Community series in
mental illness, culture, and society: Dealing with the COVID-19 pandemic
volume V

Edited by
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Community series in mental illness, culture, and society: Dealing with the COVID-19 pandemic: Volume V

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KEYWORDS

lockdown, mental health, mental disorders, psychiatry, psychological impact, SARS-CoV-2, social distancing, social isolation

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Editorial on the Research Topic
Community series in mental illness, culture, and society: dealing with the COVID-19 pandemic: volume V

The COVID-19 pandemic has caused, not only serious socioeconomic consequences, but also physical, psychological, and mental health crises (1). Since the start of the pandemic, high rates of psychological distress, depression, anxiety, and post-traumatic stress were reported (2), and numerous efforts have been made to reduce the treatment gap by addressing the mental health requirements of underprivileged communities and nations (2, 3). Risk factors include female sex, student status, unemployment, and physical and psychiatric comorbidities (4). This impact of the pandemic is also moderated by other variables, such as ethnicity (5), culture (6), and being part of vulnerable population groups (7).

Following the previous four volumes of our Community Series Research Topic entitled "*Mental illness, culture, and society: dealing with the COVID-19 pandemic*" (8–11), this fifth volume features nine new papers that investigated the relationship between mental health and the COVID-19 pandemic in specific populations and communities.

Two studies looked at the impact of the pandemic on the mental health of young individuals. Liu et al. examined depressive symptoms in 2,554 postgraduate students residing in eastern China. Collected data included the Patient Health Questionnaire, the interpersonal sensitivity subscale of Symptom Checklist-90, the Psychological Capital Questionnaire, and the Pittsburgh Sleep Quality Index. The prevalence of mild, moderate, and severe depressive symptoms was 30.97, 6.58, and 1.45%, respectively. Psychological capital and sleep quality independently mediated the relationship between interpersonal sensitivity and depressive symptoms (indirect effect = 0.136 and 0.100, respectively, $p < 0.001$) and together co-played a chain-mediating role (indirect effect = 0.066, $p < 0.001$). The authors concluded that positive psychological interventions and sleep guidance may be beneficial in alleviating depressive symptoms in this population. In another cross-sectional study, Wong, Nik Farid et al. looked at how 561 young individuals aged 18–24 years from low-income communities

were responding to the pandemic. The questionnaire included the Parental Environment Questionnaire (PEQ), the Brief Resilient Coping Scale (BRCS), and the Depression, Anxiety, and Stress Scale-short form (DASS-21). The prevalence of depression, anxiety, and stress were 12.5%, 15.2%, and 6.4%, respectively. Parent-child conflict was the strongest significant predictor for higher levels of depression (OR = 10.90, 95% CI 4.31–27.57), anxiety (OR = 11.92, 95% CI 5.05–28.14), and stress (OR = 4.79, 95% CI 1.41–16.33) symptoms. Females and those from low-income households had more severe symptoms of depression and anxiety. Furthermore, those employed had greater severity of anxiety symptoms compared to those unemployed, while a lower level of physical exercise was associated with higher depressive symptoms.

Likewise, Wong, Alias et al. recruited 553 parents of children aged 13–24 years from low-income community settings and assessed the parent-child relationships using the PEQ and DASS-21. Married parents reported a higher level of parent-child conflict than single parents (OR = 3.18, 95% CI 1.30–7.75). More parent-child conflict was noted in participants aged 60–72 years old who were unemployed, retired, housewives, or from lower-income groups. Alternatively, physical activity and enough sleep were associated with a lower level of conflict. The authors suggested that this low risk of parent-child conflict and psychological sequelae for parents could be due to numerous support measures implemented by the government.

Three studies looked at different patient populations during the pandemic. Thirunavukkarasu et al. evaluated oral health-related quality of life (OHRQOL) and its association with mental health among 677 patients with type 2 diabetes mellitus (T2DM) in Saudi Arabia. For their assessment, the authors used the Arabic version of the Oral Health Impact Profile-14 questionnaire and DASS-21. Half of the participants (52.7%) had poor OHRQOL. This was significantly higher in patients with a longer duration of T2DM (aOR = 3.31, 95% CI 1.96–4.17) and those who did not periodically monitor their oral health (aOR = 2.85, 95% CI 1.76–3.89). Total OHRQOL scores had a significant association with depression (aOR = 2.32, 95% CI 1.34–3.71, p = 0.001), anxiety (aOR = 1.81, 95% CI 1.22–2.79, p = 0.003), and stress (aOR = 1.43, 95% CI 1.14–2.19, p = 0.026). Findings highlight the importance of health education programs for patients with T2DM to ensure improved both oral and mental health outcomes. Zhang et al. compared the electronic medical records of patients visiting the largest psychiatric emergency department in China in 2020, compared to before the pandemic. Compared to 2018 and 2019, the proportions of visits related to anxiety and stress disorders in 2020 significantly increased (from 83 in 2018 to 239 in 2020; 188.0% increase) and patients were significantly younger (p < 0.001). Findings highlighted the need for well-equipped crisis prevention services during the pandemic. Wu et al. examined perceived COVID-19 stigma using the Short Version of COVID-19 Stigma Scale (CSS-S) in 1,297 patients who recovered from COVID-19 in China. The authors identified three profiles of perceived COVID-19 stigma: low (12.8%), moderate (51.1%), and severe (36.1%). Older age, living with other people, anxiety, female gender, and sleep disorder were positively associated with moderate and severe perceived COVID-19 stigma. Alternatively, higher education, social support, and peace of mind were negatively associated with severe perceived

stigma. The authors identified the value of ≥20 as an optimal cut-off for the CSS-S.

Two studies looked at mental health during pregnancy or after delivery. Guo et al. explored the impact of the pandemic on two cohorts of pregnant women at their first antenatal care in China (pre-COVID-19 group, n = 5,728 and COVID-19 group, n = 739). The Patient Health Questionnaires-9 and−15 and Generalized Anxiety Disorder-7 scale were used to assess symptomatology. There were significant differences in the demographic characteristics between the two groups (p < 0.05) and newly registered participants for antenatal care dropped by about 50% during the pandemic. After matching demographics, the prevalence of depression, generalized anxiety disorder, and somatoform disorder was found to be significantly higher during the COVID-19 pandemic compared to before (2.3%, 9.6%, 20.8% vs. 0.3%, 3.9%, and 10%, respectively). The authors concluded that the pandemic not only increased mental health problems among pregnant women but also decrease antenatal care clinic attendance. Zou and Chen examined the emotional status of 36 new mothers with infants aged 0–1 years old in China. In this qualitative study, the authors found participants to be chronically depressed, feeling anxious, and upset. Negative emotions were caused either by COVID-19 or by the strict epidemic control policy implemented in China. The new mothers were also anxious about their offspring's physical health, feeding options, and childcare. Lastly, positive emotions were related to strong parent-child bonds, a better understanding of childcare, and a good ability to perceive risks.

Lastly, Kin Ng et al. looked to validate the traditional Chinese versions of the 36-item and 18-item COVID Stress Scales (CSS-36 and CSS-18, respectively) in Hong Kong. The study included 521 undergraduate students (61% female, aged 18–26 years). Findings offered evidence for the psychometric properties of the scales in the Hong Kong context. The results of confirmatory factor analyses supported a six-factor structure for both the CSS-36 and the CSS-18. In addition, both scales exhibited good internal consistency, reliability, and concurrent validity with fear of COVID-19 and negative emotional states.

In conclusion, the articles collected in the fifth volume of our Research Topic further highlight the impact of COVID-19 on different population groups. Mental health professionals must collaborate to offer prompt and customized treatment services to impacted individuals, especially those who are considered to be at a higher risk.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Perceived stigma among discharged patients of COVID-19 in Wuhan, China: A latent profile analysis

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Background: Perceived stigma has greatly influenced the life quality of the COVID-19 patients who recovered and were discharged (RD hereafter). It is essential to understand COVID-19 stigma of RD and its related risk factors. The current study aims to identify the characteristics of perceived COVID-19 stigma in RD using latent profile analysis (LPA), to explore its psycho-social influencing factors, and to determine the cut-off point of the stigma scale using receiver operating characteristic (ROC) analysis.

Methods: A cross-sectional study was conducted among COVID-19 RD in 13 communities in Jianghan District, Wuhan City, Hubei Province, China from June 10 to July 25, 2021, enrolling total 1,297 participants. Data were collected on demographic characteristics, COVID-19 perceived stigma, post-traumatic stress disorder (PTSD), anxiety, depression, sleep disorder, fatigue, resilience, social support, and peace of mind. LPA was performed to identify different profiles of perceived COVID-19 stigma level. Univariate analysis and multinominal logistic regression analysis were conducted to explore the influencing factors in different profiles. ROC analyses was carried out to identify the cut-off value of perceived stigma.

Results: Among the participants, three profiles of perceived stigma were identified: "low perceived COVID-19 stigma" (12.8%), "moderate perceived COVID-19 stigma" (51.1%), and "severe perceived COVID-19 stigma" (36.1%). Multinominal logistic regression analysis revealed that older age, living with other people, anxiety, and sleep disorder were positively associated with moderate perceived COVID-19 stigma, while higher educational level was negatively associated with moderate perceived COVID-19 stigma. Female, older age, living with other people, anxiety, and sleep disorder were positively associated with severe perceived COVID-19 stigma, while higher educational level, social support, and peace of mind were negatively associated with severe perceived COVID-19 stigma. ROC curve of the Short Version of COVID-19 Stigma Scale (CSS-S) for screening perceived COVID-19 stigma showed that the optimal cut-off value was ≥20.

Conclusion: The study focuses on the issue of perceived COVID-19 stigma and its psycho-socio influencing factors. It provides evidence for implementing relevant psychological interventions to COVID-19 RD.

KEYWORDS

COVID-19, perceived stigma, latent profile analysis, discharged patients, China

1. Introduction

COVID-19 has emerged as a global health emergency and posed a great threat to almost all countries and regions (1). It affects all segments of the population, especially the patients of COVID-19 (2). The impact is far beyond merely physical concerns. Previous studies have shown that the pandemic has led to psychological problems among patients, healthcare workers, and other caregivers (3, 4). Patients infected with COVID-19 not only suffered from illness, but also had mental health problems due to viral infection and worries about after-effects (5). Perceived stigma is prevalent among COVID-19 survivors and healthcare workers in COVID-19 designated hospitals, which has an interrelated bearing on their mental health (6, 7).

In post pandemic era, most patients of COVID-19 have been discharged (8). The mental health of those who had recovered from COVID-19 and been discharged from hospital (RD hereafter) deserve more attention during their rehabilitation (9). These patients were isolated during treatment and had limited freedom and communication with the outside world (10). Thus, their negative emotions cannot be alleviated in a short period of time. RD may have a more serious sense of loneliness and repression, as well as a higher level of psychological pressure (11). In the aftermath and the long-covid period, they may experience depression, anxiety, fatigue, post-traumatic stress disorder, and neuropsychiatric syndromes (12–14). Poor mental health condition will impact one's social behaviors and cognitive functions. As a result, RD's mental health should be attached much importance.

RD's mental health condition might affect their perceived COVID-19 stigma (15). Perceived stigma is one's personal feelings about the stressors and his projection of the feelings on others (16). From the patient's perspective, they might feel being stigmatized if their mental health condition was poor. COVID-19 RD are at high risk of PTSD, partly because of their near death experience, delirium, and ICU-related trauma during the COVID-19 experience (17, 18). They might have uncontrollable thoughts about the experience and their image in others' mind, which would increase their perceived stigma. Perceived stigma might also in turn predict PTSD (19). Depression is another prevalent mental issue among COVID-19 RD (20). RD with depressive symptoms might be more sensitive and pessimistic to the negative attitudes from the community, which makes them feel more stigmatized emotions (21). Besides, to contain the spread, patients are required to stay in close isolation during treatment and reduce their movement after discharge, which may lead to feelings of loneliness and fear of discrimination, thus increasing their perceived stigma (22). Peace of mind is important for them to manage stressful situations, as well as avoid the irresistible but unwanted impulses (23). Resilience is not a linear path toward happiness, but a combination of behaviors that encourages individuals and communities to persevere and move forward confronting difficult situations (24, 25). Higher level of resilience might decrease the risk of developing psychological distress, and suppress suicidal thoughts and insomnia (26, 27). Resilience might be influenced by job stress, perceived stress, and mindfulness, and be promoted by brief resilience interventions based on positive psychology (28–30). Thus, with higher level of peace of mind and resilience, patients will control their emotions better and be less sensitive to the negative attitudes from others, which might result in lower sense of perceived stigma. From the

society's perspective, low perceived social support may also lead to perceived stigma among COVID-19 RD (31). Perceived stigma might in turn increase the mental problems among RD and be detrimental to their mental health recovery (32). Therefore, the stigma among COVID-19 RD may have a certain impact on the whole population.

The perceived COVID-19 stigma in RD could be evaluated by a modified 12-item HIV stigma scale, which contains 4 sub-scales to measure personalized stigma, disclosure concerns, concerns about public attitudes, and negative self-image (33). However, this scale has no cut-off point, which makes it hard to precisely evaluate the stigma among RD. Clinical psychiatric interviews are usually regarded as the gold standard for diagnosis and the criterion for determining cut-off points of screening tools, However, the identification and diagnosis of cases with perceived COVID-19 stigma has not reached a consensus. Additionally, the characteristics and prevalence of perceived COVID-19 stigma among RD and its psycho-social influencing factors remain elusive. Currently, most previous studies focused on the recursive effect of perceived stigma on mental health without considering the possible vicious circle between mental health and perceived stigma among RD. While according to the theory of socio-ecological model, one is not a passive recipient of life events, but a key role in constructing and modifying the living system (34). It is therefore important to explore the influencing factors of perceived COVID-19 stigma among RD. The specific objectives of current study are to identify the characteristics of perceived COVID-19 stigma in RD using latent profile analysis (LPA); to explore the psycho-social influencing factors of perceived COVID-19 stigma in RD; and to determine the cut-off point of the stigma scale using ROC analysis for further evaluation and application, which may help healthcare professions and policymakers to deal with the increasing stigma and control the pandemic effectively.

2. Methods

2.1. Study design and participants

The cross-sectional study was carried out among previously-infected COVID-19 patients in Jianghan District (Wuhan, China) from June 10 to July 25, 2021. Extracted from the electronic medical records of the Jianghan District Health Bureau, a total of 3,059 COVID-19 patients met the inclusion criteria and were eligible for the study, for they were infected with the original SARS-Cov-2 strain and were diagnosed between December 10, 2019 and April 20, 2020. When they were receiving clinical re-examination, 1,601 COVID-19 survivors were invited to complete a questionnaire survey on their mental health status, and 1,541 of them who finished the survey were included in the study. All investigators and support staff in this study were trained according to the same protocol and required to have an educational background in medicine or public health. From June to July 2021, the online structured questionnaire was distributed to those who had a history of COVID-19 infection and had been discharged. All participants' digital informed consent was obtained to ensure their voluntary participation. An online survey platform Redcap was used to disseminate the self-administered electronic questionnaires and digital consent to the target population. The study

was approved by the Ethics Review Board of the Institute of Pathogen Biology, Chinese Academy of Medical Sciences (IPB-2020-22), and the Research Ethics Committee of the hospital (2021001, 20210208). The participants had to meet the following criteria: (1) over the age of 18; (2) a history of COVID-19 hospitalization; (3) proficiency in Chinese; (4) able to independently complete scale assessments with the assistance of the researchers; (5) had a mobile communication device like a smartphone and a WeChat account; (6) able to access the Internet with mobile equipment at any time; (7) had not received PTSD, depression, or anxiety interventions within 1 month before his or her enrollment in the study. Those who met any of the following criteria were excluded: (1) had serious cognitive impairment; (2) had serious heart, brain, lung, kidney, liver, and other medical diseases or tumors; (3) found it difficult to complete the questionnaire study. In total, of the 1,541 participants who completed the questionnaire, 1,297 participants were included in the final analysis based on the criteria above.

2.2. Measures

2.2.1. Demographic characteristics

Demographic characteristics, including gender, age, region, marital status, etc., and items on COVID-19 infection, such as clinical classification of COVID-19 in patients and perceived mental health status during hospitalization, were collected.

2.2.2. Stigma

The Short Version of COVID-19 Stigma Scale (CSS-S) is a 12-item scale that is employed for evaluating the perceived stigma of patients of COVID-19 during the past 2 weeks (33). The scale was reviewed by several experts in the field and was approved to use in this population. Each item is scored on a Likert scale of 1–4. Higher total scores indicate greater stigmatization. In this study, the Cronbach's alpha of the instrument was 0.936.

2.2.3. Post-traumatic stress disorder

The Impact of Events Scale-Revised (IES-R) is a 22-item scale aimed at screening posttraumatic stress symptoms in adults or older people. The items of this instrument are rated on a 5-point Likert scale from 0 to 4 (35, 36). The IES-R contains three dimensions measuring intrusion, avoidance, and hyperarousal. Respondents rate their degree of distress during the past 7 days after they have identified a specific stressful life event that occurred to them. A total score equal to or above 35 can be regarded as positive PTSD symptoms. This instrument has been proven valid and reliable among Chinese COVID-19 patients (37). In this study, the Cronbach's alpha of the instrument was 0.965.

2.2.4. Anxiety

The Generalized Anxiety Disorder Questionnaire (GAD-7) consists of 7 items that are rated on a 4-point Likert scale from 0 to 3. It was developed for measuring the severity of generalized anxiety symptoms during the past 2 weeks (38). The scores of the instrument range from 0 to 21. A cutoff score of ≥ 5 is recommended for considering significant anxiety symptoms. This instrument has demonstrated to be reliable and valid among the Chinese population (39, 40). In this study, the Cronbach's alpha of the instrument was 0.951.

2.2.5. Depression

The Patient Health Questionnaire (PHQ-9) is a 9-item questionnaire that is used for screening and monitoring depression of varying degrees of severity during the past 2 weeks (41). The items of the PHQ-9 are rated on a 4-point Likert scale ranging from 0 to 3. The total score is utilized to assess the degree of depression of participants, with scores of ≥ 5 indicating depression. This instrument has been validated among various Chinese populations (42, 43). In this study, the Cronbach's alpha of the instrument was 0.914.

2.2.6. Sleep disorder

The Pittsburgh Sleep Quality Index (PSQI) consists of 18 items and is used to measure an individual's quality of sleep during the past 2 weeks (44). It contains seven components including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction, and each component is a 4-point Likert scaled from 0 = no difficulty to 3 = severe difficulty. The total scores range from 0 to 21 and a cutoff score of ≥ 6 is recommended for considering certain sleep disorders (45). This instrument has been validated among Chinese population (46). In this study, the Cronbach's alpha of the instrument was 0.784.

2.2.7. Fatigue

The Fatigue Scale-14 (FS-14) is a 14-item scale aiming at measuring the severity of fatigue during the past 2 weeks (47). The items of this instrument are rated on a 2-point scale of 0–1. The FS-14 contains two dimensions measuring physical fatigue and mental fatigue, respectively. Higher total scores of the 14 items indicate a higher level of fatigue. This instrument has been proved valid and reliable among Chinese (48). In this study, the Cronbach's alpha of the instrument was 0.845.

2.2.8. Resilience

The Resilience Style Questionnaire (RSQ) consists of 16 items that are rated on a 5-point Likert scaled from 1 to 5. It is used to measure the level of an individual's resilience during the past 2 weeks (49). Higher total scores of the 16 items indicate a greater ability to recover from negative events. This instrument was developed and validated among the Chinese rural left-behind adolescents and non-local medical workers (50, 51). In this study, the Cronbach's alpha of the instrument was 0.975.

2.2.9. Social support

The level of perceived social support of the participants was measured by two items including emotional support and material support during the past 2 weeks (52). The items were: (1) "How much support can you obtain from family/friends/colleagues when you need to talk or to obtain emotional support?" and (2) "How much support can you obtain from family/friends/colleagues when you need material support (e.g., financial help)?" and each item was 11-point Likert scaled from 0 to 10. In this study, the Cronbach's alpha of the instrument was 0.819.

2.2.10. Peace of mind

The Peace of Mind Scale (PoM) comprises a total of 7 items rated on a 5-point scale ranging from 1 ("not at all") to 5 ("all of the time") and is used for measuring the peace of mind during the

past 2 weeks (53). Higher total scores indicate a more peaceful mind. This instrument has been validated among Chinese population (53). In this study, the Cronbach's alpha of the instrument was 0.874.

2.3. Statistical analysis

Descriptive analyses were performed to describe the participants' demographic characteristics, clinical characteristics, the condition of perceived stigma, and potential influencing factors.

