is inferred that the unique dynamics of the Omicron variant transmission and the degree of preventative measures enforced can also widely determine negative mental health outcomes.

Present Study

Given that pandemics can inflict adverse mental health impacts, coupling this with the spike in COVID-19 infections in China starting early in March 2022 due to the rapid transmission of the Omicron variant, the present study was conducted to assess and explore the mental health status and behavioral outcomes of Chinese people during this pandemic period. Unambiguously, elevated anxiety, depression, uncertainty about the future, fear of infection, and isolation, among others, were observed during the Omicron outbreak leading to the psychological distress.[8] We anticipated an elevated level of COVID-19 fear, stress, anxiety, depression, and its impact on different behavioral outcomes (i.e., well-being, quality of sleep, and alcohol use), during the sudden countrywide Omicron outbreak in China. We also inferred there would be significant gender differences, where women would experience higher rates of mental health and men would experience higher rates of alcohol use. Furthermore, to address the impact of mental health status on health outcomes during the Omicron outbreak, we analyzed the associations between subjective sleep quality and different mental health conditions (i.e., mental well-being, stress, and fear of COVID-19). Additionally, we aimed to explore the association between staying with family members during the outbreak, history of self and family member/friend's COVID-19 infection, depression symptoms, and mental well-being with alcohol dependency symptoms.

Material and Methods

Participants

A total of 1321 people completed the online cross-sectional survey utilizing convenience sampling technique where 1049 were considered valid for this study—272 questionnaires were invalidated due to either multiple submission or incomplete submission. Any legally consenting person living in China with an internet connection and a WeChat or QQ account on their cellphone could participate in the survey. Before starting the survey, participants were informed regarding the research intentions, costs and benefits, duration of study, and data confidentiality. After understanding the study's nature, participants provided their full consent electronically before anonymously participating in the study. This present study was conducted in adherence with the Helsinki Declaration and its later amendments and/or analogous ethical criterion and the ethical committee of Northwest Normal University, China, has approved the study (ERB No. 20220029, Date: March 5, 2022).

Measures

Depression, Anxiety, and Stress Scale: In the present study, we used the Chinese version of the Depression, Anxiety, and Stress Scale 21.[9] Participants were asked to express their past week's stance for 21 items on this 4-point Likert scale starting from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much or most of the time*). The total score of the scale ranging from 0 to 21 for each of 3 subscales, and the corresponding cutoff scores reported for this study were depressive symptoms: mild (10-13), moderate (14-20), severe (21-17), and extremely severe (≥ 28 for depression); anxiety symptoms: mild (8-9), moderate (10-14), severe (21-27), extremely severe (≥ 20); stress symptoms: mild (15-18), moderate (19-25), severe (26-33), extremely severe (≥ 34).[10] In the present study, all subscales had good internal consistency reliability (Cronbach's alphas ranged from .84 to .87).

Warwick Edinburgh Mental Wellbeing Scale: To access psychological positivity and subjective well-being, this study used Chinese version of Warwick Edinburgh Mental Wellbeing Scale (WEMWBS).[11] On this 14 items and 5-point Likert scale (ranging from 1 being *None of the time* to 5 being *All the time*), participants were asked to rate each statement to what best fits their experience of the last 14 days; and a subsequent total score was created, ranging from 14 to 70. Tennant et al[12] suggested the cutoff score ranged from 14 to 42 denoting lower, 43-59 denoting average and 60-70 denoting high mental well-being. The internal consistency of the WEMWBS for the present study was excellent (Cronbach's alpha = .96).

Alcohol Use Disorder Identification Test: The Alcohol Use Disorder Identification Test (AUDIT) assesses people who have had difficulties with alcohol in the last year.[13] The test includes 10 items (3 items for assessing the frequency and extent of alcohol consumption, 3 items for assessing alcohol dependency, and 4 items for assessing the alcohol consumption induced problems). Participants answer for each item on the 5-point test starting from 0 to 4 which comprises a total score ranging from 0-40. The cutoff score for the present study is as following: 0-7 for abstinence or low risk use; 8-15 for hazardous use; 16-19 for harmful use; and 20-40 for possible dependence. The Chinese version of the AUDIT[14] had good internal consistency reliability (Cronbach's alpha = .82) for this study.