In the absence of an accurate and precise reference standard, LPA has been widely employed to identify the symptom characteristics and to further calculate and determine optimal cut-off points of assessment instruments (54–56). LPA is a person-centered statistical method that employs latent profile model (LPM) to divide population into multiple profiles, and it focuses on identifying latent subpopulations within a population based on a set of continuous variables (57–59). Despite the possible arbitrariness for LPA in determining the number of class members due to its semi-subjective properties, the misclassification rate is relatively low, and it could produce more reasonable results compared with some other classification approaches (60–62). Generally, in LPA, individuals assigned to the latent profile that represents the lowest level of symptoms or risks are regarded as "non-cases," and others are considered "cases" (56). Hence, LPA was conducted to identify the characteristics of perceived COVID-19 stigma among RD. Robust maximum likelihood (MLR) estimation was employed to estimate the parameters. The Lo–Mendell–Rubin (LMR) and the bootstrap likelihood ratio test (BLRT) were performed to compare the model fit improvement between models with k classes and k-1 classes, significant p values indicated a better model fit with k classes. The optimal number of classes was evaluated by the entropy, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), the adjusted Bayesian Information Criterion (aBIC), and the interpretability and definition of classifications, where an entropy value≥0.80 represented adequate quality of classification, lower AIC, BIC, and aBIC values indicate better model fit, and the "turning point" of the scree plot for the aBIC could suggest an appropriate number of classes.

After the selection of optimal model and definition of classifications, Chi-square began with the full set of demographic and clinical characteristics, PTSD, anxiety, depression, sleep disorder, fatigue, resilience, social support, and peace of mind, to evaluate their associations with different characteristics of perceived COVID-19 stigma. Statistically significant variables ($p \leq 0.20$) in the univariate analysis were further used for stepwise multinomial logistic regression analysis. Adjusted odds ratio (AOR) and the corresponding 95% confidence intervals (95% CI) were calculated to assess the regression model results.

Receiver operating characteristic (ROC) analysis was conducted to determine the optimal cut-off value for the CSS-S. The area under the ROC curve (AUC), sensitivity, specificity, and Youden's index value were employed to evaluate the performance of classifiers, and Youden's index value was used to identify the optimal cut-off value. SAS9.4 and Mplus8.3 were utilized to conduct all the analyses with level of significance determined at a 0.05 value of p.

3. Results

3.1. Demographic characteristics

Among the 1,541 people who finished the survey questions, 1,297 questionnaires were enrolled in the data analysis. As illustrated in Table 1, over half of the participants were male ($n = 563$, 56.6%) and were less than or equal to 60 years old ($n = 683$, 52.7%). The majority of the participants were from urban areas ($n = 1,136$, 87.6%) and married ($n = 1,105$, 85.2%). Most of the participants had an income for 2020 less than 60,000 China Yuan(CNY, 1 CNY equals 0.14 USD on 2022.12.31; $n = 805$, 62.1%), and had an education level as senior high school or below ($n = 921$, 71%). A small percentage of participants lived alone ($n = 158$, 12.2%), used alcohol no less than 2 times per week ($n = 117$, 9%), and were current smokers ($n = 161$, 12.4%). The COVID-19 patients were clinically classified into four categories: asymptomatic ($n = 60$, 4.6%), mild ($n = 927$, 71.5%), moderate ($n = 132$, 10.2%), critically severe ($n = 178$, 13.7%). A significant proportion of the participants had no experience at ICU ($n = 1,250$, 96.4%), had never received psychological or emotional counseling during hospitalization ($n = 1,225$, 94.4%), and had never received psychological or emotional counseling before infection ($n = 1,169$, 90.1%). Just under a half of participants stayed over 20 days in hospital ($n = 611$, 47.1%), and had no complication ($n = 530$, 40.9%). Most of the patients perceived good ($n = 736$, 56.7%) or moderate ($n = 247$, 19%) mental health status during hospitalization.

3.2. Stigma and related psychological factors

The 12-item CSS-S's total scores range from 12 to 48 with higher scores indicating a more stigmatizing attitude. The mean score in this study was 28.04 (SD = 7.33). The mean scores of fatigue, peace of mind, resilience, and social support were 6.38 (SD = 4.04), 24.70 (SD = 5.99), 56.82 (SD = 14.04), 14.25 (SD = 5.18), respectively. The prevalence of PTSD, anxiety, depression, and sleep disorder were 16.5, 28.8, 37.9, and 47.1%, respectively (Table 2).

3.3. Latent profile analysis

Latent profile models (LPA) with one-to-five-class solutions were specified, and the fit indices of the 5 models are displayed in Table 3. The entropies of all classifications were above 0.9. The LMR and BLRT test were all statistically significant. The AIC, BIC and aBIC decreased with the increase of class number, and the scree plot of aBIC flattened out after the 3-class model (see Figure 1). Taken together, considering the model fit, parsimoniousness, and interpretability of the classes, the 3-class model was selected as the optimal model for the current sample, the distribution and conditional means of items of CSS-S on each class in the 3-class model are illustrated in Figure 2 and Table 4. In the 3-class model, the average latent class probabilities for most likely latent class membership (0.978, 0.977, and 0.972) demonstrate reasonable classification and good distinction (see Table 5). Given the conditional means of items on each class, we define Class1 ($n = 166$, 12.8%) as "low perceived COVID-19 stigma" group, Class2 ($n = 663$,

TABLE 1 Demographic characteristics of the participants.

Variable	N	%
Gender		
Male	563	43.4
Female	734	56.6
Age (years)		
≤60	683	52.7
>60	614	47.3
Region		
Urban	1,136	87.6
Rural areas	161	12.4
Marital status		
Unmarried/divorced /widowed	192	14.8
Married	1,105	85.2
Income for 2020 (CNY)		
<60,000	805	62.1
≥60,000	492	37.9
Dwelling state		
Living alone	158	12.2
Living with others	1,139	87.8
Education level		
Senior high school or below	921	71
Above senior high school	376	29
Frequency of alcohol use per week		
<2	1,180	91
≥2	117	9
Current smoker		
No	1,136	87.6
Yes	161	12.4
Clinical classification of COVID-19 patients		
Asymptomatic	60	4.6
Mild	927	71.5
Moderate	132	10.2
Critically severe	178	13.7
Experience at ICU		
No	1,250	96.4
Yes	47	3.6
Length of hospital stay (days)		
≤20	686	52.9
>20	611	47.1
Complication		
No	530	40.9
Yes	767	59.1
Having received psychological or emotional counseling during hospitalization		
No	1,225	94.4
Yes	72	5.6

(Continued)

TABLE 1 (Continued)

Variable	N	%
Perceived mental health status during hospitalization		
Poor	314	24.2
Moderate	247	19
Good	736	56.7
Having received psychological or emotional counseling before infection		
No	1,169	90.1
Yes	128	9.9

51.1%) as "moderate perceived COVID-19 stigma" group, and Class3 ($n = 468$, 36.1%) as "severe perceived COVID-19 stigma."

3.4. Influencing factors of perceived COVID-19 stigma of RD

The result of univariate analysis showed that female ($\chi^2 = 21.999$, $p < 0.001$), older age ($\chi^2 = 45.595$, $p < 0.001$), being married ($\chi^2 = 4.401$, $p = 0.111$), low family income ($\chi^2 = 23.261$, $p < 0.001$), living with other people ($\chi^2 = 7.456$, $p = 0.024$), low education level ($\chi^2 = 61.653$, $p < 0.001$), having complication ($\chi^2 = 10.117$, $p = 0.006$), perceiving worse mental health status during hospitalization ($\chi^2 = 48.489$, $p < 0.001$), PTSD ($\chi^2 = 73.360$, $p < 0.001$), anxiety ($\chi^2 = 74.878$, $p < 0.001$), depression ($\chi^2 = 70.081$, $p < 0.001$), sleep disorder ($\chi^2 = 70.875$, $p < 0.001$), and fatigue ($F = 21.220$, $p < 0.001$) were positively associated with perceived COVID-19 stigma, while resilience ($F = 22.030$, $p < 0.001$), social support ($F = 25.070$, $p < 0.001$), and peace of mind ($F = 39.130$, $p < 0.001$) were negatively associated with perceived COVID-19 stigma among RD (see Table 6). These variables were further employed in stepwise multinomial logistic regression analysis with the "low perceived COVID-19 stigma" group as a reference. The result of stepwise multinomial logistic regression analysis showed that older age (AOR = 1.753, $p = 0.004$), living with other people (AOR = 2.152, $p = 0.003$), anxiety (AOR = 2.444, $p = 0.004$), and sleep disorder (AOR = 1.921, $p = 0.002$) were positively associated with moderate perceived COVID-19 stigma, while higher educational level (AOR = 0.624, $p = 0.012$) was negatively associated with moderate perceived COVID-19 stigma; Female (AOR = 1.674, $p = 0.011$), older age (AOR = 3.046, $p < 0.001$), living with other people (AOR = 2.037, $p = 0.011$), anxiety (AOR = 2.813, $p = 0.001$), and sleep disorder (AOR = 2.628, $p < 0.001$) were positively associated with severe perceived COVID-19 stigma, while higher educational level (AOR = 0.340, $p < 0.001$), social support (AOR = 0.953, $p = 0.021$), and peace of mind (AOR = 0.951, $p = 0.008$) were negatively associated with severe perceived COVID-19 stigma among RD (Table 7).

3.5. Receiver operating characteristic analysis

To identify the optimal cut-off value of CSS-S for screening perceived COVID-19 stigma among RD, participants assigned to the "low perceived COVID-19 stigma" group in LPA were defined
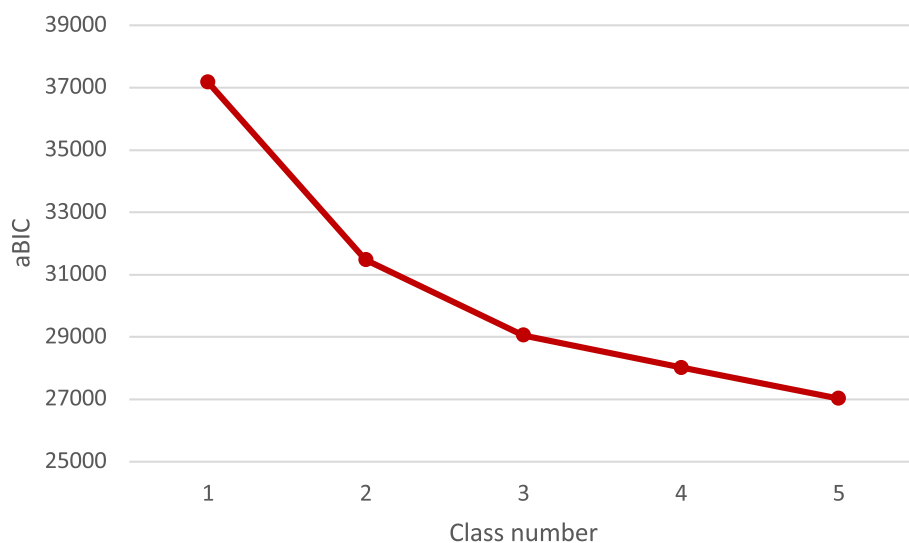
FIGURE 1
Scree plot of change trend of adjusted Bayesian Information Criterion (aBIC).

TABLE 2 Descriptive statistics for CSS-S, FS-14, PoM, RSQ, social support, IES-R, GAD-7, PHQ-9 and PSQI.

Variable	*n*	%	Mean (SD)	Range
Stigma (CSS-S)				
Total score			28.04(7.33)	12–48
Fatigue (FS-14)				
Total score			6.38(4.04)	0–14
Peace of mind (PoM)				
Total score			24.70(5.99)	7–35
Resilience (RSQ)				
Total score			56.82(14.04)	16–80
Social support				
Total score			14.25(5.18)	0–20
Post-traumatic stress disorder (IES-R)				
No	1,083	83.5		
Yes	214	16.5		
Anxiety (GAD-7)				
No	923	71.2		
Yes	374	28.8		
Depression (PHQ-9)				
No	805	62.1		
Yes	492	37.9		
Sleep disorder (PSQI)				
No	686	52.9		
Yes	611	47.1		

CSS-S: COVID-19 Stigma Scale; FS-14: Fatigue Scale-14; PoM: Peace of Mind Scale; RSQ: Resilience Style Questionnaire; IES-R: Impact of Events Scale-Revised; GAD-7: Generalized Anxiety Disorder Questionnaire; PHQ-9: Patient Health Questionnaire; PSQI: Pittsburgh Sleep Quality Index.

as "non-cases" (i.e., no stigma), and those assigned in "moderate perceived COVID-19 stigma" and "severe perceived COVID-19 stigma" groups were defined as "cases" (i.e., probable stigma). The ROC curve was then plotted for the total score of CSS-S using the binary outcome, with an AUC value of 99.96% ($p < 0.001$), indicating a good predictive capacity for perceived COVID-19 stigma (see Figure 3). The diagnostic criteria and indices are illustrated in Table 8. The optimal cut-off value was ≥ 20, where the sensitivity, specificity, and Youden's index value were 0.996, 0.982, and 0.978, respectively.

4. Discussion

The cross-sectional study employs LPA to assess the characteristics of perceived COVID-19 stigma among RD and analyzes its psycho-socio contributing factors. Perceived stigma of RD was divided into three categories in this study. We measured the demographic characteristics and some possible psychological predictors of perceived COVID-19 stigma. Generally, older age, living with other people, anxiety, and sleep disorder were positively associated with moderate perceived COVID-19 stigma, while higher educational level was negatively associated with moderate perceived COVID-19 stigma; female, older age, living with other people, anxiety, and sleep disorder were positively associated with severe perceived COVID-19 stigma, while higher educational level, social support, and peace of mind were negatively associated with severe perceived COVID-19 stigma among RD. The cut-off point of the stigma scale was determined at 20 using ROC analysis.

This study classified COVID-19 RD into three groups according to the stigma level: "low perceived COVID-19 stigma," "moderate perceived COVID-19 stigma," and "severe perceived COVID-19 stigma" group. Only 12.8% of RD were categorized into the "low perceived COVID-19 stigma" group, which indicated the lowest levels of stigma and reported the lowest level of psychological risk factors.
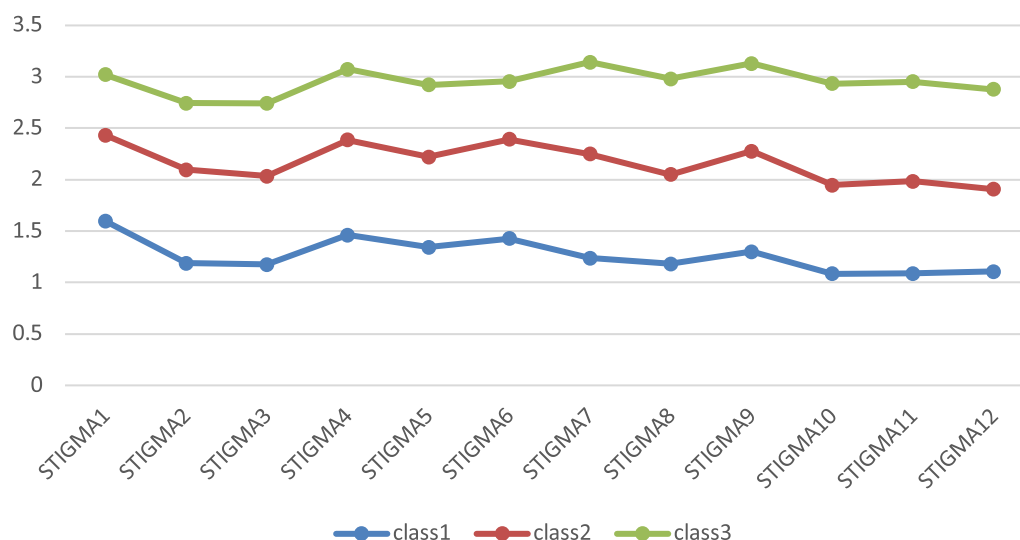
FIGURE 2
Three classes of the best-fitting 3-class model based on COVID-19 Stigma Scale (CSS-S).

TABLE 3 Model fit indices for latent profile models with different classes.

Class number	AIC	BIC	aBIC	Entropy	LMR	BLRT	Class membership probability
1	37121.342	37245.37	37169.134				1
2	31403.104	31594.313	31476.782	0.928	<0.001	<0.001	0.510/0.490
3	28949.821	29208.211	29049.386	0.944	<0.001	<0.001	0.128/0.361/0.511
4	27896.009	28221.581	28021.461	0.954	0.007	<0.001	0.125/0.369/0.469/0.037
5	26872.931	27265.684	27024.269	0.954	0.006	<0.001	0.137/0.360/0.307/0.160/0.036

TABLE 4 Conditional means of items of CSS-S on each class.

	Class1	Class2	Class3
STIGMA1	1.597	2.433	3.022
STIGMA2	1.188	2.097	2.744
STIGMA3	1.174	2.035	2.742
STIGMA4	1.463	2.387	3.074
STIGMA5	1.343	2.222	2.921
STIGMA6	1.428	2.394	2.956
STIGMA7	1.239	2.249	3.144
STIGMA8	1.183	2.05	2.981
STIGMA9	1.299	2.277	3.129
STIGMA10	1.084	1.948	2.934
STIGMA11	1.087	1.986	2.952
STIGMA12	1.108	1.907	2.877
Class membership probability	0.128	0.511	0.361

TABLE 5 Average latent class probabilities for most likely latent class membership by latent class.

Latent class	Latent class membership		
	1 (166)	2 (663)	3 (468)
1	0.978	0.022	0.000
2	0.008	0.972	0.021
3	0.000	0.023	0.977

perceived stigma. Similar to previously published studies, anxiety was a major risk factor for stigma. In a study that evaluated the depression and anxiety symptoms among 174 patients who recovered from symptomatic COVID-19 infection in Saudi Arabia, the stigma scores were significantly associated with higher scores on anxiety (63). Some other studies on people living with epilepsy, dementia, and cancer patients also demonstrated that anxiety is one of the psychosocial determinants of perceived stigma (64–66). Therefore, mitigating the anxiety symptoms is essential to decrease the stigma among RD. Emotional regulation, mindfulness, and experiential techniques are possible solutions to improve social anxiety disorder symptoms (67). RD could also try exercise, yoga, and meditation, which were proven to have modest positive effect on assisting their anxiety alleviation (68). Hospitals and communities should assess the anxiety level of COVID-19 RD to detect anxiety as early as possible. For RD

The majority belonged to the "moderate perceived COVID-19 stigma" (51.1%).

Compared with the "low perceived COVID-19 stigma" group, anxiety and sleep disorder were positively associated with moderate

TABLE 6 Univariate analysis of influencing factors of perceived COVID-19 stigma of RD.

Variable	Classification of perceived stigma			χ^2/F	p
	Low perceived COVID-19 stigma	Moderate perceived COVID-19 stigma	Severe perceived COVID-19 stigma		
Gender				21.999	<0.001
Male	86	313	164		
Female	80	350	304		
Age(years)				45.595	<0.001
≤60	116	372	195		
> 60	50	291	273		
Region				1.695	0.428
Urban	147	573	416		
Rural areas	19	90	52		
Marital status				4.401	0.111
Unmarried/divorced/widowed	33	89	70		
Married	133	574	398		
Family income for 2020 (CNY)				23.261	<0.0001
< 60,000	83	396	326		
≥60,000	83	267	142		
Dwelling state				7.456	0.024
Living alone	28	66	64		
Living with other people	138	597	404		
Education level				61.653	<0.001
Senior high school or below	88	446	387		
Above senior high school	78	217	81		
Frequency of alcohol use per week				1.197	0.5496
< 2	149	600	431		
≥2	17	63	37		
Current smoker				2.349	0.309
No	140	580	416		
Yes	26	83	52		
Clinical classification of COVID-19 patients				7.743	0.2575
Asymptomatic	8	36	16		
Mild	130	464	333		
Moderate	12	69	51		
Critical severe	16	94	68		
Experience at ICU				0.956	0.6202
No	162	639	449		
Yes	4	24	19		
Length of hospital stay(days)				0.937	0.6259
≤20	83	358	245		
> 20	83	305	223		
Complication				10.117	0.006
No	86	267	177		
Yes	80	396	291		
Having received psychological or emotional counseling during hospitalization				0.604	0.7396
No	157	629	439		
Yes	9	34	29		

(Continued)

TABLE 6 (Continued)

Variable	Classification of perceived stigma			χ^2/F	p
	Low perceived COVID-19 stigma	Moderate perceived COVID-19 stigma	Severe perceived COVID-19 stigma		
Perceived mental health status during hospitalization				48.489	<0.001
Poor	22	129	163		
Moderate	39	129	79		
Good	105	405	226		
Having received psychological or emotional counseling before infection				0.030	0.9852
No	149	598	422		
Yes	17	65	46		
PTSD				73.360	<0.001
No	157	589	337		
Yes	9	74	131		
Anxiety				74.878	<0.001
No	150	501	272		
Yes	16	162	196		
Depression				70.081	<0.001
No	138	438	229		
Yes	28	225	239		
Sleep disorder				70.875	<0.001
No	125	376	185		
Yes	41	287	283		
Fatigue	5.193 ± 4.137	6.050 ± 3.931	7.263 ± 3.982	21.220	<0.001
Resilience	58.693 ± 19.189	58.750 ± 12.896	53.436 ± 12.772	22.030	<0.001
Social support	15.223 ± 5.401	14.944 ± 4.761	12.928 ± 5.399	25.070	<0.001
Peace of mind	26.530 ± 6.807	25.558 ± 5.698	22.846 ± 5.614	39.130	<0.001

FIGURE 3
The receiver operating characteristic (ROC) curve of the CSS-S for screening perceived COVID-19 stigma.
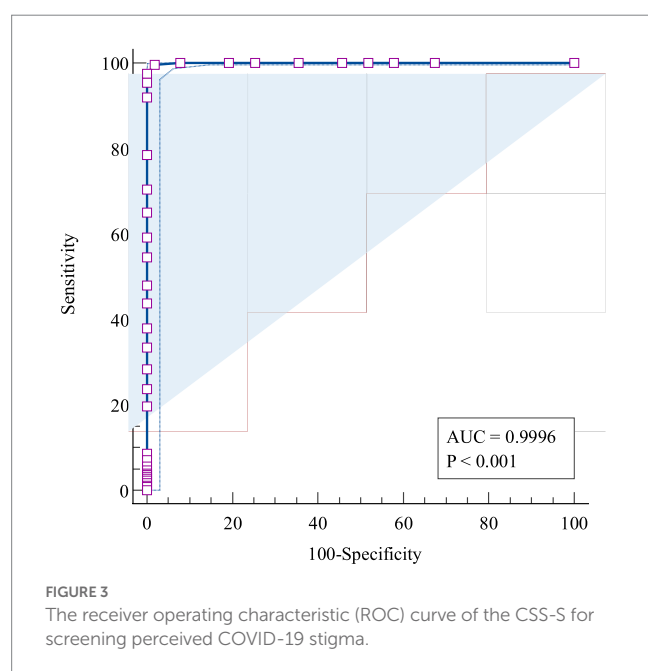
with anxiety symptoms, the community should provide them with knowledge and stress coping strategies, and provide training to help them manage emotions. Psychological interventions like mindfulness-based therapy could be implemented by government or community to alleviate anxiety symptoms (69). The society should be less hostile to RD. It is necessary for social media to refute false information, strengthen the information guidance of social media, and output positive information, so as to avoid the anxiety mood in origin.