Fear of Coronavirus Disease 2019 Scale: The Fear of Coronavirus Disease 2019 Scale (FCV-19S) is a measure that assesses levels of COVID-19 pandemic fear.[15] This self-reporting measure comprises 7 items including the measurement of fear of COVID-19 (item 1, "I am most afraid of coronavirus-19"; item 4, "I am afraid of losing my life because of coronavirus-19"; item 7, "My heart races or palpitates

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MAIN POINTS

- There were higher rates mental health problems during the Omicron outbreak.
- Rates of the mental problems were lower than the early stages of the pandemic.
- Higher stress, lower mental well-being, and COVID-19 fear predicted poor sleep quality.
- Depression and lower mental well-being predicted alcohol dependency.

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when I think about getting coronavirus-19). The total score for this 5-point Likert scale (1 being *strongly disagree* to 5 being *strongly agree*) ranges from 7 to 35, where the higher scores denote greater levels of COVID-19 fear. This present study utilized the Chinese version of the FCV-19S[16] with good internal consistency (Cronbach's alpha = .93).

Pittsburgh Sleep Quality Index: The Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-reporting questionnaire for measuring sleep quality over the last month.[17] The items of the PSQI have scores on 7 components (self-reported sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction). The single item (item 9) of the revised Chinese edition of the PSQI[18] was used to evaluate the subjective sleep quality of the respondents in the last month. The participants

responded to this question using 4-point scale, ranging from 0 (*very good*) to 3 (*very bad*).

Statistical Analysis

In the present study, Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM SPSS Corp.; Armonk, NY, USA) was used to analyze the extracted and cured data. Descriptive statistics (frequency, percentages, mean, and standard deviation), independent sample t-tests, χ^2 tests, and multiple linear regressions were performed. Mental health status (anxiety, depression, stress, well-being) and alcohol dependency of the participants were assessed by descriptive statistics. Chi-square test was utilized to measure the difference of gender, whether they were living with family, COVID-19 exposure history, vaccination and mental health status with alcohol dependency as well as history of COVID-19 exposure to different mental health status, sleep quality, and alcohol dependency. Multiple linear regression analyses were utilized to assess the impact of staying with family members during the outbreak, history of COVID-19 exposures (staying with family members during the pandemic, being infected by COVID-19, and family members/friends being infected by COVID-19) and vaccination status, depression, anxiety, stress, mental well-being, and fear of COVID-19 on sleep quality and alcohol dependency symptoms. Age and gender were controlled for in the regression analyses.

Results

Demographic Distribution

Participants' age ranged from 16 years to 72 years (M = 25.22 years, SD = 8.92). Detailed demographic characteristics of participants are presented in Table 1. Almost two-third of the participants were aged between 21 and 30, and four-fifth were women. Regarding education, 82.3% of the participants had completed a bachelor's degree. Among the participants, 87.3% were single, while 11.7% were married. Concerning profession, the majority of the participants were students. More than half of the participants (52.3%) had a monthly income between 500 and 2000 Yuan.

Descriptive Statistics of Mental Health and Alcohol Dependency

Table 2 demonstrates the prevalence statistics of mental health variables and alcohol dependency symptoms. Among the participants, 10.1% had moderate levels of depressive symptoms, 1.7% had severe, and 1.0% had extremely severe depressive symptoms. Regarding anxiety symptoms, 12.4% of the participants had moderate levels of anxiety symptoms, 4.1% had severe, and 2.8% had extremely severe anxiety symptoms. Concerning stress, 3.6% of the participants had moderate, 1.5% had severe, and 0.3% had extremely severe stress symptoms. Results also showed that only 26.5% of participants had lower mental well-being symptoms. Concerning alcohol dependency, 0.6% participants had harmful drinking symptoms and 0.7% had alcohol dependency symptoms. Table 2 also shows that 40.2% participants had COVID-19 fear (≥17).