Our study also found that sleep disorders is a determinant of moderate perceived stigma in RD. Previous studies showed that 29.5% of the COVID-19 hospitalized patients had sleep disorders (70). Poor sleep quality was associated with stigma (71). Cognitive behavior therapy is aimed at treating insomnia by avoiding behaviors and thoughts that might develop into sleep disorders (72). RD with sleep disorders could use this method on their own to improve their sleep quality. Effective programs based on the therapy could also be embedded in smartphones to assist their sleep promotion process (73). In addition, progressive muscular relaxation is an effective way to help COVID-19 patients feel less anxious and have better quality sleep (74).

TABLE 7 Multinomial logistic regression analysis of influencing factors of perceived COVID-19 stigma of RD.

Variable	Moderate perceived stigma				Severe perceived stigma			
	AOR	95%CI		p	AOR	95%CI		p
		LL	UL			LL	UL	
Gender								
Male	1				1			
Female	1.063	0.744	1.519	0.736	1.674	1.128	2.483	0.011
Age(years)								
≤60	1				1			
> 60	1.753	1.192	2.577	0.004	3.046	2.009	4.618	<0.001
Dwelling state								
Living alone	1				1			
Living with other people	2.152	1.304	3.553	0.003	2.037	1.181	3.515	0.011
Education level								
Senior high school or below	1				1			
Above senior high school	0.624	0.432	0.903	0.012	0.340	0.221	0.522	<0.001
PTSD								
No	1				1			
Yes	1.082	0.495	2.367	0.844	2.014	0.915	4.431	0.082
Anxiety								
No	1				1			
Yes	2.444	1.327	4.501	0.004	2.813	1.499	5.276	0.001
Sleep disorder								
No	1				1			
Yes	1.921	1.275	2.895	0.002	2.628	1.695	4.072	<0.001
Social support	1.005	0.966	1.046	0.803	0.953	0.914	0.993	0.021
Peace of mind	0.998	0.965	1.032	0.891	0.951	0.917	0.987	0.008

LL: lower limit; UL: upper limit.

TABLE 8 Criterion values and coordinates of ROC curve for perceived COVID-19 stigma.

Criterion	Sensitivity	Specificity	Youden's index
≥12	1.000	0.000	0.000
>19	1.000	0.922	0.922
>20	0.996	0.982	0.978
>21	0.975	1.000	0.975
>48	0.000	1.000	0.000

The "severe perceived COVID-19 stigma" group reported three more risk factors compared with "moderate perceived COVID-19 stigma" group, including female gender, insufficient social support and peace of mind. Female gender is a risk factor of "long-covid" syndrome and tend to have a higher proportion of physical and psychological symptoms than male [75]. Because of the more severe illness and torment they suffered, they might find it difficult to maintain a good mentality toward the stigmatized attitudes. A low perceived level of social support prevailed during the pandemic due to the shutdown of many places, like schools, markets, and workplaces to avoid transmission of the virus [76]. RD facing such conditions may arouse a sense of isolation and vulnerability, which would cause severe stigma. Perceived social support and use of adaptive coping strategies were found to affect individuals' psychological adjustment and resilience [77]. Interventions like in-person interview, supportive psychotherapy, and positive attention would improve their social support and could be considered widely promoted [78]. Peace of mind might increase one's self awareness and attitude toward the surroundings, and indirectly reduce the sense of being stigmatized. A previous study on female patients with schizophrenia also identified that enhancing peace of mind will help reduce stigma level [79].

Our study determined 20 as the cut-off score for CSS-S by LPA and ROC analysis, which may guide future epidemiological studies on COVID-19 stigma. The cut-off value is instructive for clinical practice in COVID-19 RD mental health promotion. Hospitals are suggested to collect stigma information of discharged patients and carry out relevant psychological intervention for patients whose scores exceed 20.

Although our team have analyzed the same population in advance and explored the prevalence and influencing factors of anxiety and depression in RD [80], a further analysis in this study provided

insightful observations from a different perspective. This study enriched our knowledge on the association between mental health and perceived stigma among RD, and provided possible suggestions for the authorities and the society to reduce perceived COVID-19 stigma in the future. However, it has several limitations. First, this cross-sectional study has its inherent limitations, for it contains no dimension of time to support a causal relationship. Second, the study was conducted more than 18 months after the COVID-19 patients were discharged, which may cause recall bias. Third, convenience sampling may decrease the representativeness of the population. Fourth, stigma contains two factors, namely "public stigma" and "self-perceived stigma." In this study, we only mention the latter. Further studies should measure stigma more comprehensively in a representative sample.

5. Conclusion

This study provides an insightful result of the prevalence and influencing factors of perceived stigma among RD in Wuhan. Stigma among COVID-19 RD could be divided into 3 groups: "low perceived COVID-19 stigma," "moderate perceived COVID-19 stigma," and "severe perceived COVID-19 stigma" group. Based on the cut-off value we explored, the high proportion of perceived stigma level highlights the importance of solving the stigma and discrimination problem, for its impact on personal and community well-being. Therefore, it is essential to mitigate the psychological problems and reduce the perceived stigma level of RD as part of the response toward the COVID-19 pandemic. Psychological interventions on anxiety, sleep disorder, and social support are suggested to alleviate mental health problems and stigma among this population. Additionally, this study discovered the precise cut-off value for CSS-S, which provides a valuable tool for screening perceived stigma among future COVID-19 patients and can be used to identify the patients in noosed of tailored interventions.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Review Board of the Institute of Pathogen Biology, Chinese Academy of Medical Sciences (IPB-2020-22), and the Research Ethics Committee of the hospital (2021001, 2021028). The patients/participants provided their written informed consent to participate in this study.

Author contributions

ZD and YW prepared the first draft and analyzed the data. XS provided overall guidance and managed the overall project. WX, HW, YH, MS, JF, XC, MJ, ZL, DC, and WM were responsible for the questionnaire survey and data management. YW, ZD, and XS prepared and finalized the manuscript on the basis of comments from other authors. All authors contributed to the article and approved the submitted version.

Funding

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Increased anxiety and stress-related visits to the Shanghai psychiatric emergency department during the COVID-19 pandemic in 2020 compared to 2018–2019

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Background: The coronavirus disease 2019 (COVID-19) pandemic has had a significant and far-reaching impact on mental health. The psychiatric emergency department (PED) is pivotal in the management of acute and severe mental illnesses, especially anxiety-and stress-related disorders.

Aims: This study aimed to evaluate whether changes in the frequency or patients' demographics of visiting the PED occurred during the COVID-19 pandemic among individuals with anxiety and stress-related disorders.

Methods: This cross-sectional study used data on PED visit counts from the largest psychiatric hospital in China between 2018 and 2020 (before and during the COVID-19 pandemic). Data from 2020, representing the COVID-19 pandemic period, were extracted from electronic medical records and compared using descriptive statistics for the same periods in 2018 and 2019.

Results: The number of PED visits related to anxiety and stress disorders per year increased from 83 in 2018 to 136 (63.9% increase) in 2019 and 239 (188.0% increase) in 2020. Compared to that in 2018 and 2019, the proportion of PED visits in 2020 among patients with anxiety and stress disorders increased significantly. Patients with anxiety-and stress-related disorders during PED visits in 2020 were younger than those in 2018 and 2019 (three-year groups: $F = 9.124$, $df = 2$, $p < 0.001$).

Conclusion: Despite the epidemic-policy barriers against PED visits, PED care seeking has increased, thereby underscoring the need for crisis prevention services for patients with stress and anxiety disorders.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has caused anxiety and stress-related psychosocial disruption in response to the threat of disease (1). The unpredictable emergence of COVID-19 cases in China and the impact of the pandemic on psychological health may persist for a long time (2). The impact of not only its rapid spread but also the changes in people's daily lives characterized as guarded and distant (3), the devastating impact on the economy, and the profound impact on people's sense of security and uncertainty about the future has been significant (4).

Evidence indicates that the COVID-19 pandemic has generated substantial increases in the incidence of depression, anxiety, and acute stress disorders (5–7). There is widespread consensus that mental health problems are increasing and are mainly caused by the COVID-19 pandemic, particularly due to social isolation, fear of infection, parental distress, and family financial stress (8, 9). The COVID-19 pandemic has been recognized as an important threat to mental health and well-being (10, 11). However, these findings were largely derived from self-reporting surveys, and only few studies have documented real cases with several severe mental disorders, such as suicidal and violent behavior before and during the pandemic.

Many investigations have been designed to survey the general population to assess the degree of psychological impact of the pandemic (12–14); however, this does not directly support the increase in mental illness. Psychiatric emergency departments (PED) are at the forefront of treating the mental illness crisis, and changes in PED visits during the COVID-19 pandemic provide more direct evidence to evaluate the psychological impact of the pandemic. Changes in PED visits have been used to understand the potential impact of COVID-19 on serious mental disorder outcomes (15, 16). Unfortunately, the research results are not consistent in different regions owing to the different stages of the epidemic and control policies. The number of PED visits could be decreased by COVID-19 stay-at-home orders (17) or fear of COVID-19 infection (18, 19), varied by regions (20), and increased by the deconfinement period (21).

Methods

Participants

This cross-sectional study included all patients with anxiety-and stress-related mental illnesses who visited the Shanghai Mental Health Center (SMHC) PED between 2018 and 2020 (before and during the COVID-19 pandemic). The emergency department at the SMHC is the largest PED and provides 24-h service all year-round. It is the only referral hospital in Shanghai to serve all emergency psychiatric patients. The PED visits for F4 (neurotic, stress-related, and somatoform disorders, F40 - F48) diagnoses according to the 10th revision of the International Classification of Diseases and Related

Health Problems (ICD-10) were extracted from the SMHC Diagnosis and Treatment System Database. The SMHC Research Ethics Committee approved the data analysis. This study should be considered a public health surveillance rather than a research study involving human subjects; therefore, informed consent was waived for these secondary data analyses. All data were anonymized before analysis.

Setting

The PED at SMHC is the largest mental health clinic offering medication management and psychological crisis interventions in Shanghai and China. PED patients are mainly from Shanghai and from different parts of the country. In total, the PED at SMHC reported 1,767, 2,210, and 2,648 visits in 2018, 2019, and 2020, respectively. Approximately 1,000 professional staff members provide care to patients at the SMHC. Among them, 258 were psychiatrists and psychologists and 541 were psychiatric nurses, along with other support staff members. PED provides comprehensive clinical services, including psychological assessments and counselling, medical management, brain stimulation, crisis intervention, and hospitalization. Patients seek help for issues ranging from general mental illnesses (such as schizophrenia and bipolar disorder) to more severe crises (such as suicide attempts and medication overdose). The PED is composed of 13 senior psychiatrists and 15 experienced nurses. The psychiatrists must have the professional title of attending doctor or above, and the nurses must have more than 5 years of work experience.

COVID-19 pandemic and related policy in Shanghai

Shanghai was a typical city during the epidemic. First, Shanghai had a relatively small number of local COVID-19 cases and a high recovery rate in 2020, making it a role model for other major cities and provinces in China (21). The epidemic data were obtained from the official data released by the National Health Commission of China and the Shanghai Municipal Health Commission for the number of COVID-19 infected people from 0:00 on January 1, 2020, to 24:00 on December 31, 2020. A total of 348 new COVID-19 cases were reported in 2020. The detailed distribution of COVID-19 cases in 2020 is presented in Figure 1. Second, Shanghai is one of China's largest, most populated (24,882,000 in 2020), and most internationalized cities. Shanghai's psychiatric emergency strategies and experiences can be useful in other large cities worldwide. Third and most importantly, Shanghai has the best medical resources in China, and many patients come for medical treatment from other provinces. The Shanghai government has always adopted a strategy of accurate epidemic prevention during the epidemic period, with remarkable epidemic prevention effects and a stable medical environment.
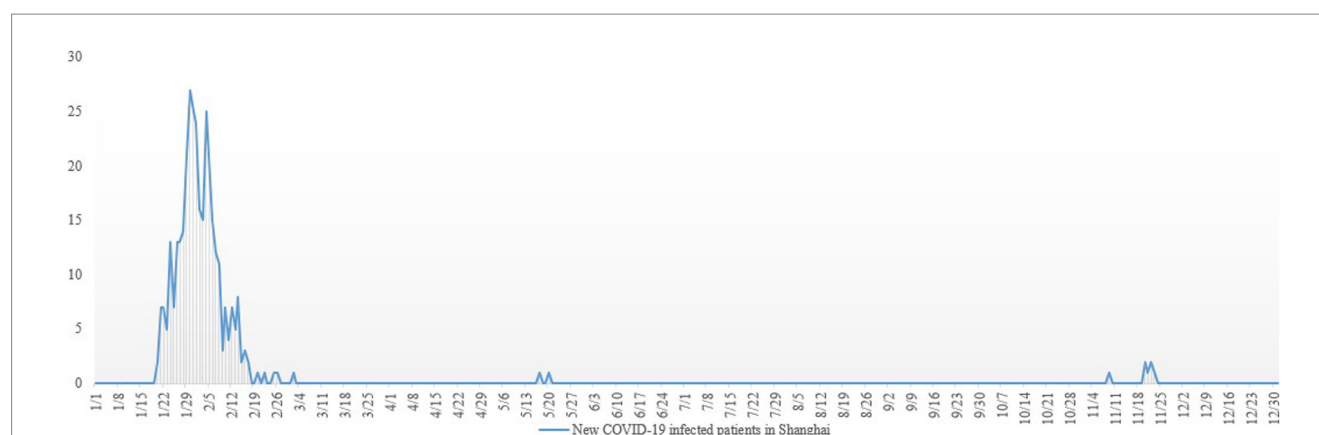
FIGURE 1
The number of COVID-19 infected people in Shanghai from January 1, 2020, to December 31, 2020.

Diagnostic categories

The SMHC electronic diagnosis and treatment system was designed according to the ICD-10. In the current analysis, the F4 (F40 – F48) neurotic, stress-related, and somatoform disorders were selected. Three diagnostic categories were classified as follows: anxiety disorders, stress-related disorders, and somatoform and dissociative disorders. The category of anxiety disorders included F40 phobic anxiety disorders and F41 other anxiety disorders (such as panic disorder and generalized anxiety disorder). The category of stress-related disorders included F43 acute stress reactions, post-traumatic stress disorder, and adjustment disorders. The category of somatoform and dissociative disorder included F44 dissociative (conversion) and somatoform disorders.

Statistical methods

The PED visit counts are presented and compared according to age, sex, and diagnostic categories. Descriptive statistical analyses, independent sample t-tests, chi-square tests, and one-way analysis of variance (ANOVA) were performed to assess temporal trends between 2018, 2019 and 2020, using IBM SPSS Statistics v.16 for Windows (IBM Corp., Armonk, NY, IBM Corp). All datasets were transferred to Excel spreadsheets (Microsoft Corporation, Redmond, WA, USA), and pie and bar graphs were generated using the software. Statistical significance was set at $p < 0.05$.

Results

From January 1, 2018, to December 31, 2020, a total of 458 PED visits for F4 diagnoses were recorded in the SMHC administrative dataset. Among them, 296 individuals (64.6%) were female and 162 (35.4%) were male, with a mean age of 43.4 years (SD = 16.5), (range, 11–86 years). The number of F4-PED visits per year increased from 83 in 2018 to 136 (63.9% increase) in 2019 and 239 (188.0% increase) in 2020 (Figure 2).

To further compare changes in the distribution of F4 diagnostic categories between 2020 and 2018–2019, Figure 3 shows the annual

proportion of patients who visited the PED in each diagnostic category. The proportions of the three diagnostic categories were not significantly different among the 3 years ($\chi^2 = 7.597$, $df = 4$, $p = 0.108$).

The sex proportion and age distribution across the 3 years are presented in Figures 4, 5. Although the proportion of women is increasing, the sex proportion in F4-PED visits from 2018 to 2020 was not statistically significant ($\chi^2 = 2.833$, $df = 2$, $p = 0.243$).

Patients in the 2020 F4-PED visits were younger than those in 2018 and 2019 (three-year groups: $F = 9.124$, $df = 2$, $p < 0.001$). Patients with F4 diagnosis were grouped into young age group and old age group based on the age of 30 and 18, and compare the proportion of the two groups in the 3 years from 2018 to 2020. When grouping by the age of 30, the proportion of young patients was 18.1% in 2018, 18.4% in 2019, but increased to 27.6% in 2020 (2018 vs. 2020, $\chi^2 = 2.980$, $df = 1$, $p = 0.084$; 2019 vs. 2020, $\chi^2 = 4.020$, $df = 1$, $p = 0.045$). When grouping by the age of 18, the proportion of young patients was 0% in 2018, 2.9% in 2019, but increased to 5.0% in 2020.

Discussion

To the best of our knowledge, this cross-sectional study is the first to provide hospital encounter data, demonstrating a potential association between the pandemic and increased anxiety-and stress-related PED visits in Shanghai. Anxiety-and stress-related disorders exhibited greater increases in overall visits in 2020 than in 2018 or 2019. This growth makes the number of patients in 2020 greater than the sum of the previous 2 years, suggesting an increase in the burden of these disorders during the pandemic. These findings are comparable to the prevalence reported in studies conducted in other countries during the COVID-19 pandemic (22, 23), revealing that despite some variations, the overall clinical picture of pandemic-related anxiety and stress symptoms is universal.

Although affected by fear of contagion and epidemic control measures, PED visits for anxiety-and stress-related disorders in Shanghai were more frequent during the pandemic than during the homologous pre-pandemic period. This result is inconsistent with those of previous reports (17, 18, 20, 24), which found that the overall ED visits have decreased. These studies often need to explain the contradictions through assumptions; that is, the recognition of
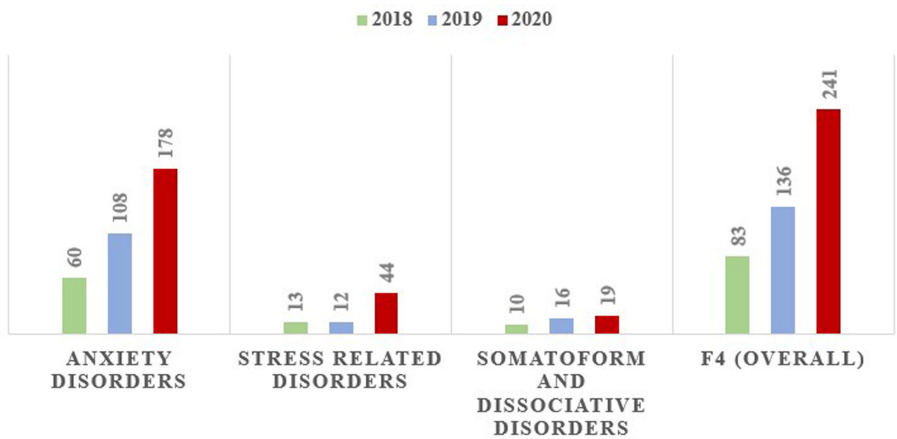
FIGURE 2
The number of yearly F4-PED visits across 2018, 2019, and 2020.

FIGURE 3
The proportion of F4 diagnostic categories in yearly PED visits across 2018, 2019, and 2020.
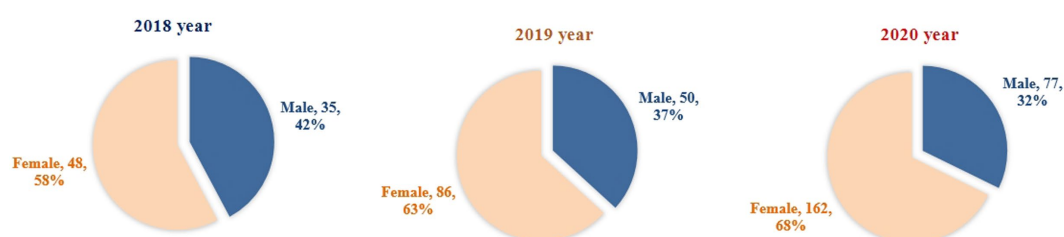
FIGURE 4

The proportion of sex in yearly F4-PED visits across 2018, 2019, and 2020.
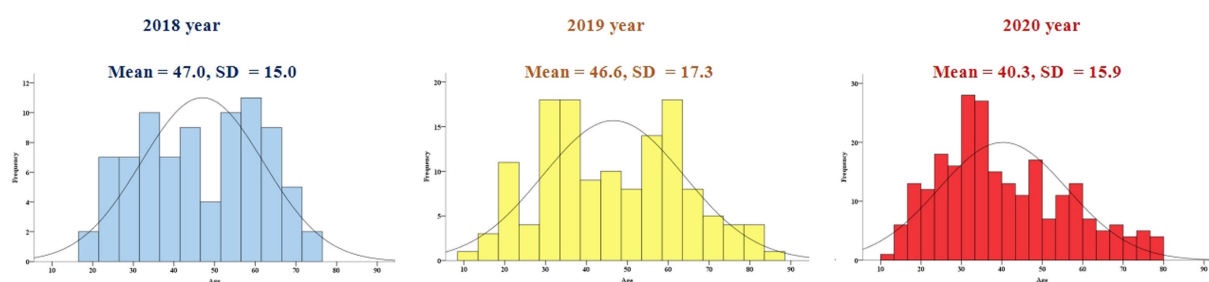
FIGURE 5

The distribution of age in yearly F4-PED visits across 2018, 2019, and 2020.

the epidemic leads to an increase in people's psychological stress and pressure (1, 5), and social isolation leads to an increase in psychological problems (25, 26). Meanwhile, the number of PED visits is reduced owing to the fear of infection. However, in the current study, under the infection rate and prevention and control measures taken at the time of the epidemic in Shanghai, the number of PED visits increased consistently. These findings confirmed the increased mental health burden and help-seeking behavior under normalized epidemic management after a relatively serious epidemic in the early stages.

Moreover, in a secondary analysis of age, our findings suggested that younger people are a vulnerable population (27, 28) to anxiety and stress disorders during the pandemic. During quarantine, children and adolescents experienced periods without school, causing decreased physical activity, more internet time, irregular sleep patterns, and less appropriate diets, which have negative and potentially prolonged effects on the psychological health of individuals (29). Teenagers who have never experienced a pandemic in their lifetime may be less mature and perhaps incapable of facing this lifestyle transformation; for instance, students had to complete their school curriculum online. Evidence suggests that reciprocal interactions between brain functions and social activities and quarantine may have negative impacts on anxiety and stress-related disorder onsets during adolescence (30).

Given the potentially serious consequences of untreated anxiety and stress-related symptoms on psychological outcomes in adolescents, interventions are urgently needed to reduce symptoms and build resilience. Before these patients seek emergency assistance, psychological interventions to prevent and treat anxiety and

stress-related disorders are effective, with cognitive behavior therapy (CBT) emerging as a front-line treatment that potentially offers additional benefits to reduce anxiety and increase social support (31, 32). To reduce the risk of spreading infections, many CBT practitioners have turned to digital therapies (33). CBT delivered via the Internet (iCBT) shows treatment effectiveness comparable to that of CBT (34, 35) and is cost-effective (36).

The present study has some limitations. First, only one site was included in this study; the data were not nationally representative, and the results may not be generalizable to populations in other areas. The degree of development of the city and epidemic scale are different. Second, given that standardized structured interviews cannot be conducted in the emergency environment, the diagnostic categories may be incomplete or inaccurate when the first visits are recorded. Third, PED visits should not be interpreted as equal to the overall mental health burden because many patients with mental disorders do not visit the PED. Fourth, some other factors, such as economic status and employment policy, which might confound the relationship between epidemic scale and PED visits, were not controlled in our study.

Conclusion

In summary, these findings suggest that the COVID-19 pandemic is associated with an increase in anxiety and stress disorders, especially in younger groups, which may require public attention and support by implementing special interventions or prevention programs (37, 38).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval for the study was obtained from the Human Research Ethics Committee at the Shanghai Mental Health Center (Ref No: 2021-14). This study should be considered a public health surveillance rather than a research study involving human subjects; therefore, informed consent was waived for these secondary data analyses. All data were anonymized before analysis.

Author contributions

TZ, ZC, XX, HW, and JW conceptualized the study, wrote the first draft of the manuscript, and conducted statistical analyses. XX, LZ, LX, and YW collected and organized the primary data. YH, HL, TC, and XT managed the literature search, statistical analyses, and edited the manuscript. XW, JW, and TZ designed the study and supervised its implementation. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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text

Evaluation of oral health-related quality of life and its association with mental health status of patients with type 2 diabetes mellitus in the post-COVID-19 pandemic era: A study from Central Saudi Arabia

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Background and objectives: The association between oral and mental health is reciprocal, in which poor oral health may lead to several mental health issues, especially among patients with diabetes. The present study evaluated oral health-related quality of life (OHRQOL) and its association with mental health conditions among patients with type 2 diabetes mellitus (T2DM) in central Saudi Arabia.

Methods: The Arabic version of the Oral Health Impact Profile-14 (OHIP-14) questionnaire and the Depression, Anxiety, and Stress Scale-21 Items (DASS-21) were used to assess the OHRQOL and mental health status of patients with diabetes. We utilized logistic regression analysis to identify the predictors of poor OHRQOL, and Spearman's correlation test to identify any correlations between OHIP-14 and overall DASS-21 scores, as well as each subscale.

Results: Of the 677 patients included in the present study, 52.7% had a poor OHRQOL, which was significantly higher (positive association) among patients with a longer duration of diabetes (adjusted odds ratio [AOR]=3.31; 95% confidence interval [CI]=1.96−4.17) and those who did not periodically monitor their oral health (AOR=2.85; 95% CI=1.76−3.89). Some forms (mild, moderate, severe, or extremely severe) of depression, anxiety, and stress were observed in 59.7, 71.1, and 67.1% of the participants, respectively. Furthermore, we found that the total OHRQOL scores had a significant positive association with depression (AOR=2.32, 95% CI=1.34−3.71, p=0.001), anxiety (AOR=1.81, 95% CI=1.22−2.79, p=0.003), and stress (AOR=1.43, 95% CI=1.14−2.19, p=0.026).

Conclusion: The results of the present study suggest the importance of appropriate and targeted health education programs for T2DM patients to ensure periodic dental examinations and oral health. Additionally, we recommend counseling

sessions for all T2DM patients with trained healthcare providers to improve their mental health status during follow-up visits at outpatient diabetes care centers.

1. Introduction

The incidence of diabetes mellitus (DM) is rapidly increasing worldwide, especially in low- and middle-income countries. As such, DM is emerging as a major public health issue worldwide, including in the Kingdom of Saudi Arabia (KSA) (1, 2). The COVID-19 pandemic has amplified this global burden, as several studies have reported an increased risk of developing diabetes among individuals who had suffered from severe acute respiratory syndrome coronavirus - 2 (SARS-CoV-2) infection (3, 4).

According to the World Health Organization (WHO), good oral health is an essential marker for general health, mental health, and health-related quality of life (5, 6), and includes tooth decay (dental caries), gum (periodontal) diseases, oral injuries, and oral cancer (6, 7). Oral health and oral health-related quality of life (OHRQOL) share several modifiable risk factors for chronic non-communicable diseases (i.e., DM, cardiovascular diseases, and cancer) (5, 8). Additionally, causal associations have been documented between DM and poor oral health (9, 10). As reported in previous studies, poor oral health eventually leads to a poor OHRQOL (10, 11), although the association between oral and mental health is reciprocal. As such, poor oral health may in turn lead to several mental health issues, such as depression, anxiety, phobia of dental treatment, or affective and/or eating disorders. Additionally, there is a prevalence of dental caries, periodontitis, tooth loss, and improper dental-care utilization in those with poor oral health (12, 13). Similarly, previous evidence has suggested that poor oral health and psychiatric disorders are associated with the development of DM, and that patients with DM are two-to-three times more at risk of developing depression than those without DM. Fewer than half of the individuals with DM who have depression and other mental disorders, however, are diagnosed and receive adequate treatment (14, 15).

During the COVID-19 pandemic, people with diabetes reported several oral health problems due to limited access to dental care, fear factors and a shortage of dental equipment and supplies (16–18). One year after the first lockdowns, dentists worldwide reported the adverse effects of the COVID-19 pandemic on oral health, such as a higher incidence of advanced periodontal diseases and tooth decay that led to decreased OHRQOL (19, 20). A study published by Ciardo et al. during the COVID -19 era reported that OHRQOL was significantly associated with the mental health status of their participants (21). Several authors stated that concerns persist regarding the long-term health effects of the COVID-19 pandemic, and its potentially significant mental health consequences are still poorly understood, especially among people with chronic illness (22, 23). A survey by Khalifa et al., which assessed OHRQOL among patients with and without Type 2 DM(T2DM) in the United Arab Emirates, indicated that among patients with T2DM, OHRQOL was significantly associated with both the social disability and handicap domains. In contrast, the handicap domain was the only domain significantly associated with non-diabetic patients (24). Another study, performed during the COVID-19 pandemic by Moradian et al., found a significant increase in the prevalence of psychiatric symptoms, namely depression, generalized anxiety, and distress, among patients with T2DM after the COVID-19 outbreak. Increased depression-related symptoms, generalized anxiety, and distress were predicted by COVID-19-related fear, whereas only higher depressive symptoms were predicted by trust in governmental actions to face COVID-19 (25).

The COVID-19 pandemic has significantly impacted the short- and long-term mental health of numerous individuals, and T2DM patients are no exception (22, 26, 27). Considering the high prevalence of T2DM in the KSA and poor oral health among them, it is critical to evaluate OHRQOL, mental health status, and predisposing factors among T2DM patients, especially in the post-COVID-19 pandemic era (28, 29). Appropriate healthcare services, therefore, can be implemented at diabetes care centers for prompt diagnosis and necessary referrals. Furthermore, necessary interventions targeting mental health among T2DM patients can be designed to improve OHRQOL and mental health simultaneously. The available literature on this subject in KSA, however, is limited. Therefore, the present study was conducted to evaluate the OHRQOL, mental health status, and associated factors among patients with T2DM in the Qassim region of KSA. We also assessed the predictive effect of T2DM patients' OHRQoL on their mental health status.

2. Participants and methods

2.1. Research design

The present quantitative cross-sectional study was conducted from August 2022 to January 2023.

2.2. Research setting

The present study was conducted in the Qassim (central) region of the KSA, one of the 13 provinces in the country, with a total population of approximately 1.4 million. In the KSA, outpatient diabetes care is provided at primary health centers (PHCs) and diabetic clinics associated with the Ministry of Health.

2.3. Inclusion and exclusion criteria

The inclusion criteria were as follows: patients with T2DM, 18–65 years of age, attending outpatient diabetes care facilities of the

Ministry of Health in the Qassim region of the KSA, and with duration of diabetes ≥1 year. The exclusion criteria were as follows: other types of DM patients pediatric patients, hospital inpatients with T2DM, and those unwilling to participate.

2.4. Sampling strategy

The required number of patients with T2DM for analysis in the present study was estimated using Cochran's equation (z^2pq/e^2), where p was the expected prevalence of 73% for some degree of depression among patients with T2DM, as stated by Aljohani et al. in 2021 (30), q was 1–0.73, and e was the margin of error at 5%. We applied all stated values to the equation and found that the minimum required sample size was 303. Furthermore, considering two different settings (diabetes clinics and PHCs) and a 10% additional sample size, the research team concluded that the required minimum sample size was 677. The present study used a consecutive sampling method to obtain the required number of patients. Using this technique, we consecutively invited every 5th T2DM patient from the outpatient diabetes care facilities to participate in the study until we obtained the minimum required sample ($n = 677$). A total of 805 participants were invited for the present study. Every 5th patient recruitment strategy was selected after a focus group discussion with the physicians at the diabetes care facilities to avoid the possibility of patients from the same family sharing the same sociodemographic background characteristics. Furthermore, we restricted the maximum per day to 10 patients from each type of facility to enroll patients over a longer period of time.

2.5. Data collection method

First, we explained the purpose of the present study to patients with T2DM, and obtained informed consent from those who were willing to participate. We collected anonymized participant data using an Arabic version of the survey, and validated the data collection protocol, which consisted of three sections. The first section gathered data regarding the participants' age, gender, smoking status, educational status, occupational status, associated comorbidities, and oral health-related behaviors. The second section consisted of the administration of the Oral Health Impact Profile-14 (OHIP-14) questionnaire, which is a validated and reliable tool (Cronbach's alpha (α) > 0.70) used to evaluate OHRQOL in a variety of settings, including Arab countries (31–33). The psychometric properties of the Arabic version of the OHIP-14 are described below. Cronbach's α, which measures internal consistency, was 0.89 (high). Additionally, the test–retest correlation coefficient was highly acceptable for each item (0.81–0.97) and subscale score (0.85–0.97). These values indicate that the OHIP-14 is reproducible and can be used in a variety of settings. Furthermore, the OHIP-14 has adequate internal consistency and discriminant validity for all subscales. The OHIP-14 assesses 7 domains, including functional constraints, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap, using 14 questions. The study patients used a 5-point Likert scale, ranging from "never" to "very often," to answer all 14 questions, and we scored each item from 0 to 4, accordingly. We combined all domains and categorized them as having a poor or

good OHRQoL, according to the threshold demarcation value formula [(total highest score − total lowest score)/2 + total lowest score]. The highest total OHIP-14 score was 54, and the lowest total score was 6. The cutoff value, therefore, was set as 30 to categorize patients as having a poor (≥30) or good (<30) OHRQOL. Furthermore, a higher total OHIP-14 score indicates poorer OHRQoL. The third and final section consisted of the Depression, Anxiety, and Stress Scale-21 Items (DASS-21), a self-reported scale utilized to evaluate the emotional states of depression, anxiety, and stress. Each of the DASS-21 subscales is comprised of seven items. Similar to the OHIP-14, the DASS-21 scale is a validated and reliable tool used in a variety of settings worldwide, including in Arab countries. The Arabic version of the DASS-21 tool showed high internal consistency (α = 0.94), and the internal reliability coefficients for the depression, anxiety, and stress subscales were 0.88, 0.81, and 0.89, respectively (34–37). The study patients responded on a 4-point Likert scale, ranging from "did not apply to me at all" (score, 0) to "applied to me most of the time" (score, 3). The total DASS-21 scores and each subscale were combined, and categorized as normal, mild, moderate, severe, or extremely severe (36, 38).

2.6. Data analysis

The research team used the Statistical Package for Social Science (SPSS, version 21) to code and analyze the anonymized data of patients with T2DM related to oral health and mental health. Descriptive results are presented as frequencies, proportions, means, standard deviations (SDs), medians, and interquartile ranges (IQRs). We utilized binary logistic regression analysis (poor vs. good) to identify predictors of poor OHRQoL and to find the predictive effect of OHRQOL on the mental health of T2DM patients. An adjusted odds ratio (AOR) with a confidence interval (CI) that did not include a null value of one was considered a significant predictor. During the data curation and normality assumption analysis, we found that the OHIP-14 and DASS-21 scores did not meet the normality assumption (Shapiro–Wilk test). We, therefore, utilized the Kruskal-Wallis (for categorical variables), Mann–Whitney U (for dichotomous variables), and Spearman's correlation tests to identify the correlations between the OHIP-14 scores and the total DASS-21 scores as well as each subscale. The significance ($p < 0.05$) value was interpreted based on two-tailed tests.

3. Results

During the data collection period, 805 eligible patients with T2DM were contacted, of whom 677 (required sample size for the present study) consented to participate in the present survey (response rate 84.09%).

Of the 677 patients, the majority (44.2%) were 40–50 years old, males (52.9%), studied at the university level (62.0%), married (89.2%), had a monthly income >7,000 Saudi Riyal (SAR [1 USD = 3.75 SAR]) (42.1%), and were non-smokers (78.4%). When assessing oral health-related behaviors, 57.9% brushed their teeth at least once per day, although approximately one-fourth (23.8%) missed periodic dental check-ups and 18.3% perceived their oral health as either poor or fair (Table 1).

TABLE 1 Background and oral health related characteristics of the study population ($n=677$).

Characteristics	Number	%
Age (mean ± SD)	46.7 ± 9.2	
Less than 40 years	169	25.0
40 to 50 years	299	44.2
More than 50 years	209	30.9
Gender		
Male	358	52.9
Female	319	47.1
Occupation#		
Government	171	25.3
Private	388	57.3
Unemployed	118	17.4
Education level		
Up to high school	257	38.0
University (UG and PG)	420	62.0
Marital status		
Married	604	89.2
Single	73	10.8
Monthly income (1 USD = 3.75 SAR)		
Up to 5,000 SAR	109	16.1
5,000 to 7,000 SAR	283	41.8
More than 7,000 SAR	285	42.1
Presence of other chronic illness		
No	454	67.1
Yes	223	32.9
Duration of Diabetes (mean ± SD)	8.32 ± 4.5	
Smoking status (including shisha)		
No	531	78.4
Yes	146	21.6
Brushing teeth (per day)		
Once or less	285	42.1
Twice or more	392	57.9
Dental health checkup by the dentist (every 6 months)		
No	161	23.8
Yes	516	76.2
Perception on their oral health		
Excellent	45	6.6
Very good	197	29.1
Good	311	45.9
Fair	121	17.9
Poor	3	0.4

#Government – Currently working in any of the government sector departments of KSA; private - currently working in private sectors, self-employed/business; Unemployed – Currently not working in any job.

When looking at the data analyzed related to the OHIP-14 profile, more than one-third (36.7%) of the participants often (fairly and very) had worsened taste, and 11.4% very often had discomfort in eating daily food. Similarly, 1.3% of participants very often felt embarrassed of their oral health (Table 2).

Among the study participants, 357 (52.7%) had poor OHRQoL, which was significantly higher (positive association) among patients >50 years of age (AOR = 2.57; 95% CI = 1.65–4.08; $p = 0.001$) and those with a longer duration of diabetes (AOR = 3.31; 95% CI = 1.96–4.17; $p = 0.017$). Poor OHRQoL was significantly lower (negative association) among patients working in the private sector (AOR = 0.59; 95% CI = 0.44–0.82; $p = 0.017$), and those with a university-level or higher education (AOR = 0.71; 95% CI = 0.53–0.94; $p = 0.006$) (Table 3).

The distribution of mental health symptoms in patients with T2DM, based on the results of the DASS-21, are presented in Table 4. Some form (mild, moderate, severe, or extremely severe) of depression, anxiety, and/or stress were observed in 59.7, 71.1, and 67.1% of all included participants, respectively.

The DASS-21 depression subscale scores were significantly associated with gender ($p = 0.001$), occupation ($p = 0.045$), and smoking status ($p = 0.017$); the anxiety subscale scores were significantly associated with age ($p = 0.001$), gender ($p < 0.001$), education status (0.029), and presence of another chronic illness ($p = 0.001$); the stress subscale was significantly related to gender ($p < 0.001$), work status ($p = 0.001$), and smoking status ($p = 0.001$) (Table 5).

Spearman's correlation test revealed a significant positive correlation between the OHIP-14 score and the total DASS-21 score (rho = 0.247; $p < 0.001$), as well as the depression (rho = 0.251; $p < 0.001$), anxiety (rho = 0.188; $p = 0.001$), and stress (rho = 0.152; $p = 0.003$) subscales (Table 6).

We applied binomial logistic regression analysis to find the predictive effect of OHRQOL on the mental health status of T2DM patients. After adjusting with other covariables of the present study, we found that the total OHRQOL scores assessed by the OHIP-14 had a significant positive association with depression (AOR = 2.32, 95% CI = 1.34–3.71, $p = 0.001$), anxiety (AOR = 1.81, 95% CI = 1.22–2.79, $p = 0.003$), and stress (AOR = 1.43, 95% CI = 1.14–2.19, $p = 0.026$) (Table 7).