Differences in Mental Health by Demographics

Supplementary Table 1 demonstrates significant interactions of gender with depressive symptoms ($\chi^2 = 12.283$, df = 4, P = .015), alcohol dependency ($\chi^2 = 66.604$, df = 3, P < .001), and mental well-being scores ($\chi^2 = 12.742$, df = 2, P = .002). Men had higher depressive and alcohol dependency symptoms. For mental well-being, a higher proportion of upper and lower mental well-being scores were prevalent

Table 1. Participants' Distribution in Terms of Their Socio-demographic Characteristics

Variables	Groups	Frequency (%)
Age	16-20 years	203 (17.7%)
	21-30 years	790 (68.8%)
	31-40 years	60 (5.2%)
	41-72 years	96 (8.4%)
Gender	Women	895 (78%)
	Men	253 (22%)
Education	Junior school and below	44 (3.8%)
	High school/Technical secondary school/Technical school	69 (6%)
	College (specialized)	30 (2.6%)
	Bachelor's	946 (82.3%)
	Master's and above	60 (5.2%)
Marital Status	Single	1003 (87.3%)
	Married	134 (11.7%)
	Divorced	9 (0.8%)
	Widowed	3 (0.3%)
Province	Beijing	112 (10.68%)
	Fujian	107 (10.2%)
	Gansu	111 (10.58%)
	Guangdong	147 (14.01%)
	Heilongjiang	104 (9.91%)
	Hubei	131 (12.49%)
	Yunnan	102 (9.72%)
	Shanghai	106 (10.1%)
	Shannxi	129 (12.3%)
Profession	Student	963 (83.8%)
	Full-time job	64 (5.6%)
	Part-time job	15 (1.3%)
	Business/owner/entrepreneur	5 (0.4%)
	Self-employed	41 (3.6%)
	Unemployed	20 (1.7%)
	Other	41 (3.6%)
Monthly income	Less than 500 Yuan	196 (17.1%)
	500-2000 Yuan	601 (52.3%)
	2001-5000 Yuan	94 (8.1%)
	5001-20000 Yuan	61 (5.3%)
	Inconvenience to disclose	197 (17.1%)

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Table 2. Prevalence Statistics of Depression, Anxiety, Stress, Mental Well-Being, Alcohol Dependency, and Fear of COVID-19 Symptoms

Variable	Categories	Frequency (%)
Depression	Mild	108 (9.4%)
	Moderate	119 (10.4%)
	Severe	19 (1.7%)
	Extremely severe	12 (1.0%)
Anxiety	Mild	151 (13.1%)
	Moderate	143 (12.4%)
	Severe	47 (4.1%)
	Extremely severe	32 (2.8%)
Stress	Mild	70 (6.1%)
	Moderate	41 (3.6%)
	Severe	17 (1.5%)
	Extremely severe	7 (0.3%)
Mental well-being	Lower	304 (26.5%)
	Average	658 (57.3%)
	Higher	187 (16.3%)
AUDIT	Hazardous drinking	55 (4.8%)
	Harmful drinking	7 (0.6%)
	Alcohol dependent	8 (0.7%)
Fear of COVID-19	Having fear	462 (40.2%)

AUDIT, Alcohol Use Disorder Identification Test.

among men and a higher proportion of average mental well-being scores were prevalent among women. Supplementary Table 2 shows significant differences of living at home during complete lockdown with anxiety ($\chi^2 = 9.983$, df $= 4$, $P = .041$), alcohol dependency ($\chi^2 = 21.722$, df $= 3$, $P < .001$), and mental well-being scores ($\chi^2 = 10.358$, df $= 2$, $P = .006$). Among participants having anxiety symptoms, those staying outside the home had a higher prevalence of anxiety symptoms. For alcohol dependency and mental well-being, participants

staying home during complete lockdown had a higher prevalence of alcohol dependency as well as lower mental well-being scores. Supplementary Table 3 shows significant differences of history of COVID-19 infection history with depressive symptoms ($\chi^2 = 18.400$, df $= 8$, $P = .018$) and mental well-being scores ($\chi^2 = 12.758$, df $= 4$, $P = .013$). Severe and extremely severe depressive symptoms and higher mental well-being scores were more prevalent among those who had no history of COVID-19 infection. Supplementary Table 4 shows significant differences for history of COVID-19 infection of family members/friends with depression ($\chi^2 = 29.596$, df $= 8$, $P < .001$), alcohol dependency symptoms ($\chi^2 = 101.831$, df $= 6$, $P < .001$), and mental well-being scores ($\chi^2 = 13.081$, df $= 4$, $P = .011$). Participants whose family members/friends were infected by COVID-19 had a higher prevalence of moderate and severe depressive symptoms and lower mental well-being scores. Participants having no history of their family members/friends getting a COVID-19 infection had a higher prevalence of hazardous alcohol use and alcohol dependency symptoms. Supplementary Table 5 shows non-significant differences for vaccination status with mental health variables, alcohol dependency symptoms, and fear of COVID-19.