4. Discussion

The COVID-19 pandemic has significantly impacted the short- and long-term mental health of numerous individuals, and T2DM patients are no exception. The WHO celebrated "World Mental Health Day" on October 10th, and the theme for 2022 was "Making Mental Health & Well-Being for All a Global Priority." The WHO's priority for global health needs can be achieved by assessing the burden of mental health issues, including in patients with T2DM (39). These statements reinforce the importance of the present study in the post-COVID-19 pandemic times, in which we evaluated the OHRQoL and mental health status of, and their associated factors among, patients with T2DM attending outpatient diabetes care centers in the Qassim region of the KSA.

Oral health status and OHRQoL are critical in evaluating the mental health status of patients with T2DM, as there is no proper mental health without good oral health (12, 40). In the present study, we found that nearly one-fourth (23.8%) of the participants did not obtain periodic check-ups by a dental care provider, and that approximately half (52.7%) of the participants had a poor OHRQoL. The results of a recent study by Kumari et al., performed in

TABLE 2 Diabetes patients responses related to oral health impact profile – 14 (OHIP – 14) assessment (*n*=677).

Domains	Items	Never *n* (%)	Hardly ever *n* (%)	Occasionally *n* (%)	Fairly often *n* (%)	Very often *n* (%)
Functional limitations	Trouble pronouncing words	22 (3.2)	40 (5.9)	139 (20.5)	283 (41.8)	193 (28.5)
	Worsened sense of taste	4 (0.6)	134 (19.8)	290 (42.8)	174 (25.7)	75 (11.1)
Physical pain	Painful aching in mouth	4 (0.6)	137 (20.2)	282 (41.7)	163 (24.1)	91 (13.4)
	Uncomfortable to eat food	17 (2.5)	114 (16.8)	265 (39.1)	204 (30.1)	77 (11.4)
Psychological discomfort	Being self-conscious	26 (3.8)	131 (19.4)	223 (32.9)	213 (31.5)	84 (12.4)
	Feeling tense	22 (3.2)	128 (18.9)	264 (39.0)	200 (29.5)	63 (9.3)
Physical disability	Unsatisfactory diet	23 (3.4)	142 (21.0)	292 (43.1)	114 (16.8)	106 (15.7)
	Interrupting meals	21 (3.1)	110 (16.2)	234 (34.6)	221 (32.6)	91 (13.4)
Psychological disability	Embarrassed	61 (9.0)	62 (9.2)	241 (35.6)	230 (34.0)	83 (12.3)
	Difficulty relaxing	11 (1.6)	195 (28.8)	211 (31.2)	171 (25.3)	89 (13.1)
Social disability	Irritable with other people	27 (4.0)	100 (14.8)	333 (49.2)	142 (21.0)	75 (11.1)
	Constrains doing routine jobs	25 (3.7)	192 (28.4)	178 (26.3)	205 (30.3)	77 (11.4)
Handicap	Life is less satisfying	29 (4.3)	146 (21.6)	284 (41.9)	149 (22.0)	69 (10.2)
	Unable to function	39 (5.8)	139 (20.5)	272 (40.2)	131 (19.4)	96 (14.2)

2020, indicated that 42.5% of patients with T2DM had a low OHRQoL (41). Interestingly, a study that assessed the OHRQoL of Iranian patients before the COVID-19 pandemic showed a much lower proportion of patients with poor OHRQoL (42). The wide variation among these studies is due to differences in study settings, OHIP assessment tools, and participants' diabetes status. The present study used the OHIP-14 questionnaire to assess adult patients with T2DM. Irrespective of the variations in the OHRQOL in different settings, Cervino et al. affirmed that the presence of DM significantly decreases the OHRQoL and psychological alteration among patients with DM (43).

The results of the present study indicated that in patients with T2DM, OHRQoL was significantly associated with age and educational status. Similar to the results of the present study, Sandberg et al. reported that age was a critical factor for poor OHRQoL in several domains among patients with T2DM who participated in their study (44). An epidemiological survey by Kakoei et al. showed an association between oral health, blood sugar levels, and OHRQoL among the participants of their study (45). The results of the present study indicated that the incidence of poor OHRQoL was significantly lower (protective factor) in highly educated T2DM patients (AOR = 0.61; 95% CI = 0.43–0.87; *p* = 0.006). Similar to the results of the present study, Kumari et al. also found a protective relationship between educational status and OHRQoL among patients with T2DM (AOR = 0.51; 95% CI = 0.27–0.97; *p* = 0.041) (41). Another predictor of poor OHRQOL in patients with T2DM was a lack of periodic oral check-ups by dental care providers. As shown by several authors, regular oral examinations and care by dental physicians might lead to improved oral health and, therefore, OHRQOL (24, 46, 47). In the present study, however, we observed that 23.8% of participants did not regularly obtain check-ups by dental care providers. Sadeghi et al. explored a similar association between OHRQOL and dental check-ups (42).

The results of the present study indicated that some form (mild, moderate, severe, and extremely severe) of depression, anxiety, and stress were observed in 59.7, 71.1, and 67.1% of patients with T2DM,

respectively. Similarly, a recent study performed by Aljohani et al. in the KSA reported that a higher proportion (73%) of patients with T2DM had some degree of depression (30). Some possible explanations for these discrepant results are the length or concurrent events of the study period and the tools used to assess depression status, which varied between the studies. Aljohani et al. collected data during the height of the COVID-19 restrictions, *via* a patient health questionnaire (nine questions). A study performed by Mukrim et al. before the COVID-19 pandemic in the northern region of the KSA reported much lower levels of depression (37.4%) and anxiety (45.6%) among patients with T2DM (48). Similarly, Sharma et al. analyzed data collected before COVID-19 from patients with T2DM, and found that depression and anxiety were reported by 57.8 and 49.7% of their study participants, respectively (49). It is worth mentioning, again, that the results of the present study and those from other studies performed during and in the post-COVID-19 pandemic affirm the short- and long-term impacts of the COVID-19 pandemic, and the need for the continuous assessment of mental health status and related factors to ensure the WHO's mental health activities targets are met (39).

The results of present study indicated that T2DM patients' depression status was significantly associated with age, gender, duration of diabetes, and smoking status; anxiety was significantly associated with age and the presence of other chronic illnesses; and stress was significantly associated with income and smoking status. Additionally, the results of the present study indicated that the median scores of all DASS-21 subscales were considerably higher among unemployed participants. Similar to the present study, a recent study by Birhanu et al., performed in 2022, reported that female sex and duration of diabetes (>5 years) were significant predictors of depression among patients with T2DM (50). Another study, involving Malaysian patients with T2DM, found that comorbid anxiety disorders were significantly lower among older patients (AOR = 0.96; 95% CI = 0.93–0.98), and a recent cross-sectional study by Karpha et al. performed in 2022, showed that anxiety was significantly associated with marital status, educational status, and T2DM-related

TABLE 3 Predictors of OHRQOL among diabetes patients (*n*=677).

Characteristics	Total (*n*=677)	OHRQOL		Binomial logistic regression	
		Poor (*n*=357)	Good (*n*=320)	Adjusted OR [AOR] (95% CI)	*p* value
Age group					
Less than 40 years	169	112	57	Ref	
40 to 50 years	299	162	137	1.67 (1.10–2.54)	0.016*
More than 50 years	209	83	126	2.57 (1.65–4.08)	0.001*
Gender					
Male	358	173	185	Ref	0.262
Female	319	184	135	0.82 (0.58–1.16)	
Occupation#					
Government	171	80	91	Ref	
Private	388	214	174	0.59 (0.44–0.82)	0.017*
Unemployed	118	63	55	0.67 (0.38–1.18)	0.162
Education level					
Up to high school	257	120	137	Ref	0.006*
University (UG and PG)	420	237	183	0.71 (0.53–0.94)	
Marital status					
Married	603	321	282	Ref	0.713
Single	74	36	38	1.31 (0.48–1.66)	
Monthly income (1 USD = 3.75 SAR)					
Up to 5,000 SAR	109	70	39	Ref	
5,000 to 7,000 SAR	283	188	95	0.96 (0.55–1.68)	0.896
More than 7,000 SAR	285	99	186	0.81 (0.58–1.62)	0.071
Presence of other chronic illness					
No	454	234	220	Ref	
Yes	223	123	100	0.84 (0.57–1.22)	0.353
Duration of diabetes		8.32 ± 4.5		3.31 (1.96–4.17)	0.001*
Smoking status (including shisha)					
No	531	281	250	Ref	0.327
Yes	146	76	70	0.81 (0.53–1.24)	
Dental health checkup by the dentist (every 6 months)					
No	161	110	51	Ref	
Yes	516	247	269	2.85 (1.76–3.98)	0.007*

*Significant (*p* < 0.05) values.

#Government – Currently working in any of the government sector departments of KSA; private - currently working in private sectors, self-employed/business; Unemployed – Currently not working in any job.

TABLE 4 Mental health status of the participants assessed by the Depression, Anxiety and Stress Scale − 21 (DASS − 21) (*n*=677).

Status	Depression *n* (%)	Anxiety *n* (%)	Stress *n* (%)
Normal	273 (40.3)	196 (28.9)	223 (32.9)
Mild	171 (25.3)	241 (35.6)	179 (26.4)
Moderate	130 (19.2)	171 (25.3)	144 (21.3)
Severe	63 (9.3)	27 (4.0)	62 (9.2)
Extremely severe	40 (5.9)	42 (6.2)	69 (10.2)

complications (51, 52). Similar to the result of the present study of patients with T2DM, a study conducted in Egypt during the COVID-19 pandemic found that distress among T2DM patients was significantly associated with lower income and educational status (53). Another critical finding explored in the present study was the significant positive correlation between the OHIP-14 scores and the total DASS scores, as well as all three subscales, which indicated that higher OHIP-14 scores, which were associated with a poor OHRQoL, may lead to higher odds of developing depression, anxiety, and stress. Furthermore, the present study's multivariable analysis also confirmed the predictive effect of OHRQOL on the mental health status of

TABLE 5 Patients characteristics and its association with total and each subscale of DASS-21 (*n*=677).

Variables	DASS 21 – Total		Depression		Anxiety		Stress	
	Median (IQR)	Value of *p*	Median (IQR)	Value of *p*	Median (IQR)	Value of *p*	Median (IQR)	Value of *p*
Overall	27 (11)		10 (3)		9 (4)		9 (5)	
Age group**								
Less than 40 years	26 (12)	0.006*	9 (5)	0.200	10 (4)	0.001*	8 (6)	0.063
40 to 50 years	28 (11)		9 (4)		9 (3)		9 (6)	
More than 50 years	28 (7)		10 (3)		8 (4)		10 (5)	
Gender***								
Male	29 (9)	0.001*	10 (3)	0.001*	10 (4)	<0.001*	10 (5)	<0.001*
Female	27 (10)		9 (3)		9 (5)		8 (5)	
Occupation#/**								
Government	27 (13)	0.038*	8 (4)	0.045*	8 (7)	0.173	9 (5)	0.001*
Private unemployed	27 (9)		10 (3)		10 (4)		8 (4)	
	33 (10)		10 (4)		9 (5)		12 (4)	
Education level***								
Up to high school	27 (11)	0.309	10 (4)	0.547	10 (5)	0.029*	9 (6)	0.217
University (UG and PG)	27 (10)		10 (3)		9 (3)		9 (6)	
Marital status***								
Married	27 (10)	0.012*	9 (3)	0.249	9 (4)	0.081	10 (3)	0.181
Single	28 (9)		10 (4)		9 (3)		9 (5)	
Monthly income in SAR (1 USD = 3.75 SAR)**								
Up to 5,000	27 (8)	0.093	8 (4)	0.104	10 (5)	0.298	10 (5)	0.031*
5,000 to 7,000	27 (10)		10 (4)		9 (4)		8 (6)	
More than 7,000	28 (10)		10 (3)		10 (4)		8 (5)	
Presence of chronic illness***								
No	28 (7)	0.347	9 (3)	0.217	10 (4)	0.001*	10 (5)	0.027*
Yes	30 (12)		10 (5)		9 (5)		10 (4)	
Smoking status (including shisha)***								
No	27 (10)	0.017*	8 (6)	0.240	9 (4)	0.179	8 (5)	0.001*
Yes	32 (12)		10 (3)		11 (4)		11 (7)	

*Significant value, **Test applied: Kruskal Wallis, ***Test applied: Mann–Whitney U test. #Government – Currently working in any of the government sector departments of KSA; private - currently working in private sectors, self-employed/business; Unemployed – Currently not working in any job.

TABLE 6 Correlation between OHIP-14 scores with the total and each subscale of DASS-21 (*n*=677).

Correlation variables	Spearman's rho value	*p* – value*
OHIP-14 and depression	0.251	<0.001
OHIP-14 and anxiety	0.188	0.001
OHIP-14 and stress	0.152	0.003
OHIP-14 and DASS-21 total score	0.247	<0.001

p – value less than 0.05 (two-tailed) is significant.

diabetes patients. A study conducted by Sandberg et al. that assessed oral health and diabetes status on the health-related quality of life reported similar findings to the present study (44). A recent survey by Hajek et al. also found similar results. In their study, the participants with poor OHRQOL were likely to develop depression and anxiety among both genders (54). Another survey conducted during COVID-19, which evaluated the impact of the COVID-19 pandemic on oral health and psychological factors, stated that during COVID-19 pandemic indicated a positive association (21).

The present study evaluated the OHRQoL of patients with T2DM living in the central region of the KSA, and its association with mental health, using a standardized methodology and a validated tool. The authors would like to mention, however, the limitations of the present study. We utilized a quantitative cross-sectional study design among patients with T2DM from outpatient clinics; therefore, the results of the present study may not apply to all patients with DM. Second, the cross-sectional study design used in the present study might not have detected a causal relationship between the risk factors and outcome, or behaviors over the study period. Another limitation of the cross-sectional study protocol is that we could not identify a temporal association between OHRQOL and mental health status in patients with DM. Third,

TABLE 7 The predictive effect of OHRQOL on mental health status of diabetes patients (n=677).

Characteristics	Logistic regression values	Depression*	Anxiety*	Stress*
OHIP-14 Score (total)	AOR**	2.32	1.81	1.43
	95% CI of AOR	1.34–3.71	1.22–2.79	1.14–2.19
	value of p (two-tailed)	0.001	0.003	0.026

*Normal versus other forms of mental health subscales according to the DASS-21 instrument.

**Adjusted variables: Age, gender, occupation, educational status, marital status, monthly income, presence of chronic illness, and smoking status.

questionnaire-based survey-related biases, such as recall, exaggeration, and self-reported bias, cannot be excluded in our results. Finally, we conducted the present study based on patients living in the central portion of the KSA. The findings, therefore, may not reflect the OHRQOL and mental health status of all patients with DM in the KSA as a whole. Therefore, an exploratory prospective survey aiming to evaluate the qualitative aspects and temporal association between OHRQOL and the mental health status of T2DM and other types of diabetes patients should be conducted in all regions of the KSA.

5. Conclusion

The results of the present study indicated that more than half of the patients with T2DM had a poor OHRQOL, which was significantly associated with age and educational status. We identified that nearly one-fourth of the patients with T2DM obtain regular check-ups of their oral status with a dentist, and that a high proportion of participants had depression, anxiety, and/or stress. Furthermore, we found a significant positive correlation between the OHIP-14 scores and each of the DASS-21 subscales, indicating that a higher OHRQOL can improve the mental health status of patients with T2DM. The results of the present study suggest the need for appropriate and targeted health education programs for patients with T2DM on the importance of periodic dental examinations and oral health. Additionally, we recommended, during follow-up visits at outpatient diabetes care centers, that all T2DM patients seek counselling with trained healthcare providers to improve their mental health status.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Regional Research Ethics Committee, Qassim Health

Affairs. The patients/participants provided their written informed consent to participate in this study.

Author contributions

AT, MA, MS, AHA, and LA made substantial contribution in conceptualization and design of the present study. AT, MA, BA, AAA, ASA, and RA involved in acquisition of the data. MA, AT, ASA, and LA involved in data entry. AT, MS, AHA, BA, AAA, ASA, and RA involved in analysis and interpretation of the data. AT involved in drafting the article, with all other authors involved in critically revising the manuscript. All authors approved the final version of the manuscript to be published and agreed to be held accountable for all aspects of the work.

Acknowledgments

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychometric properties of the traditional Chinese version of the COVID Stress Scales in Hong Kong

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Introduction: The COVID Stress Scales (CSS) assess six domains of COVID-19-related stress, including (a) COVID danger, (b) COVID socioeconomic consequences, (c) COVID xenophobia, (d) COVID contamination, (e) COVID traumatic stress symptoms, and (f) COVID compulsive checking. Although the CSS have been validated in various cultural contexts, their psychometric properties in Hong Kong have not been examined. This study endeavors to validate the traditional Chinese version of the 36-item CSS (CSS-36) and the 18-item CSS (CSS-18) in Hong Kong.

Method: Participants were 521 Hong Kong undergraduate students (61% female) aged from 18 to 26 years ($M = 20.65$, $SD = 1.56$). An online questionnaire was used for data collection.

Results: The results of confirmatory factor analyses supported a six-factor structure for both the CSS-36 and the CSS-18. Multiple-group confirmatory factor analyses established the gender invariance of the six-factor model for both the CSS-36 and the CSS-18. The CSS-36 and the CSS-18 exhibited good internal consistency reliability and concurrent validity with fear of COVID-19 and negative emotional states.

Discussion: The findings offer evidence for the psychometric properties of the traditional Chinese version of the CSS-36 and the CSS-18 in the Hong Kong context.

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has exerted long-lasting impacts on multiple domains of health (1–3). The first COVID-19 case was identified in Wuhan, China in December 2019 (4, 5). This disease was later declared by the World Health Organization (6) as a pandemic on 11 March 2020.

On top of its detrimental impacts on physical health (1–3), the COVID-19 pandemic has also undermined people's mental health (7), and elevated levels of stress, fear, and anxiety were common in the general population during pandemics [e.g., (8–10)]. A systematic review of studies documented that stress was prevalent across countries during the COVID-19 pandemic (11). The rate of psychological distress rose up to 8 times since the outbreak (12). Stress related to COVID-19 has emerged as a major public health issue during the pandemic (8–11).

COVID Stress Scales

Taylor et al. (13) developed the COVID-19 Stress Scales (CSS) to assess stress related to COVID-19. The CSS consist of 36 items measuring six domains of COVID-19-related stress: (a) fear of the danger of COVID-19 (COVID danger), (b) fear of the socioeconomic consequences of COVID-19 (COVID socioeconomic consequences), (c) fear that foreigners might carry COVID-19 (COVID xenophobia), (d) fear of sources of contamination related to COVID-19 (COVID contamination), (e) traumatic stress symptoms related to COVID-19 (COVID traumatic stress symptoms), and (f) compulsive checking and reassurance seeking related to COVID-19 (COVID compulsive checking). Most studies on the CSS have supported a six-factor structure (5, 14–18). Other studies have identified a five-factor structure, in which the items measuring COVID danger and COVID contamination were combined into a factor of COVID danger and contamination (13, 19, 20). The CSS have exhibited good concurrent validity with constructs such as fear of COVID-19 (16, 18, 21), depression, anxiety, stress (14, 16, 18), health anxiety, posttraumatic stress disorder symptoms, and compulsive washing (15).

The original English version of the CSS was first validated in the Canadian and American populations (13). Subsequently, the CSS have been translated into various languages and have demonstrated adequate psychometric properties in different cultural contexts such as Germany (15), Egypt (19), Iran (20), Mainland China (18), the Netherlands (21), Palestine (16), Poland (21), Saudi Arabia (19), Serbia (17), Spain (5), and Sweden (14). However, the psychometric properties of the CSS in Hong Kong have not been examined. Although Xia et al. (18) validated the simplified Chinese version of the CSS in Mainland China, simplified Chinese instruments may not be entirely applicable in the Hong Kong context because of linguistic and cultural differences (22, 23). While simplified Chinese is the official written language in Mainland China, traditional Chinese is the official written language in Hong Kong. Because of cultural and historical reasons, simplified Chinese and traditional Chinese have different writing systems and are not regarded as interchangeable (24). Moreover, there are cultural differences between Hong Kong and Mainland China, and Mainland Chinese generally perceive Hong Kong people as more Westernized than them (25, 26). Therefore, it is necessary to develop a traditional Chinese version of the CSS and investigate its psychometric properties in Hong Kong.

Besides, the gender invariance of the CSS has rarely been examined, although females tended to experience higher levels of fear and anxiety of COVID-19 (12). Nonetheless, group differences cannot be interpreted unambiguously without establishing factorial invariance (27). Hence, examining the gender invariance of the CSS is crucial for understanding gender differences in COVID-19-related stress. The study by Noe-Grijalva et al. (5) supported the gender invariance for the Spanish version of the CSS. It is of theoretical interest to examine whether the CSS are invariant across gender among people in Hong Kong.

One disadvantage of the original 36-item CSS (CSS-36) is that the scales are relatively lengthy (28). Thibault et al. (28) recently validated an 18-item CSS (CSS-18) in Canadian university students.