Regression Analysis of Sleep Quality
Table 3 shows that gender, specifically men, ($B = -0.116$, $SE = 0.055$, $\beta = -0.062$, $P = .037$, 95% CI [-0.224, -0.007]) were significantly more likely to have better subjective sleep quality. After controlling for age and gender, individuals having stress symptoms ($B = 0.056$, $SE = 0.012$, $\beta = 0.250$, $P < .001$, 95% CI [0.032, 0.080]) and COVID-19 fear ($B = 0.006$, $SE = 0.003$, $\beta = 0.061$, $P = .029$, 95% CI [0.001, 0.012]) were significantly more likely to experience worsened subjective sleep quality; and those with better mental well-being ($B = -0.012$, $SE = 0.002$, $\beta = -0.166$, $P < .001$, 95% CI [-0.017, -0.008]) were significantly more likely to have better subjective sleep quality. All the predictors contributed 22.5% in variability for subjective sleep quality.

Table 3. Regression Results of the Subjective Sleep Quality

Model	Predictors	Unstandardized Coefficient		Standardized Coefficient		95% CI of B	
		B	SE	(β)	P	B	SE
1	Intercept	2.073	0.130		.000	1.819	2.327
	Age	0.001	0.003	0.009	.754	−0.004	0.006
	Gender	−0.116	0.055	−0.062	.037	−0.224	−0.007
2	Intercept	1.425	0.644		.027	0.161	2.689
	Staying with the family status during pandemic?	0.042	0.074	0.020	.577	−0.105	0.188
	Have you ever been infected with Omicron variant?	−0.127	0.235	-0.015	.588	−0.588	0.333
	Have any of your family/friends ever been infected with COVID-19?	0.432	0.267	0.044	.106	−0.091	0.956
	Have you received 2 doses of the new COVID-19 vaccine?	−0.007	0.105	−0.002	.950	−0.212	0.199
	Depression	0.006	0.012	0.025	.621	−0.018	0.030
	Anxiety	0.022	0.014	0.087	.099	−0.004	0.049
	Stress	0.056	0.012	0.250	.000	0.032	0.080
	Mental well-being	−0.012	0.002	−0.166	.000	−0.017	−0.008
	Fear of COVID-19	0.006	0.003	0.061	.029	0.001	0.012

Model 1: $R^2 = 0.004$, $F_{(2, 1146)} = 2.418$, $P = .090$; R^2 change $= 0.225$, F(9, 1137) $= 36.858$, $P < .001$, VIF $= 1.033$-4.416.
CI, confidence interval; SE, standard error; VIF, Variance Inflation Factor.

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Table 4. Regression Results of the Alcohol Dependency Symptoms

Model	Predictors	Unstandardized Coefficient B	SE	Standardized Coefficient (β)	P	95% CI of B Lower	Upper
1	Intercept	5.673	0.547		<.001	4.599	6.746
	Age	0.024	0.011	0.063	.026	0.003	0.046
	Gender	−2.581	0.234	−0.313	<.001	−3.040	−2.123
2	Intercept	6.467	2.967		.029	0.645	12.288
	Staying with the family status during pandemic?	−1.126	0.343	−0.122	.001	−1.799	−0.452
	Have you ever been infected with new coronary pneumonia?	−2.311	1.081	−0.060	.033	−4.432	−0.190
	Have any of your family/friends ever been infected with COVID-19?	3.442	1.230	0.079	.005	1.029	5.855
	Have you received 2 doses of the new COVID-19 vaccine?	0.431	0.483	0.024	.373	−0.517	1.378
	Depression	0.103	0.056	0.097	.066	−0.007	0.213
	Anxiety	0.132	0.062	0.115	.035	0.010	0.254
	Stress	−0.037	0.056	−0.037	.510	−0.148	0.073
	Mental well-being	−0.032	0.010	−0.097	.002	−0.052	−0.011
	Fear of COVID-19	−0.003	0.014	−0.007	.811	−0.030	0.024

Model 1: $R^2 = 0.109$, $F_{(2, 1146)} = 70.086$, $P < .001$; model 2: R^2 change $= 0.070$, $F(9, 1137) = 10.704$, $P < .001$, VIF $= 1.033$-4.416.
CI, confidence interval; SE, standard error; VIF, Variance Inflation Factor.