This brief version provides researchers with an option to save time and lower participants' fatigue without compromising the psychometric properties. Further validation studies on the CSS-18 in other languages are needed.

The current study

Hong Kong had low COVID-19 infection and death rates until the outbreak of the Omicron variant in early 2022. The high population density of Hong Kong has implied a very high contagion risk (29). The coping responses (e.g., panic buying) observed in Hong Kong residents are considered maladaptive and anxiety provoking (30), and might lead to an elevated level of stress among Hong Kong people. It is timely to understand COVID-19-related stress among Hong Kong people.

During the COVID-19 outbreak, students worldwide have experienced high levels of stress (11). Research has shown that younger age and student status were significant risk factors for greater distress during the COVID-19 pandemic (11). Students have experienced decreased wellbeing and increased emotional problems after the COVID-19 outbreak (31–33). More than one tenth of undergraduate and graduate students had high levels of COVID-19 fear and psychological symptoms but low levels of resilience (10). The COVID-19-related stress and mental health of students deserve special attention. However, the COVID-19-related stress of students has not been well studied in the context of Hong Kong and further research is needed.

The primary goal of the current study is to validate the traditional Chinese version of the CSS-36 (13) and the CSS-18 (28) in a sample of undergraduate students in Hong Kong. First, we examined the factor structure of the CSS. Specifically, the five-factor (13, 19, 20) and six-factor models (5, 14, 16, 17) identified in past studies were tested. Second, we investigated the factorial invariance of the CSS across gender. Third, we examined the internal consistency reliability of the CSS. Fourth, we investigated the concurrent validity of the CSS by investigating their relationships with fear of COVID-19 and negative emotional states (depression, anxiety, and stress), which are conceptually and empirically related to the CSS domains (16).

Method

Participants and procedure

Participants were 521 undergraduate students from a local university in Hong Kong. The data were collected in June 2022. Inclusion criteria included undergraduate students in Hong Kong and the ability to read traditional Chinese. Exclusion criteria included age under 18 years and the inability to provide informed consent. The participants were recruited from a local university in Hong Kong. All undergraduate students from the university were invited through a mass email to participate in the present study. An online questionnaire was used for data collection. Each eligible participant received a unique and personal link. Informed consent was obtained from the participants prior to their participation in

the study. Participation was on a voluntary basis. Each participant received a monetary incentive of $50 HKD (∼$6.4 USD) for completing the survey.

Measures

COVID-19-related stress

The CSS (13) were used to measure the levels of COVID-19-related stress. Following Hambleton's (34) guidelines of test translation and adaptation, the original English items of the CSS were first translated into traditional Chinese by a translator and then back-translated to English by another translator to ensure conceptual equivalence and accuracy. The traditional Chinese items are presented in the Supplementary material Table 1. The CSS assess six domains of COVID-19-related stress, including (a) COVID danger, (b) COVID economic consequences, (c) COVID xenophobia, (d) COVID contamination, (e) COVID traumatic stress symptoms, and (f) COVID compulsive checking. Each domain is measured by 6 items in the CSS-36 (13) and by 3 items in the CSS-18 (28). Each item is rated on a 5-point scale ranging from 0 to 4.

Fear of COVID-19

Participants' fear of COVID-19 was assessed using the Fear of COVID-19 Scale [FCV-19S; (35)]. This instrument comprises seven items (e.g., "I am most afraid of coronavirus-19"). All items are rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). This study adopted the Chinese verison of the FCV-19S validated by Chi et al. (36).

Negative emotional states

The 21-item Depression Anxiety Stress Scales [DASS-21; (37)] was used to measure participants' levels of negative emotional states. The DASS-21 consists of three subscales, including depression (seven items), anxiety (seven items), and stress (seven items). Each item is scored on a 4-point scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much*). This study employed the Chinese version of the DASS validated by Taouk et al. (38).

Data analysis

To investigate the factor structure of the CSS-36 and the CSS-18 in Hong Kong, CFAs were conducted using LISREL 8.80. The five-factor and six-factor models identified in prior studies were examined. Besides, an alternative one-factor model in which all items were loaded on a general factor was also tested. The model fit was evaluated with a combination of fit indices. A RMSEA value <0.10 represents an acceptable fit and <0.08 represents a satisfactory fit (39). A CFI > 0.95 and a NNFI > 0.95 indicate an adequate model fit (40). The Akaike information criterion (AIC) was adopted to compare the goodness-of-fit of the models. The

AIC can compare nested or non-nested model, and a smaller value reflects a superior model fit (41).

To examine the gender invariance of the six-factor models for the CSS-36 and the CSS-18 in Hong Kong, multiple-group CFAs were performed using LISREL 8.80. A series of hierarchical steps were taken to evaluate factorial invariance (27). To assess configural invariance, the factor model without cross-group equality constraints was estimated across the two gender groups. Subsequently, equality constraints were imposed on the factor loadings (metric invariance), item intercepts (scalar invariance), error variances (error variance invariance), factor variances (factor variance invariance), and factor covariances (factor covariance invariance) across the two gender groups. Concerning model comparison, as the chi-square difference test is sensitive to sample size and excessively stringent, the change in CFI (ΔCFI) was used to examine gender invariance (27). A decrease in CFI > 0.01 reflects a significant decline in the model fit (27).

Results

Demographic characteristics

Among the 521 participants, there were 203 males (39.0%) and 318 females (61.0%). Their age ranged from 18 to 26 years ($M = 20.65$, $SD = 1.56$). They were from different faculties including arts ($n = 218$, 41.8%), business ($n = 156$, 29.9%), social sciences ($n = 144$, 27.6%), and others ($n = 3$, 0.6%).

Confirmatory factor analysis

Since the tests of multivariate skewness and kurtosis indicated that the data did not follow multivariate normality ($ps < 0.001$), the robust maximum likelihood (RML) estimation was employed, and the Satorra-Bentler scaled χ^2 (S-Bχ^2) statistics were calculated to adjust for the non-normal distribution.

Table 1 presents results of CFAs for the CSS-36. The one-factor model failed to achieve a good model fit. The five-factor model fitted the data reasonably well, S-Bχ^2 (584, $N = 521$) = 2601.47, $p < 0.001$, RMSEA = 0.081, 90% CI [0.078, 0.085], CFI = 0.976, NNFI = 0.974, AIC = 2765.47. The six-factor model demonstrated a satisfactory model fit, S-Bχ^2 (579, $N = 521$) = 2106.96, $p < 0.001$, RMSEA = 0.071, 90% CI [0.068, 0.075], CFI = 0.982, NNFI = 0.980, AIC = 2280.96. Moreover, the smallest AIC value was found for the six-factor model, indicating that it had the best model fit. The six-factor model was selected as the final model. As presented in Table 2, all standardized factor loadings were stronger than 0.30 ($ps < 0.001$), and significant correlations were found among the six factors ($rs = 0.61$ to 0.85, $ps < 0.001$).

The results of CFAs for the CSS-18 are presented in Table 1. The one-factor model did not exhibit a good model fit. The five-factor model showed an acceptable model fit, S-Bχ^2 (125, $N = 521$) = 552.65, $p < 0.001$, RMSEA = 0.081, 90% CI [0.074, 0.088], CFI = 0.979, NNFI = 0.974, AIC = 664.65. The six-factor model attained an adequate model fit, S-Bχ^2 (120, $N = 521$) = 421.99, $p < 0.001$, RMSEA = 0.070, 90% CI [0.062, 0.077], CFI = 0.985, NNFI =

TABLE 1 Confirmatory factor analyses.

Model	S-Bχ^2	df	RMSEA [90% CI]	CFI	NNFI	AIC
36-item COVID Stress Scales						
1-factor model	7763.69***	594	0.152 [0.149, 0.155]	0.913	0.908	7907.69
5-factor model	2601.47***	584	0.082 [0.078, 0.085]	0.976	0.974	2765.47
6-factor model	2106.96***	579	0.071 [0.068, 0.075]	0.982	0.980	2280.96
18-item COVID Stress Scales						
1-factor model	1900.95***	135	0.159 [0.152, 0.165]	0.911	0.905	1972.95
5-factor model	552.65***	125	0.081 [0.074, 0.088]	0.979	0.974	644.65
6-factor model	421.99***	120	0.070 [0.062, 0.077]	0.985	0.981	523.99

***p < 0.001.

0.981, AIC = 523.99. The six-factor model had the smallest AIC value and was chosen as the final model (see Table 1). As shown in Table 2, all standardized factor loadings were >30 (ps < 0.001), and the six factors were significantly intercorrelated (rs = 0.59 to 0.85, ps < 0.001).

Gender invariance

Because tests of multivariate skewness and kurtosis revealed that multivariate normality was not held for the data of males and females, the RML estimation was adopted and the S-Bχ^2 statistics were computed.

The results of gender invariance tests are summarized in Table 3. For the CSS-36, the baseline model fitted the data well, S-Bχ^2 (1,158, N = 521) = 2,741.87, p < 0.001, RMSEA = 0.073, 90% CI [0.069, 0.076], CFI = 0.981, NNFI = 0.979. Constraining the factor loadings (ΔCFI = 0.000), item intercepts (ΔCFI = −0.002), item error variances (ΔCFI = 0.000), factor variances (ΔCFI = 0.000), and factor covariances (ΔCFI = 0.000) to be equal across the two gender groups did not significantly reduce the model fit. The final model demonstrated a good model fit, S-Bχ^2 (1,275, N = 521) = 3047.29, p < 0.001, RMSEA = 0.073, 90% CI [0.070, 0.077], CFI = 0.979, NNFI = 0.979. These results supported configural invariance, metric invariance, scalar invariance, error variance invariance, factor variance invariance, and factor covariance invariance across the two gender groups. The male group serves as the reference group, in which the factor means were set at zero. Hence, the factor means of the female group indicated the mean differences across the two groups. Females reported greater scores on the subscales of COVID xenophoia (t = 3.35, p < 0.001) and COVID contamination (t = 4.08, p < 0.001) than males did. No gender differences were found for the other subscale scores.

For the CSS-18, a satisfactory fit was found for the baseline model, S-Bχ^2 (240, N = 521) = 555.88, p < 0.001, RMSEA = 0.071, 90% CI [0.063, 0.079], CFI = 0.984, NNFI = 0.980. Imposing cross-group equality constraints on the factor loadings (ΔCFI = 0.000), item intercepts (ΔCFI = −0.002), item error variances (ΔCFI = 0.000), factor variances (ΔCFI = 0.000), and factor covariances (ΔCFI = 0.000) did not significantly worsen the model fit. The final model achieved an adequate model fit, S-Bχ^2

(303, N = 521) = 654.61, p < 0.001, RMSEA = 0.067, 90% CI [0.060, 0.074], CFI = 0.982, NNFI = 0.982. Configural invariance, metric invariance, scalar invariance, error variance invariance, factor variance invariance, and factor covariance invariance were established across the two gender groups. The factor means of the reference group (male) were set at zero. The factor means of the female group revealed that females reported greater subscale scores of COVID danger (t = 2.07, p < 0.05), COVID xenophoia (t = 2.97, p < 0.01) and COVID contamination (t = 4.68, p < 0.001) compared with males. Gender differences were not observed for the other subscale scores.

Concurrent validity

The descriptive statistics of the CSS-36 and the CSS18 are summarized in Table 4. To assess the concurrent validity of the CSS-36 and the CSS-18 in Hong Kong, the relationships of the CSS-36 and the CSS-18 with fear of COVID-19 and negative emotional states (depression, anxiety, and stress) were investigated. As indicated in Table 5, the measures of fear of COVID-19 and negative emotional states had adequate internal consistency reliability (Cronbach's αs = 0.85 to 0.95, McDonald's ω = 0.85 to 0.95). For the CSS-36, the overall and subscales scores had strong correlations with fear of COVID-19 (rs = 0.52 to 0.75, ps < 0.001) and smaller but significant correlations with depression (rs = 0.12 to 0.23, ps < 0.01), anxiety (rs = 0.21 to 0.31, ps < 0.001), stress (rs = 0.18 to 0.26, ps < 0.001), and the overall DASS-21 score (rs = 0.18 to 0.29, ps < 0.001). Similarly, the overall and subscale scores of the CSS-18 also showed strong correlations with fear of COVID-19 (rs = 0.50 to 0.75, ps < 0.001) and smaller but significant correlations with depression (rs = 0.10 to 0.20, ps < 0.05), anxiety (rs = 0.21 to 0.30, ps < 0.001), stress (rs = 0.17 to 0.23, ps < 0.001), and the overall DASS-21 score (rs = 0.18 to 0.27, ps < 0.001). In sum, the concurrent validity of the CSS-36 and the CSS-18 among Hong Kong undergraduate students was supported.

Internal consistency reliability

The reliability coefficients are summarized in Table 4. Regarding the CSS-36, the overall score (Cronbach's α = 0.97,

TABLE 2 Factor loadings and correlations.

	36-item COVID Stress Scales						18-item COVID Stress Scales					
	1	2	3	4	5	6	1	2	3	4	5	6
Item 1	0.86						0.81					
Item 2	0.84											
Item 3	0.71											
Item 4	0.76						0.80					
Item 5	0.72						0.75					
Item 6	0.82											
Item 7		0.90						0.87				
Item 8		0.92										
Item 9		0.92										
Item 10		0.83										
Item 11		0.86						0.86				
Item 12		0.78						0.83				
Item 13			0.86						0.82			
Item 14			0.92									
Item 15			0.91						0.87			
Item 16			0.82									
Item 17			0.72						0.72			
Item 18			0.81									
Item 19				0.91						0.88		
Item 20				0.83						0.83		
Item 21				0.78						0.81		
Item 22				0.81								
Item 23				0.79								
Item 24				0.74								
Item 25					0.88						0.84	
Item 26					0.79							
Item 27					0.75							
Item 28					0.83						0.85	
Item 29					0.90						0.91	
Item 30					0.86							
Item 31						0.84						
Item 32						0.84						0.78
Item 33						0.83						
Item 34						0.71						
Item 35						0.68						0.81
Item 36						0.73						0.80
1. COVID D	-						-					
2. COVID SE	0.64	-					0.61	-				
3. COVID X	0.67	0.64	-				0.68	0.71	-			
4. COVID C	0.81	0.67	0.85	-			0.79	0.62	0.85	-		
5. COVID T	0.65	0.65	0.65	0.73	-		0.61	0.66	0.69	0.66	-	
6. COVID CH	0.63	0.61	0.61	0.68	0.80	-	0.59	0.66	0.66	0.62	0.83	-

D, danger; SE, socioeconomic consequences; X, xenophobia; C, contamination; T, traumatic stress symptoms; CH, compulsive checking. All loadings and factor correlations are significant at $p < 0.001$.

TABLE 3 Invariance across gender.

Model	S-Bχ²	df	RMSEA [90% CI]	CFI	NNFI	Comparison	ΔCFI
36-item COVID Stress Scales							
1. Configural invariance	2741.87***	1,158	0.073 [0.069, 0.076]	0.981	0.979		
2. Metric invariance	2793.02***	1,188	0.072 [0.069, 0.076]	0.981	0.979	2 vs. 1	0.000
3. Scalar invariance	2943.19***	1,218	0.074 [0.070, 0.077]	0.979	0.978	3 vs. 2	−0.002
4. Error variance invariance	2984.78***	1,254	0.073 [0.070, 0.076]	0.979	0.979	4 vs. 3	0.000
5. Factor variance invariance	2999.08***	1,260	0.073 [0.070, 0.076]	0.979	0.979	5 vs. 4	0.000
6. Factor covariance invariance	3047.29***	1,275	0.073 [0.070, 0.077]	0.979	0.979	6 vs. 5	0.000
18-item COVID Stress Scales							
1. Configural invariance	555.88***	240	0.071 [0.063, 0.079]	0.984	0.980		
2. Metric invariance	567.12***	252	0.069 [0.062, 0.077]	0.984	0.981	2 vs. 1	0.000
3. Scalar invariance	608.06***	264	0.071 [0.063, 0.078]	0.983	0.980	3 vs. 2	−0.001
4. Error variance invariance	636.46***	282	0.070 [0.062, 0.077]	0.982	0.981	4 vs. 3	−0.001
5. Factor variance invariance	645.11***	288	0.069 [0.062, 0.076]	0.982	0.981	5 vs. 4	0.000
6. Factor covariance invariance	654.61***	303	0.067 [0.060, 0.074]	0.982	0.982	6 vs. 5	0.000

***$p < 0.001$.

McDonald's ω = 0.97) and all subscale scores (Cronbach's αs = 0.90 to 0.95, McDonald's ω = 0.90 to 0.95) yielded high reliability coefficients. Besides, the overall CSS-18 score (Cronbach's α = 0.94, McDonald's ω = 0.94) and all subscale scores (Cronbach's αs = 0.83 to 0.89, McDonald's ω = 0.84 to 0.90) also produced high reliability coefficients. Taken together, the CSS-36 and CSS-18 exhibited good internal consistency reliability among Hong Kong undergraduate students.

Discussion

This study attempts to validate the CSS-36 and the CSS-18 in Hong Kong. It was found that the six-factor model demonstrated the best fit. The factorial invariance across gender was established. Females showed higher levels of COVID-19-related stress in the domains of COVID xenophobia and COVID contamination. The CSS showed good internal consistency reliability and concurrent validity with fear of COVID-19 and negative emotional states. This study provided initial evidence for the psychometric properties of the traditional Chinese version of the CSS-36 and the CSS-18 in a sample of Hong Kong undergraduate students.

Taylor et al.'s (13) theoretical framework of COVID-19-related stress encompasses six domains, including fear of the danger of being infected, fear of the socioeconomic consequences of the pandemic, fear that foreigners is spreading the virus, fear of contacting contaminated objects, traumatic stress symptoms regarding the pandemic, and compulsive checking and reassurance seeking concerning the pandemic. Consistent with prior studies (5, 14–18), this study supported the six-factor model for both the CSS-36 and the CSS-18 in Hong Kong. Although Taylor et al. (13) proposed six domains of COVID-19-related stress, their study identified a five-factor solution, which was supported by some

other studies (19, 20). One possible explanation is that Taylor et al. (13) used the exploratory factor analysis to identify a five-factor solution, but did not compare it with a six-factor model. Studies examining both models have consistently favored the six-factor model over the five-factor model (5, 14, 17, 21). Similarly, this study found that the six-factor model fitted the data better than did the five-factor model for both the CSS-36 and the CSS-18. These findings resonate with the stress and coping model (42, 43). In particular, the COVID-19 pandemic is a stressor that may affect people's reactions and behavior in various ways (9, 30). Reducing the factor structure may result in information loss and an oversimplification of the domains of COVID-19-related stress.

Moreover, this study established the gender invariance of the six-factor model for both the CSS-36 and the CSS-18. These findings indicate that the items have the same meanings for males and females in Hong Kong, allowing meaningful comparisons of the six domains of COVID-19-related stress across gender in the Hong Kong context. This study found higher COVID xenophobia and COVID contamination in females compared with males. This echoed past research findings that females tend to experience higher levels of stress and negative emotions during the pandemic (44). This might be due to the traditional gender role of women (45). Females are often assumed to be caregivers in the family (46–48), resulting in gender inequalities during the COVID-19 outbreak (49). Compared with males, females are more likely to engage in domestic tasks such as household sterilization, grocery shopping, and caregiving for sick family members, and these tasks might be more challenging during the pandemic (49). The reasons for the gender differences in COVID-19-related stress deserve further investigations. Interestingly, similar to prior research (44), this study did not find a gender difference in the socioeconomic consequences of the pandemic. These findings suggest that higher COVID-19-related stress among females may be domain specific.

TABLE 4 Descriptive statistics and correlations of the COVID Stress Scales.

	1	2	3	4	5	6	7
36-item COVID Stress Scales							
1. COVID danger							
2. COVID socioeconomic consequences	0.59***						
3. COVID xenophobia	0.62***	0.61***					
4. COVID contamination	0.73***	0.64***	0.79***				
5. COVID traumatic stress symptoms	0.59***	0.61***	0.61***	0.67***			
6. COVID compulsive checking	0.57***	0.57***	0.57***	0.62***	0.74***		
7. Overall COVID Stress Scales	0.82***	0.81***	0.85***	0.89***	0.83***	0.80***	
M	1.48	0.80	1.02	1.13	0.54	0.89	0.97
SD	0.88	0.91	0.90	0.86	0.70	0.76	0.70
Cronbach's α	0.91	0.95	0.94	0.92	0.93	0.90	0.97
McDonald's ω	0.91	0.95	0.94	0.92	0.93	0.90	0.97
18-item COVID Stress Scales							
1. COVID danger							
2. COVID socioeconomic consequences	0.52***						
3. COVID xenophobia	0.57***	0.62***					
4. COVID contamination	0.68***	0.54***	0.73***				
5. COVID traumatic stress symptoms	0.53***	0.60***	0.61***	0.59***			
6. COVID compulsive checking	0.49***	0.57***	0.56***	0.53***	0.72***		
7. Overall COVID Stress Scales	0.79***	0.80***	0.85***	0.85***	0.81***	0.78***	
M	1.56	0.83	1.04	1.37	0.50	0.70	1.00
SD	0.93	0.94	0.91	0.93	0.72	0.76	0.70
Cronbach's α	0.83	0.89	0.84	0.88	0.89	0.84	0.94
McDonald's ω	0.85	0.89	0.85	0.88	0.90	0.84	0.94

***p < 0.001.

This study found that the CSS-36 and the CSS-18 showed comparable levels of reliability and validity in Hong Kong. These findings strengthen the confidence of applying the brief version of the CSS to wider contexts. The CSS-18 allow for a quicker assessment of the COVID-19-related stress (28) without compromising the psychometric properties. Future research is recommended to validate the CSS-18 in other cultural contexts. More important, the CSS may serve as a useful tool for assessing stress related to post-COVID conditions [i.e., long COVID; (50)]. Given that the COVID-19 pandemic has persisted for several years, it remains uncertain whether or not COVID-19-related stress will translate to chronic stress (51). Further studies may adopt the CSS to assess stress related to post-COVID conditions.

The findings of the current study have important practical implications. This study showed that the six domains of COVID-19-related stress (30) are applicable to Hong Kong undergraduate students. In this light, interventions for improving students' wellbeing during the pandemic may target some domains of COVID-19-related stress. For instance, interventions that aims at reducing compulsive checking may be particularly effective in improving mental health during the pandemic. Future studies are needed to examine the effectiveness of those interventions, and the CSS can be used to evaluate the treatment efficacy.

Limitations and future research directions

There are several caveats in this study. First, this study used a cross-sectional design. Future longitudinal research is needed to examine additional psychometric properties of the of the CSS in Hong Kong, including test-retest reliability, longitudinal invariance, and predictive validity with later outcomes. Second, the current sample included undergraduate students in Hong Kong only. Further studies are required to verify the psychometric properties of the CSS in other age groups. Third, the study only used self-report measures to examine the validity of the CSS in Hong Kong. Future work may use neural or physiological measures of stress (e.g., salivary cortisol) to validate the CSS.

Conclusions

The COVID-19 pandemic has caused stress and dampened the mental health of people worldwide. A psychometrically sound tool for assessing COVID-19-related stress is crucial for understanding the detrimental impacts of the COVID-19 pandemic on mental health

TABLE 5 Correlations of COVID Stress Scales with fear of COVID-19 and negative emotional states.

	FCV-19S	Depression	Anxiety	Stress	Overall DASS-21
M	2.08	0.90	0.76	1.07	0.91
SD	0.81	0.72	0.63	0.70	0.63
Cronbach's α	0.90	0.89	0.85	0.87	0.95
McDonald's ω	0.91	0.89	0.85	0.87	0.95
36-item COVID Stress Scales					
1. COVID danger	0.64***	0.15***	0.26***	0.19***	0.22***
2. COVID socioeconomic consequences	0.52***	0.19***	0.27***	0.20***	0.23***
3. COVID xenophobia	0.62***	0.12**	0.21***	0.18***	0.18***
4. COVID contamination	0.67***	0.13**	0.25***	0.20***	0.21***
5. COVID traumatic stress symptoms	0.67***	0.23***	0.33***	0.26***	0.29***
6. COVID compulsive checking	0.66***	0.15***	0.25***	0.19***	0.21***
7. Overall COVID Stress Scales	0.75***	0.19***	0.31***	0.24***	0.26***
18-item COVID Stress Scales					
1. COVID danger	0.61***	0.15***	0.25***	0.19***	0.21***
2. COVID socioeconomic consequences	0.50***	0.17***	0.26***	0.19***	0.22***
3. COVID xenophobia	0.62***	0.12**	0.21***	0.17***	0.18***
4. COVID contamination	0.65***	0.10*	0.21***	0.19***	0.18***
5. COVID traumatic stress symptoms	0.66***	0.20***	0.31***	0.23***	0.27***
6. COVID compulsive checking	0.62***	0.15***	0.26***	0.18***	0.21***
7. Overall COVID Stress Scales	0.75***	0.18***	0.30***	0.23***	0.26***

FCV-19S, Fear of COVID-19 Scale; DASS-21, The 21-item Depression Anxiety Stress Scales. *p < 0.05. **p < 0.01. ***p < 0.001.

and evaluating the efficacy of stress reduction intervention programs during the pandemic. To address the research needs, this study sought to evaluate the psychometric properties of the traditional Chinese version of the CSS among Hong Kong undergraduate students. The present results supported the six-factor structure of the CSS. The gender invariance of the six-factor model was established. Adequate internal consistency and concurrent validity were also achieved. The brief version of the CSS might provide a useful tool for more efficient assessments. Besides, the CSS could be useful for assessing stress pertinent to post-COVID-19 syndrome. The implications of the CSS are documented in this article. Future research is suggested to further validate the traditional Chinese version of the CSS in other age groups. More important, the conceptual framework and the factor structure of the CSS could serve as a blueprint for measures of stress related to future pandemics.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Office of Research and Knowledge Transfer, Lingnan University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

TN designed the study and performed the data analysis. TN, WC, and KW conducted the literature review and drafted and revised the manuscript. All authors approved the submitted version of the manuscript.

Funding

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1149221/full#supplementary-material

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The impact of the COVID-19 pandemic on the mental health of new mothers in China: A qualitative study of mothers with infants aged 0−1 year old

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Background: China has implemented a strict epidemic control policy (ECP) for 3 years during the COVID-19 pandemic. New mothers are under great psychological pressure to protect themselves against the virus, following the ECP, as well as taking on the main responsibility of raising their children. However, the mental health of this group has been neglected by the public. This article aims to understand the mental health of new mothers during the COVID-19 pandemic.

Method: Qualitative research methods were adopted in this study. From 1 October to 1 November 2022, we conducted in-depth interviews with 36 new mothers in Guiyang, Guizhou, China, and used thematic analysis to examine their emotional status, as well as the origins of their negative and positive emotions.

Results: (1) New mothers are chronically depressed, feeling anxious, and upset. (2) Negative emotions are caused either by the virus or by the ECP. (3) New mothers are mainly anxious about their children's physical health, feeding options, childcare, and family income. (4) Positive emotions are reflected by tight parent−child bonds, a better understanding of childcare, and an increased ability to perceive risks.

Conclusion: The anxiety of new mothers has revealed the shortcomings of the Chinese health system in the emergency management of the mother and child. At the same time, the outbreak is an opportunity to improve the response management capacity of the health system in order to prevent the recurrence of similar problems for mothers and infants.

KEYWORDS

COVID-19, mother-infant interactions, mental health, anxiety, public health

1. Introduction

The World Health Organization (WTO) declared COVID-19 a global pandemic on 11 March 2020 (1). As the virus has mutated, it has become less lethal but more infectious, and the majority of patients are able to recover by themselves (2). It is clear that the virulence of COVID-19 has been dismissed and is continuously dismissing further (3). Nevertheless, the economic and health impacts caused by COVID-19 are ongoing (4). It is likely there will be significant and extensive social change in the coming years (5). During the pandemic, most countries implemented a short-lived control policy based on the concept of living with the

virus. Nevertheless, China has been implementing a strict ECP since the outbreak of COVID-19 in December 2019. In other words, if there is a positive or suspected case, the person or community with whom the patient is in contact has to be isolated or shut down. As a result, following this strict ECP for 3 years, many families have experienced psychological changes due to the severe impact on their living conditions (6). Mothers of newborns during the epidemic were faced with the dual challenges of ECP and childcare, which brought them great psychological stress. COVID-19 is not the first virus to threaten humans, nor will it be the last (7). Therefore, it is essential to understand the mental health of new mothers during the epidemic. (1) This facilitates the identification of psychological problems arising from deficiencies in ECP, promotes the humanization of policies, and improves the capacity to cope with the public crisis. (2) It is beneficial for the government to promote a better healthcare system that takes full account of the rights of infants and creates a healthy social environment. (3) It helps to develop women's mental health and provides psychological guidance on time. (4) It is conducive to forecasting the rate of fertility, stimulating the government to adjust the policy and reduce the costs of fertility.

There is no doubt that the COVID-19 pandemic has caused much emotional stress to many families (8). Postnatal mothers may have suffered some mental distress during the epidemic (9, 10). In the study by Kochan et al. all postnatal women who gave birth during that period were reported to have been negatively affected by COVID-19 (11), which is reflected in maternal adjustment, maternal attachment, and baby care after childbirth (12). There are two main causes of this negative emotion, one being anxiety about the infant's infection. A study showed that there were statistically significant differences between fear about being infected with COVID-19 for themselves and babies and postpartum depression (13). In a retrospective analysis of infected mothers, it was found that only a small proportion of newborns were confirmed positive (14), that is, close contact between mother and infant can transmit the virus to the infant through droplets or microdroplets (15). However, it has also been suggested that the effect of an infected mother on her newborn infant is unknown (16), and there is no evidence of vertical transmission of COVID-19 (17, 18). This is because there are limited published data on infants infected in the neonatal period and the long-term effects of the virus on newborns are still unknown (19). Another is the fear of the clinical manifestations of the infection. Many studies have found that most newborns infected after birth have gastrointestinal or respiratory symptoms (20). Yaman et al. observed some infected newborns and found that the most common symptoms were feeding intolerance, cough, elevated fever, and respiratory distress (21). It may also occur as a rare case of multisystem inflammatory syndrome in children in newborns due to COVID-19—presenting with stage 11 b necrotizing enterocolitis (22). Any symptom can cause anxiety in mothers.

More stress is associated with parenting during the parenting period. Parents often feel lonely and isolated with a decreased sense of wellbeing (23). Some families also reported an increase in depression (24). This is due to prolonged lockdown and social isolation which exacerbates parenting burnout (25). For example, parents were socially isolated during lockdown (7) and, thus, did not receive professional and experienced parenting guidance on time (26), which has caused changes in family

behaviors (27). A study also stated that social isolation leaves infants with potential deficits in social communication skills (28). Okinarum and Rochdia noted that the weakened breastfeeding experience during the COVID-19 pandemic was dominated by impaired comfort, inadequate milk supply, parenting problems, and indifferent spouses (29). The most vulnerable mothers of the future are those whose income has been reduced as a result of the COVID-19 pandemic (30).

Women in pregnancy also face significant mental health challenges (31) and high levels of stress and anxiety throughout pregnancy (32). Their fragile psychology undermines the formation of a positive relationship with their unborn babies (33), the COVID-19 has affected their ability to purchase items for their babies and their feeding schedule (34).

The positive and negative emotions of new mothers in raising their children during the COVID-19 pandemic were explored in this study under the combination of the existing research results and the context of China's special ECP.

2. Materials and methods

2.1. Study design

This study uses qualitative methods to understand the mental health of new mothers during the COVID-19 pandemic. Qualitative research is considered to explain a specific problem by uncovering issues, understanding the phenomenon of events, and analyzing human behaviors (35, 36). It can focus on how an individual experiences a specific phenomenon (37, 38). Our study selected new mothers in Guiyang, Guizhou, China. On 2 September 2022, there was a confirmed case of COVID-19 in Guiyang, and on 5 September, the entire city started the ECP which was reopened on 19 September. Therefore, we decided to interview and investigate the group of new mothers who have experienced this special period, to identify their actual feelings about raising children.

2.2. Data collection procedure

(1) The author searched for 10 maternity centers in Guiyang (a maternity center is a place that provides professional postnatal recovery services for mothers who have given birth, and is traditionally used in many Asian countries, such as China, Japan, Korea, Singapore, etc.), explained the intention to the managers, and finally found two centers that agreed to participate in the interview. (2) On the recommendation of the manager, the author joined the WeChat group of mothers who have returned home from their monthly stay in the center. The group includes women who gave birth between 2020 and 2022, which is appropriate for this study. Volunteers were recruited from the group and 36 new mothers were found eventually. (3) Interview purpose: to examine the impact of the COVID-19 pandemic on the mental health of new mothers. (4) Interview duration: 1 October to 1 November 2022. (5) Interview process: we conducted in-depth interviews (semi-structured interviews) with 36 new mothers through voice chat on WeChat around the interview questions. Each interview lasted ~1 h and the language used in each interview was Chinese. Each interview was recorded with the consent of each interviewee.

2.3. Data analysis

(1) Data cleaning: after the interviews, the recordings were transcribed into texts in Chinese. Then, the data were preliminarily cleaned by deleting the blanks, unrecognized words, incorrect words, and unclear expressions appearing in each conversion. Finally, a set of interview data featured with smooth Chinese wordings was obtained and translated into English. (2) Code generating: we reviewed the data repeatedly to increase our familiarity. Then, the interview data was put into NVIVO 12 software for coding. The name of each interviewee was anonymized. While the data were being encoded, our team often held online meetings to discuss themes and our unique findings using inductive methods. When all the data were encoded, our coding work was completed. (3) Review the themes: the researchers reviewed the coding of each theme to verify whether they formed a coherent pattern of research questions to ensure that the logic was clear and whether they described the meaning of the entire dataset. (4) Conducting the thematic analysis: in this step, the authors identified the final themes and subthemes and wrote the report explaining how the findings were developed as well as presenting a final interpretation of the theme naming and interview data. (5) Credibility: first, there was a peer debriefing with three university professors who specialize in postnatal psychology. As a result, they examined all processes of data collection, collation, and thematic analysis. In addition, it has been examined through member checks to accurately examine the interpretations and themes that emerged from the interviews, with quotations from interviewees provided in the findings to enhance credibility. Finally, it has adopted the triangulation techniques to decrease the impact of potential bias in the data.

3. Results

Table 1 shows the sociodemographic characteristics of the qualitative study participants ($n = 36$). Of these, 75% of the new mothers were vaccinated, and 100% of them had a bachelor's degree or even higher, with a high level of educational background that indicates a good understanding of the interview questions and provides in-depth insights. Figure 1 shows a graph of the emotional word cloud for parenting during the pandemic for new mothers, where 81% are negative emotions and 19% are positive emotions. The top three negative emotion words were anxious, distressed, and burnout. The top three positive emotion words were fulfilling, happy, and hardworking. Table 2 shows the graph of the analysis results, i.e., themes and sub-themes.

3.1. Health

3.1.1. Being infected

The greatest anxiety among the interviewees was about being infected, as they were concerned about three main subjects: their children, themselves, and strangers. The psychological burden is exacerbated by the symptoms of the child's infection and the uncertainty of the after-effects.

"Fevers are difficult for infants to tolerate, as well as the treatment process, medication for small infants may cause damage to their liver with its after-effects" (A2).

"I'm afraid I'll get infected and pass it on to my children" (A3).

Strangers were one of the risk factors that potentially influenced the choice of a nanny by the interviewees. They indicated that they would feel at ease if they had a nanny, especially women in the postnatal period.

"With so many people infected, I struggle to find good nannies to look after the children for me and share the household chores" (A1).

3.1.2. Being isolated

The interviewees were very frustrated by the isolation and the uncertainty of the isolated places, which might be a five-star hotel or a school dormitory in the village. Generally speaking, isolation is required urgently by the government, as to whether sufficient baby supplies can be provided at the quarantine places, as well as whether the babies will be able to adapt to the unfamiliar environment and whether there is a risk of being infected by the gathering during the transfer. Interviewees stated that everything was uncertain.

"Once there was a confirmed or suspected case nearby, we would be forcibly pulled to a designated place for quarantine. Whilst my child is still an infant, the quarantine place would be lack of convenient baby supplies, which makes it difficult to stay" (A6).

"Instead, the quarantine area increases the risk of being infected. Thus, all dare not catch a cold now" (A8).

3.1.3. Outbreak of other diseases

The interviewees felt that the nucleic acid testing policy was dehumanizing and overly rigid. The reason is that a 24-h nucleic acid testing is now required to enter the hospital. This means that both the parents and the child must have their nucleic acid testing done in advance and then wait for the nucleic acid results to show negative. The problem is that it is unpredictable for infants to have emergencies. In addition, it usually takes about 8 h for the nucleic acid results to be back, which takes too long for an infant with a sudden disease.

"If there is an emergency like diarrhea or high fever. I am afraid that my child will not get timely treatment if the nuclear results come out too slowly. Especially at night when the nucleic acid tests take longer, and the medical staff are understaffed" (A11).

TABLE 1 Sociodemographic characteristics of the qualitative study participants (*n* = 36).

Code	Age	Education background	Vaccination	Age of child in months (as of 1st October 2022)	Number of children	Description of the emotional word
A1	26	Bachelor's degree	Yes	2	1	Breakdown, enjoying, fulfilling
A2	33	Bachelor's degree	No	6	2	Anxious, responsibility, happiness
A3	28	Bachelor's degree	No	3	1	Burnout, irritable, scared
A4	30	Master's degree	Yes	5	1	Depressed, bored, worried
A5	28	Bachelor's degree	Yes	6	2	Depressed, suffering, irritable
A6	31	Bachelor's degree	No	3	1	Panic, scared, irritable
A7	25	Bachelor's degree	Yes	4	1	Panic, scared, worried
A8	31	Bachelor's degree	Yes	5	2	Panic, worried, sad
A9	26	Bachelor's degree	No	2	1	Bored, worried, anxious
A10	34	Master's degree	Yes	4	2	Anxious, careful, quiet
A11	26	Bachelor's degree	Yes	4	1	Distressed, anxious, self-discipline
A12	30	Bachelor's degree	Yes	6	1	Careful, anxious, helpless
A13	31	Bachelor's degree	Yes	8	1	Restricted, bored, worried
A14	27	Bachelor's degree	Yes	7	2	Resigned, distressed, delayed
A15	26	Bachelor's degree	No	3	1	Depressed, resigned, pressure
A16	29	Master's degree	Yes	4	1	Lying flat, moved, numb
A17	28	Bachelor's degree	Yes	11	1	Anxious, helpless, expected
A18	25	Bachelor's degree	Yes	7	1	Anxious, irritable, suffering
A19	31	Bachelor's degree	Yes	6	1	Suicide, ashamed, helpless
A20	27	Bachelor's degree	Yes	5	1	Scared, hurried, worried
A21	30	Bachelor's degree	No	3	3	Happy, quiet, fulfilling
A22	27	Master's degree	Yes	10	1	Happy, comfortable, fulfilling
A23	26	Bachelor's degree	Yes	2	1	Hardworking, respectful, united
A24	26	Bachelor's degree	Yes	5	2	Suffering, distressed, sorrow
A25	28	Bachelor's degree	No	3	1	Frightened, anxious, helpless
A26	27	Bachelor's degree	Yes	6	1	Worried, hardworking, distressed
A27	28	Bachelor's degree	Yes	12	1	Burnout, fighting, confident
A28	33	Bachelor's degree	Yes	5	2	Bored, upset, distressed
A29	31	Bachelor's degree	Yes	7	1	Poor, nervous, irritable
A30	30	Bachelor's degree	Yes	8	1	Distressed, burnout, irritable
A31	28	Master's degree	Yes	10	1	Irritable, confident, burnout
A32	27	Bachelor's degree	No	3	1	Distressed, lonely, poor
A33	30	Bachelor's degree	Yes	10	2	Burnout, upset, sorrow
A34	30	Bachelor's degree	Yes	7	1	Helpless, poor, nervous
A35	28	Bachelor's degree	Yes	8	3	Fighting, poor, burnout
A36	26	Master's degree	No	5	1	Distressed, burnout, upset

3.1.4. Delayed plans

Travel restrictions during the ECP disrupted the parenting plans of the interviewees, such as the physical examination and child vaccinations. Infants who are growing too fast are bound to have inaccurate data from overtime physical examinations. Moreover, some vaccines have limited injection times.
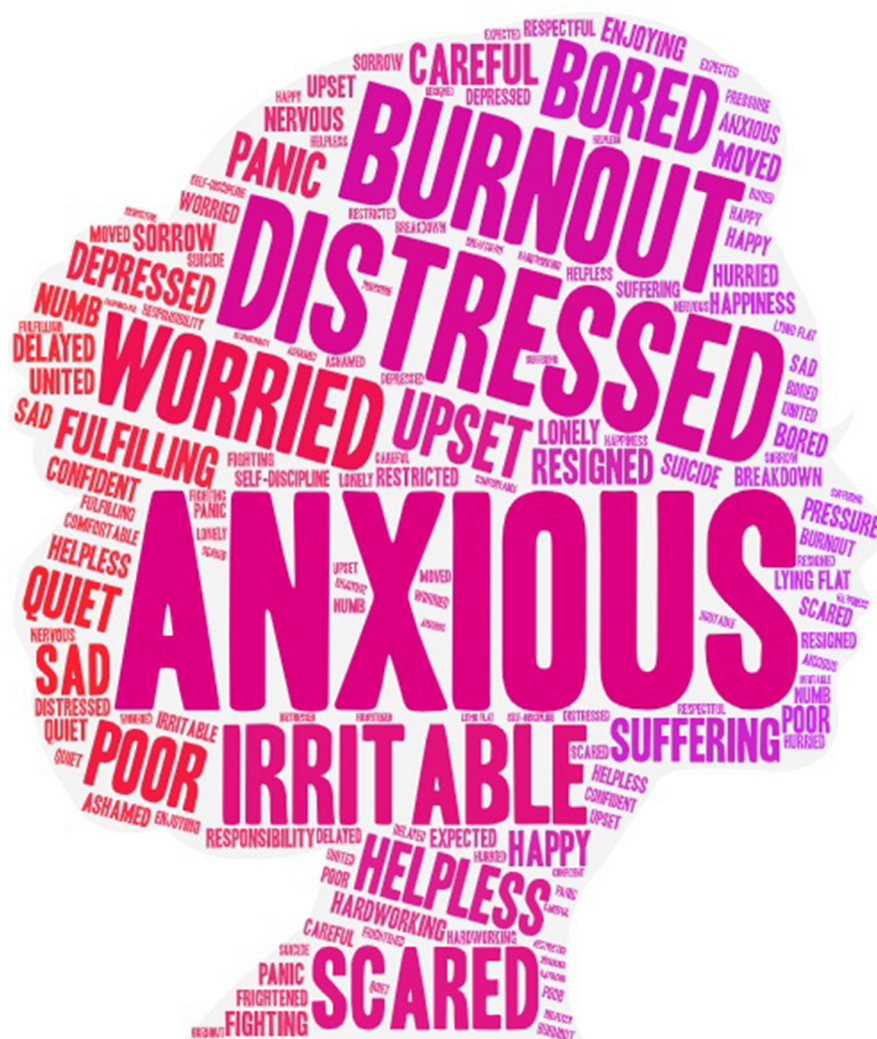
FIGURE 1
The emotional word cloud.