Regression Analysis of Alcohol Dependency

Table 4 shows that age ($B = 0.024$, $SE = 0.011$, $β = 0.063$, $P = .026$, 95% CI [0.003, 0.046]) and gender (specifically men) ($B = −2.581$, $SE = 0.234$, $β = −0.313$, $P < .001$, 95% CI [−3.040, −2.123]) were significantly more likely to show greater alcohol dependency symptoms. After controlling for age and gender, staying with family members during the pandemic ($B = −1.126$, $SE = 0.343$, $β = −0.122$, $P = .001$, 95% CI [−1.799, −0.452]), being infected by COVID-19 ($B = −2.311$, $SE = 1.081$, $β = −0.060$, $P = .033$, 95% CI [−4.432, −0.190]), family members/friends being infected by COVID-19 ($B = 3.442$, $SE = 1.230$, $β = 0.079$, $P = .005$, 95% CI [1.029, 5.855]), anxiety symptoms ($B = 0.132$, $SE = 0.062$, $β = 0.115$, $P = .035$, 95% CI [0.010, 0.254]), and mental well-being ($B = −0.032$, $SE = 0.010$, $β = -0.097$, $P = .002$, 95% CI [−0.052, −0.011]) were significant predictors of alcohol dependency symptoms. All the predictors contributed 7.0% in variability for alcohol dependency symptoms.

Discussion

As far as it seems, the current study is one of few that examines the mental health impacts for Chinese individuals during the Omicron variant outbreak in China. The COVID-19 pandemic has already demonstrated elevated levels of mental health burdens across the world; this study aimed to examine how mental health was affected during the Omicron wave. Previous studies have suggested the mental health toll and subsequent behavioral problems for people due to the outbreak of COVID-19, across earlier phases of the pandemic.[6,19] The goal of this study was to address and fill the gap in research of how mental and physical health outcomes during the Omicron wave specifically were affecting those living in China.

The results of this present study demonstrate substantially elevated levels of depressive symptoms, anxiety symptoms, stress, lower mental well-being, harmful drinking symptoms, alcohol dependency symptoms, and COVID-19 fear among the Chinese participants in the initial outbreak of the Omicron variant and regressive restriction measures. Previous literature has demonstrated how higher levels of anxiety, depression, and alcohol-related issues (both hazardous drinking and dependency) lead to lower mental health well-being during the initial COVID-19 outbreak.[6] However, the findings of this study diverge in terms of: lower depressive (13.1%) and anxiety symptoms (19.3%), higher stress levels (5.4%), lower mental well-being symptoms (26.5%), harmful drinking symptoms (0.6%), alcohol dependency symptoms (0.7%), and subsequently higher COVID-19 fear (40.2%). Although there were some differences that demonstrate, compared to this previous study, greater adverse psychological impacts (e.g., well-being, COVID-19 fear, stress, harmful drinking, and alcohol dependency), there were also comparative differences in the opposing direction for anxiety and depression. An explanation for the latter could be due to familiarity with adjusting back to lockdown conditions during the initial phases of the pandemic and having a better understanding of how to manage anxiety and depression from such conditions. As for the differences that did increase, this could be a result of the unknown nature surrounding the new outbreak and lockdown conditions, which increased fears and distributed lifestyles and comfort levels.

Moreover, with respect to alcohol, according to the WHO report,[20] the prevalence of alcohol dependency for Chinese people prevailed at 4.4%. For both the present study and Ahmed et al,[7] alcohol dependency (for both hazardous and harmful drinking) exceeded that of the WHO report. During the initial phase of the pandemic, a new mental health crisis surfaced due to the uncertainty of the nature and prevalence of COVID-19 infection; as a result, anxiety and depression increased in prevalence and became more chronic.[21] Further, the pandemic exacerbated these mental health concerns—as different levels of rigorous restriction measures induced loneliness, grief, boredom, depression, and anxiety.[22] This present study has not confirmed the residential difference of restriction measures and their impact on mental health effects for the current regions involved in the sample.

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However, overall, the study's results do demonstrate that during the Omicron variant, as in previous waves of the pandemic, mental and physical health outcomes were impacted. It is possible that these increases in alcohol dependency and drinking were a result of coping with pandemic-related emotions.[23]

The present study also examined potential differences with gender, finding that men showed higher depressive and alcohol dependency symptoms as well as lower well-being symptoms compared to women. For women, there were a greater number compared to men who demonstrated average mental well-being scores. Gender differences were non-significant in terms of anxiety and COVID-19 fear during the Omicron outbreak in China. Concerning alcohol dependency symptoms, men reported a greater number of alcohol dependency symptoms, which is homogenous with the previous report.[20] Schuckit et al[24] revealed that people, especially men, tend to drink hazardously to cope with the negative mental health states (i.e., depression). However, existing literature suggests a higher consumption of alcohol by men, whereas women show higher levels of depression.[25] The association between depression and alcohol consumption is inconclusive with respect to gender both in past literature as well as in the current study.[26]

In this present study, staying with family during the Omicron outbreak was significantly associated with higher anxiety symptoms and alcohol dependency as well as lower and higher mental well-being symptoms (vs. moderate well-being). The findings with anxiety symptoms and mental well-being are conflicting with existing literature,[27] as well as alcohol dependency.[28] The existing literature has focused on family cohesion and its impact on mental health outcomes and alcohol dependency. However, the findings diverge due to the great uncertainty in daily life from the pandemic due to changes in the lifestyles, substantially reduced physical and social contacts, and the potential of experiencing chronic illness for oneself and/or friends and family members. The lockdown has been shown to negatively impact mood, which could have subsequent impacts on anxiety symptom development, lower well-being, and greater alcohol dependency. Mood could play the key role for higher well-being as well. The pandemic atmosphere can have adverse impacts on conventional family cohesion and support as well as limit social connections. During strict community lockdowns, findings have demonstrated this, showing family conflicts are elevated due to family violence. Conflicts between family members were induced mainly because of congested family space and unusual crowding.[29] These differences across the literature with the present study could be due to the contextual changes living in a pandemic can have on psychological and behavioral adjustments to this new way of living. Although the pandemic can have adverse health impacts, the recurrence of COVID-19 outbreaks can build resilience as people know how to better protect themselves and mobilize their resources to help them cope with mental health issues. Mild mental health problems (stress, anxiety, and depression) and lower mental well-being were found in the present study among those who had a history of COVID-19 infection. Prior research explains that this may be because, despite recovery, residual feelings of stress, anxiety, and depression persist among survivors.[30] Moreover, prior research has shown that lower-intensity mental health problems were often complemented by greater resilience as well as perceived family and social support.

Further, knowing how to cope with an aversive situation, such as during a pandemic, can help to improve one's overall situation.

Koçak et al[31] found that history of friend/family members' infection of COVID-19 is a significant moderator of depressive symptoms. The findings of this present study are consistent with this aforementioned study. Participants whose family members/friends affected by COVID-19 did show a higher prevalence of moderate and severe depressive symptoms, as well as lower mental well-being symptoms. The finding of the present study also finds that for participants having no history of COVID-19 infection among their family members/friends had a higher prevalence of hazardous alcohol use and alcohol dependency symptoms. Existing literature shows that during almost all stressful experiences, alcohol consumption and dependence are elevated; unerringly, when facing financial and psychological turmoil the consumption of alcohol increases significantly, which broadly generalizes both the high hazardous alcohol use and alcohol dependency results.[32] Moreover, in terms of vaccinations, COVID-19 vaccination helps the immune system's ability to fight against infections, which in turn can ease mental health vulnerabilities. However, the findings of this present study exhibited non-significant interactions for vaccination status with mental health problems, alcohol dependency symptoms, and fear of COVID-19. It could be that this non-significant finding was due to the indiscriminate nature of mass vaccination which may have led to a lack of correlation with the mental health issues.

Finally, the present study examined how sleep quality was impacted during the Omicron variant wave. Although quality of sleep is exigent, during the pandemic research regarding poor sleep has demonstrated the need to examine it, as it has been found to negatively impact mental health.[33] Sleep quality and different psychological problems (i.e., anxiety and depression) are also largely correlated.[34] Poor sleep quality induced from any pandemic stress can further elevate mental health problems.[35] In line with the existing literature, the results of the present study showed that stress and fear of COVID-19 decrease subjective sleep quality and mental well-being increases subjective sleep quality.

This present study has several limitations. First, for the online self-report studies, possibility of making an erroneous judgment or making a quick decision continuously prevails. Additionally, data collected through the self-report method could be susceptible to the social desirability bias. Second, 82.3% of respondents were undergraduate level students, and 78% were women. As such, the generalizability of the results is limited. Future research should focus on having a more diverse sample. Third, the gender difference found for alcohol dependency, showing that men had greater symptoms should be further explored in longitudinal research to determine whether this finding is related to greater alcohol consumption for men and/or due to pandemic specific contextual influences.

This study explored various mental and physical health outcomes: stress, depression, anxiety, COVID-19 fear, alcohol dependency, and sleep quality during Omicron variant's outbreak in China. Over a quarter of the respondents demonstrated lower mental well-being compared to earlier waves of the pandemic, and a larger proportion of respondents reported harmful drinking levels and alcohol

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dependency symptoms. Precisely, men showed higher depression and alcohol dependency symptoms as well as both extremes of mental well-being scores—higher and lower levels—compared to women. Exposure to COVID-19, infection history of COVID-19 and family cohesion significantly correlated with the different behavioral outcomes. As COVID-19 continuously evolves, so should psychology's understanding of its impacts. This study helps to shed light on how individuals in China were impacted during the Omicron wave; these results can help to amplify further research, especially on how health is impacted during variants of the pandemic. Similarly, the findings can help to inform health intervention plans to support people in need and draw attention to health professionals for whom may be most vulnerable to experiencing adverse psychological health consequences.

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Supplementary Table 1. Differences in Mental Health Variables, Alcohol Dependency, and Fear of COVID-19 by Gender

	Gender		df	χ² (*P*-value)
	Male	**Female**		
Depression				
Moderate	36 (14.2%)	83 (9.3%)	4	12.283 (.015)
Severe	6 (2.4%)	13 (1.5%)		
Extremely severe	5 (2.0%)	7 (.8%)		
Anxiety				
Moderate	41 (16.2%)	102 (11.4%)	4	7.229 (.124)
Severe	11 (4.3%)	36 (4.0%)		
Extremely severe	8 (3.2%)	24 (2.7%)		
Stress				
Moderate	12 (4.7%)	29 (3.2%)	4	8.808 (.066)
Severe	8 (3.2%)	9 (1%)		
Extremely severe	7 (2.8%)	4 (.4%)		
Alcohol use				
Hazardous users	31 (12.3%)	24 (2.7%)	3	66.604 (< .001)
Harmful users	4 (1.6%)	3 (.3%)		
Dependent users	7 (2.8%)	1 (.1%)		
Mental wellbeing				
Lower	73 (28.9%)	231 (25.8%)	2	12.742 (.002)
Average	123 (48.6%)	535 (59.7%)		
Upper	57 (22.5%)	130 (14.5%)		
Fear of COVID-19				
Yes	151 (59.7%)	585 (65.3%)	1	2.693 (.101)
No	102 (40.3%)	311 (34.7%)		

Supplementary Table 2. Differences in Mental Health Variables, Alcohol Dependency, and Fear of COVID-19 by Home Stay Status

	Home Stay		df	χ² (*P*-value)
	Yes	**No**		
Depression				
Moderate	10 (5.3%)	109 (11.3%)	4	7.770 (.100)
Severe	5 (2.7%)	14 (1.5%)		
Extremely severe	2 (1.1%)	10 (1%)		
Anxiety				
Moderate	16 (8.5%)	127 (13.2%)	4	9.983 (.041)
Severe	6 (3.2%)	41 (4.3%)		
Extremely severe	5 (2.7%)	27 (2.8%)		
Stress				
Moderate	7 (3.7%)	34 (3.5%)	4	4.148 (.386)
Severe	3 (1.6%)	14 (1.5%)		
Extremely severe	0 (0%)	4 (.4%)		
Alcohol use				
Hazardous users	15 (8%)	40 (4.2%)	3	21.722 (< .001)
Harmful users	3 (1.6%)	4 (.4%)		
Dependent users	5 (2.7%)	3 (.3%)		
Mental wellbeing				
Lower	53 (28.2%)	251 (26.1%)	2	10.358 (.006)
Average	91 (48.4%)	567 (59%)		
Upper	44 (23.4%)	143 (14.9%)		
Fear of COVID-19				
Yes	102 (54.3%)	585 (60.9%)	1	2.865 (.091)
No	86 (45.7%)	376 (39.1%)		

Supplementary Table 3. Differences in Mental Health Variables, Alcohol Dependency, and Fear of COVID-19 by Whether Participants were Infected by COVID-19

	Have you infected ever?		df	χ² (*P*-value)
	Yes	No		
Depression				
Moderate	3 (37.5%)	115 (10.1%)	8	18.400 (.018)
Severe	0 (0%)	19 (1.7%)		
Extremely severe	0 (0%)	12 (1.1%)		
Anxiety				
Moderate	2 (25.0%)	141 (12.4%)	8	8.636 (.374)
Severe	1 (12.5%)	46 (4.0%)		
Extremely severe	1 (12.5%)	31 (2.7%)		
Stress				
Moderate	2 (25.0%)	39 (3.4%)	8	11.302 (.185)
Severe	0 (0.0%)	17 (1.5%)		
Extremely severe	0 (0.0%)	4 (.4%)		
Alcohol use				
Hazardous users	1 (12.5%)	54 (4.7%)	6	
Harmful users	1 (12.5%)	6 (.5%)		
Dependent users	1 (12.5%)	6 (.5%)		
Mental wellbeing				
Lower	6 (75%)	298 (26.1%)	4	12.758 (.013)
Average	2 (25%)	656 (57.5%)		
Upper	0 (0%)	187 (16.4%)		
Fear of COVID-19				
Yes	6 (75%)	730 (64%)	2	2.198 (.333)
No	2 (25%)	410 (36%)		

Supplementary Table 4. Differences in Mental Health Variables, Alcohol Dependency, and Fear of COVID-19 by Whether Participants' Family Members/Friends were Infected with COVID-19

	Infection history of friend/family		df	χ² (*P*-value)
	Yes	No		
Depression				
Moderate	1 (20.0%)	116 (10.2%)	8	29.596 (< .001)
Severe	1 (20.0%)	18 (1.6%)		
Extremely severe	0 (0%)	12 (1.1%)		
Anxiety				
Moderate	2 (40%)	140 (12.3%)	8	10.313 (.244)
Severe	1 (20%)	46 (4%)		
Extremely severe	0 (.0%)	32 (2.8%)		
Stress				
Moderate	1 (20%)	40 (3.5%)	8	4.497 (.810)
Severe	0 (.0%)	17 (1.5%)		
Extremely severe	0 (.0%)	4 (.4%)		
Alcohol use				
Hazardous users	0 (.0%)	55 (4.8%)	6	101.831 (< .001)
Harmful users	1 (20%)	6 (.5%)		
Dependent users	0 (.0%)	7 (.6%)		
Mental wellbeing				
Lower	4 (80%)	298 (26.1%)	4	13.081 (.011)
Average	1 (20%)	657 (57.5%)		
Upper	0 (.0%)	187 (16.4%)		
Fear of COVID-19				
Yes	2 (40%)	734 (64.3%)	2	4.844 (.089)
No	3 (60%)	408 (35.7%)		

Supplementary Table 5. Differences in Mental Health Variables, Alcohol Dependency, and Fear of COVID-19 by Vaccination Status

	Have you received the Vaccine		df	χ^2 (*P*-value)
	Yes	No		
Depression				
Moderate	114 (10.1%)	2 (12.5%)	4	9.117 (.333)
Severe	19 (1.7%)	0 (.0%)		
Extremely severe	12 (1.1%)	0 (.0%)		
Anxiety				
Moderate	140 (12.4%)	1 (6.3%)	4	5.431 (.711)
Severe	47 (4.2%)	0 (.0%)		
Extremely severe	32 (2.8%)	0 (.0%)		
Stress				
Moderate	40 (3.6%)	0 (.0%)	4	5.375 (.717)
Severe	17 (1.5%)	0 (.0%)		
Extremely severe	4 (.4%)	0 (.0%)		
Alcohol use				
Hazardous users	54 (4.8%)	0 (.0%)	3	9.506 (.147)
Harmful users	7 (.6%)	0 (.0%)		
Dependent users	7 (.6%)	1 (6.3%)		
Mental wellbeing				
Lower	295 (26.2%)	5 (31.3%)	2	6.895 (.142)
Average	650 (57.7%)	7 (43.8%)		
Upper	181 (16.1%)	4 (25%)		
Fear of COVID-19				
Yes	719 (63.9%)	11 (68.8%)	1	1.599 (.450)
No	407 (36.1%)	5 (31.3%)		