"The physical examination was delayed and may not have detected physical problems in time or the need for nutrition" (A15)

.

"We have missed the best time to get the children's vaccinations" (A23).

3.2. Feeding problems

During the ECP, there was a severe shortage of household supplies due to the suspension of logistics and urban deliveries. This included adult supplies, baby formula milk, and baby supplements. However, the need for these had to be requested from the community manager, which made it difficult to get what was once readily available, and the interviewees found it difficult to have balanced nutrition.

3.2.1. Nutrition in breast milk

Official regulations stipulate that household goods can only be purchased online at government-designated supermarkets, and the suspension of logistics and urban deliveries has caused a severe shortage of supplies.

"Now it's not about buying whatever you want, you can only buy what is available. If I don't eat enough and my breast milk will not be nutritious" (A4).

3.2.2. Shortage of formula milk

Because of the ECP, all shops in the city had to be closed as well as logistics and deliveries were both stopped, thus, there was a lack of staff to deliver formula milk even if it was available.

"It is very troublesome to apply to the community managers to buy formula milk" (A36).

Themes	Sub-themes
Health	Being infected
	Being isolated
	Outbreak of other diseases
	Delayed plans
Feeding problems	Nutrition in breast milk
	Shortage of formula milk
	Baby supplies
	Types of infant foods
Parenting burnout	Lack of toys
	Lack of sleep
	Sports and socializing
Family income	Declining family income
	Increasing family costs
Family time	Parent-child companionship
	Parent-child interaction
Health knowledge	COVID-19 vaccine
	Risk perception

3.2.3. Baby supplies

There is a severe shortage of baby supplies and a lack of staff to deliver them if they are available.

> "It is difficult to purchase baby supplies such as diapers, clothes, milk bottles, etc" (A25).

3.2.4. Types of infant foods

There was a lack of stock of foods for infants and the tools needed to make infant foods during the ECP. Interviewees indicated that they could only add supplementary foods later for infants who were ready to have them.

> "It is difficult to buy the vegetables and meat to make a varied meal that you want, and the diet structure is not balanced. The time of the ECP is unclear, which is likely to be around two months" (A18).

3.3. Parenting burnout

3.3.1. Lack of toys

All interviewees felt a strong sense of parenting burnout, lacking the assistance of nannies and toys so that they could only concentrate on playing with the children. Especially with two children at home, taking care of both the older and the younger one certainly increases the mental burden on parents.

> "We can't buy new toys to relieve the stress of being with children" (A12).

> "I am very tired of taking care of two children at the same time. During the ECP, neither could I go out nor buy toys. I felt helpless and devastated" (A10).

3.3.2. Lack of sleep

Many of the interviewees were in short of sleep and depressed. Although it was common for infants aged 0–1 year to wake up several times, both night awakening and nursing affected the quality of sleep of the interviewees. During non-epidemic periods, mothers were able to take their children out for a relaxing walk, which helped the infants to sleep. However, during the ECP, it was a lot more tiring for mothers to have to spend time with their children from morning to night.

> "During the ECP, the universal nucleic acid testing policy was implemented, and two tests were required for 3 days. In order to ensure that all residents got their nucleic acid results on the same day and faced with a large population base, we were asked to do the test at 5 a.m. every day, which seriously affected the quality of sleep of our children" (A16).

> "I was unable to walk my child with the pram, whereas going out and being in touch with new things helped him to sleep. Outdoors is also a time for me to relax, unluckily now I have to stay at home" (A5).

3.3.3. Sports and socializing

During the pandemic, the government called for fewer gatherings, so many people spontaneously cut down on outdoor activities. Travel was even restricted in the ECP.

> "It is the time for children to practice walking and to play with other children to develop social skills, however, outdoor activities are reduced because of the fear of being infected" (A22).

3.4. Family income

3.4.1. Declining family income

It has been found that the interviewees' income has declined but they are unable to do anything about it, as they are struggling to take care of their children and work at the same time.

> "My family income has seriously declined" (A9).

3.4.2. Increasing family costs

During the ECP, high costs of logistics and deliveries led to a rise in the price of products, which consequently increased the cost of the family.

"Buying formula milk, diapers and toys during this time is much more expensive than before" (A13).

3.5. Family time

Interviewees indicated that the only relief during the epidemic or ECP was the extra family time, which allowed parents to see the growth of their children.

3.5.1. Parent-child companionship

"I went out less, and with the restrictions on travel during the ECP, I had more time to spend with my children" (A33).

3.5.2. Parent-child interaction

"I have more time to train my child to lift his head, roll over, crawl, walk and talk" (A20).

3.6. Health knowledge

3.6.1. COVID-19 vaccine

The interviewees acquired not only information about children's vaccines but also about the COVID-19 vaccine.

"I have known about the COVID-19 vaccine and the importance of the vaccines for children" (A17).

3.6.2. Risk perception

The interviewees were forced to learn about the protection of infectious diseases to ensure the safety of their infants. These 3 years also led them to promote their risk perception and highlighted the need for exercises.

"We have purchased masks, protective clothing, and disinfectant medication, as well as we pay more attention to personal and children's sanitary problems. Children masks are also prepared when going out" (A21).

"We have to prepare in advance for the various diseases that our children may face in the future" (A32).

"I will put more emphasis on my child's exercise condition so as to strengthen the immune system" (A34).

4. Discussions

Our study describes the child-raising styles followed by new mothers in China during the COVID-19 pandemic. It was found that the COVID-19 pandemic has had a severe impact on the mental health of new mothers. Their negative emotions rose during the pandemic, which is consistent with the findings of previous studies. Different from previous studies, this study is novel and exploratory for several reasons. First, as far as we know, there is still no in-depth discussion on the mental health problems of new mothers in China during the COVID-19 pandemic. Previous studies have focused on children over 1 year old in China, mainly examining their vaccine (39), communication (40), sleep (41), and sports problems (42). In contrast, our research results supplement the feeding of infants aged 0–1 year in the context of the COVID-19 pandemic. Based on open-ended questions, we then summarized the sub-themes of each theme. The latest research results fully show the causes of anxiety in new mothers. Therefore, this study fills the gap in the existing articles on how the COVID-19 pandemic has led to difficulties for new mothers to raise young children. Second, our research results play a forward-looking role in predicting the future quantity and quality of the population, which has not been mentioned in previous studies. The number of births in China in 2020 is 18% lower than in 2019, and the total fertility rate falls to 1.3 (43). The changes in the number of births directly affected by the pandemic are concentrated in late 2020 and early 2021. Initially, the decline in fertility caused by the COVID-19 pandemic is the result of a combination of anxiety about the poor survival of infants, parenting burnout, a severe drop in household income due to the recession, the shutdown of work and production, and uncertainty and weakened confidence in future life expectations. These psychological problems directly affect their fertility intentions (44–46). It has been suggested that women who are chronically tired, frightened, depressed, and anxious may have weaker bonding with their families which may lead to more marital problems and mental disorders (47, 48). Therefore, it is important to be alert to the consequences of a population that remains at low fertility for a long time and intervenes in advance. The willingness to have children requires the capacity, measures, and effectiveness of the government's response to the pandemic, with regard to the state of economic recovery and growth, the speed and extent of people's productive recovery, and preferential policies to reduce the costs of childbirth, parenting, and education, as well as a well-developed health system. Interviewees expressed the expectation that the government would offer children a secure social environment in the future.

This study summarized the factors affecting the mental health of new mothers in China according to the interview results. In general, interviewees were anxious about the contagiousness of COVID-19, as well as being psychologically stressed by the strict ECP that affected their normal living conditions. This is because the policy is becoming increasingly demanding and appears to conflict with the interests of citizens (49–51). The mechanics of the policy are that, first, all febrile patients are classified as suspected, which leads to difficulties in getting medical treatment for common illnesses. Medical institutions should set green channels for the vulnerable group of infants and give them treatment priority. Second, the requirement of a nucleic acid certificate for everyone to enter the hospital may delay the visit of infants to the doctor. As a special group, infants and young children should be exempted from nucleic acid certification. This policy is dehumanizing, in that, first, logistics and city deliveries are required to stop during ECP, which makes it impossible to

purchase and deliver infant supplies. This study shows that during the quarantine period, measures that both restrict travel and mandate the suspension of logistics and deliveries have caused a shortage of supplies, as well as the contradiction that the supplies cannot be delivered even if they are available so that the logistics and deliveries should not be suspended at any time to enable the supply needs of infants. Moreover, it is necessary that the supply of public goods should be given priority to infants. Second, the unexpected and random conditions of centralized quarantine lacked consideration of the environment in which the infants were accommodated. This study recommends that families with infants can adopt home isolation measures to avoid the separation of mother and child. It is necessary to note that with the severe global economic decline during the COVID-19 pandemic, the cost of living is increasing invisibly, so that the cost of parenting becomes high, which aggravates the financial burden. The government should transition the strict ECP to a normalized policy to gradually reduce the impact of the pandemic on living conditions (52).

In addition, there were fewer cases of positive emotions obtained in the study, and through interviews, it is assumed that this is because women in the postpartum period are more prone to depression due to greater mood swings as they deal with both physical recovery and infant rearing (53, 54). In addition to the COVID-19 outbreak, the suddenness was completely unexpected for new mothers and caused a disruption in their parenting plans. Furthermore, when a mother is infected with COVID-19 during maternal nurturing, it becomes difficult to cope with the crying infants, especially in the late time or early morning. If an infant is infected, he or she may have a fever and a sore throat, especially since most infants under the age of 1 can only express pain by crying, which adds to the psychological burden on the mothers (55). At present, there have been studies that have found COVID-19 can trigger or exacerbate postnatal depression (56, 57). However, most Chinese citizens are unaware of postnatal depression and do not usually seek psychological help in advance. Therefore, there may already be potential patients of postnatal depression among the interviewees, who are not aware of it. Probably because of personal privacy, they hid their illness. Hence, the government should promote healthcare systems such as family doctors to provide one-on-one support and guidance for the mental health of new mothers.

On the whole, it seems unavoidable to have anxiety and fear of childcare during the pandemic, which is a painful stage. The spread of panic caused by the pandemic should not be underestimated. If psychological adjustment is not carried out in time, new mothers may have a heavy psychological burden before being attacked by COVID-19. Many of our interviewees are first-time mothers. The lack of experience has led to their confusion when making mistakes in raising children. They can only rely on conjecture and online information to find solutions. Furthermore, new mothers need a stable period to gradually adjust and adapt, which requires not only their cooperation but also the concerted efforts of society. Finally, the control and treatment of COVID-19 and the adjustment of the ECP is a public issue. We call on society to give them more attention and support because psychological factors have a significant impact on one's mental and physical health. When people are well-cared, understood, and supported by society, they can improve their physical and mental health, which can help them to eliminate anxiety and depression.

The limitations of this article are as follows: First, it is difficult for this study to record the parenting experience and feelings of all new mothers in China during the COVID-19 pandemic. Since there might be significant differences among some cities, it is impossible to generalize the research results. In future research, it is advised to expand the research sample and use more research methods, such as quantitative methods and mixed research methods, to probe deeper into the mental health problems of new mothers. Second, fewer positive emotions were obtained, and the investigation of positive emotions may lead to new findings, as the attitude of those who are optimistic seems to be crucial when most people have negative emotions due to the COVID-19 pandemic. It will be necessary for future studies to collect more samples, explore the reasons why optimists are positive, and explore their approaches to the management of emotions.

5. Conclusion

As a major public health emergency, COVID-19 has refocused public attention on the health system. From the outbreak of the pandemic to its subsequent management and prevention, the health system is faced with not only a medical problem but also a public issue that affects the social fabric. The anxiety of new mothers during the COVID-19 pandemic revealed shortcomings in the emergency response of the Chinese health system in terms of mothers and infants. For example, the concerns of new mothers about being infected exposed the lack of transparency in the news reporting of the pandemic and the lack of awareness of the mutation, the latest symptoms, the treatment options, and the after-effects of COVID-19, therefore, it could be understandable that they had a panic about the virus. Meanwhile, the concerns of mothers about the conditions of isolation revealed the inadequate supply of public goods. Moreover, the anxiety of new mothers about the normal treatment of sick infants is a reflection of the over-managed healthcare system. On the issue of infant feeding, inefficiencies in the emergency supply chain during an outbreak of a public health event were revealed, resulting in a lack of provision of basic supplies for infants. Nevertheless, there is no policy enacted to alleviate the financial stress of new mothers during the pandemic, for example, to reduce the cost of childbirth and parenting. It has also been found that the pandemic is a proper time for health and safety education (58), which indirectly prompts new mothers to grow in their knowledge of infectious disease risks, vaccines, healthy parenting, and public health. In addition, it is also an opportunity to enhance the emergency management capacity of the health system in order to prevent the recurrence of similar problems for mothers and infants. Finally, we appeal to society to give more attention and incentives to new mothers and expect the government to introduce a policy of assistance. Only by building a healthy social environment, we can increase the willingness to have children and maintain a stable demographic structure.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was obtained from the individuals for the publication of any potentially identifiable images or data included in this article. The patients/participants provided their written informed consent to participate in this study.

Author contributions

Acknowledgments

Conflict of interest

Publisher's note

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Effects of interpersonal sensitivity on depressive symptoms in postgraduate students during the COVID-19 pandemic: Psychological capital and sleep quality as mediators

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Background: This study aimed to examine depressive symptoms associated with interpersonal sensitivity, sleep quality, and psychological capital among postgraduate students during static campus management after the COVID-19 pandemic in China.

Methods: Research data were obtained during static campus management (10−19 April 2022) after the reappearance of COVID-19 in cities in eastern China. We collected data through an online questionnaire, and the anonymous self-reported questionnaire included the Patient Health Questionnaire, the interpersonal sensitivity subscale of Symptom Checklist-90, the Psychological Capital Questionnaire, and the Pittsburgh Sleep Quality Index. analysis of variance was performed using t-test and ANOVA. The PROCESS macro was used to determine the relationship between interpersonal sensitivity and depression, together with the independent and serial mediating role of psychological capital and sleep quality.

Results: A total of 2,554 postgraduate students were included in this study. The prevalence of mild, moderate, and severe depressive symptoms was 30.97, 6.58, and 1.45%, respectively. Interpersonal sensitivity was significantly associated with depressive symptoms (direct effect = 0.183, $p < 0.001$). Between interpersonal sensitivity and depressive symptoms, psychological capital and sleep quality played a single mediating role (indirect effect = 0.136 and 0.100, $p < 0.001$, respectively) and a chain mediating role together (indirect effect = 0.066, $p < 0.001$).

Conclusion: Interpersonal sensitivity has a significant influence on depression among Chinese graduate students. Psychological capital and sleep quality may

not only independently mediate the relationship between interpersonal sensitivity and depression, but also co-play a chain-mediating role in the pathway from interpersonal sensitivity to depression. Positive psychological interventions and sleep guidance may be beneficial in alleviating depressive symptoms.

Introduction

To control the rapid spread of COVID-19, the World Health Organization (WHO) has recommended a series of measures. One of those measures, lockdown, has proven effective in controlling the spread of the disease (1, 2). The prolonged lockdown has brought the epidemic under control to a certain extent, but it has also had a detrimental effect on people's physical and mental health. Recent research has shown that mental health problems were more severe in the general population during the lockdown period (3). For example, children's mental health worsened as a result of the pandemic in England (4), and adults experienced worse psychological outcomes during the pandemic in Saudi Arabia (5). In addition, the lockdown measures had a negative impact on the mental health of adolescents (6) and the elderly (7). Depression was found to be one of the most common and prominent psychological symptoms during this period (8). Almost half of the adult participants reported depressive symptoms during the lockdown (9), and the prevalence of depression in the general population (70.10%) was significantly higher compared with COVID-19 patients (39.50%) (10).

Locking down university campuses is a static management method used in China. In order to protect students from the COVID-19 pandemic, all college students are not allowed to enter and leave the campus gates at will during static management, but they are allowed to carry out activities on campus according to their actual needs, such as walking, eating, and shopping for daily necessities. It was found that the mental health of college students had been affected by campus lockdown (11), more so than administrative staff (12). Longitudinal analyses have shown a significant increase in depressive symptoms among college students during lockdown (13, 14). Compared with undergraduate students, postgraduate students typically face more pressure from scientific research and study (15), especially given the shortage of tutoring during the COVID-19 pandemic, which could lead them to experience anxiety or depression. A survey of 3137 Chinese postgraduate students showed that the prevalence of depressive symptoms was as high as 33.87% (16). One study agrees that women are more likely to suffer from depression than men (17). However, a study in China found that a significantly higher percentage of male students suffered from depression than their female counterparts (17). A Norwegian study of medical students found no gender differences in mental health or stress during medical school (18).

In addition to depression, sleep was also affected during the lockdown (19). Sleep quality includes quantitative aspects of sleep, such as sleep duration, sleep latency, or the number of awakenings, but also more purely subjective aspects, such as the "depth" or "restfulness" of sleep (20). Studies have found that sleep duration increased and sleep quality paradoxically decreased in college students (21, 22). Meanwhile, depressive symptoms were highly correlated with poor sleep quality among college students (13). A survey found that sleep quality was an important predictor of an individual's mental wellbeing (23). Furthermore, sleep quality may mediate the relationship between negative emotions or behaviors and depression among college students, such as academic stress (24) or Internet addiction (25). However, research is scarce on the sleep quality of postgraduate students during the lockdown.

Interpersonal sensitivity itself is a prominent mental health problem faced by contemporary college students (26), reflecting the quality of individual interpersonal interaction. Sometimes major traumatic events can amplify the negative aspects of interpersonal relationships (27), especially the limited social contact leads to a lack of social support (28) during the COVID-19 pandemic, although online media can support online interaction, the effect is not as good as face-to-face interaction (29). A study in Morocco found that individuals showed significantly higher levels of interpersonal sensitivity during COVID-19 (30). Furthermore, interpersonal sensitivity can trigger or exacerbate psychiatric symptoms (31), such as anxiety (32), depression (33), and so on. According to the diathesis-stress model, an individual's own personality vulnerability is stimulated by external stressful events, leading to a sustained increase in depression, and when the external stimulus reaches a certain level, the individual becomes depressed (34). In addition, interpersonal problems may directly affect sleep quality in college students (35). One study showed that real-life interpersonal interaction was positively associated with sleep quality and may improve it (36). Nonetheless, in the case of limited face-to-face interpersonal interaction, there is little research on the mediating role of sleep quality in the relationship between interpersonal sensitivity and depression among Chinese postgraduate students.

Psychological capital (PsyCap) has been defined as the positive psychological state that individuals show in the process of their own growth and development, including four components: self-efficacy, optimism, hope, and resilience (37). Previous studies demonstrated that PsyCap was negatively correlated with depression, and can ease depressive symptoms (38) and reduce negative emotions or prevent psychological symptoms (39). In addition, PsyCap may mediate the relationship between stress or work-family conflict and depression (40, 41). However, the role of PsyCap in the pathway from interpersonal sensitivity to depression remains unclear. In
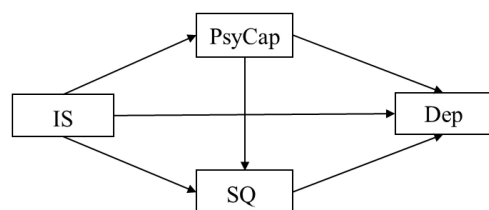
FIGURE 1
The chained mediation models. In this figure, the independent variable is interpersonal sensitivity (IS), the dependent variable is depression (Dep), and the mediators are psychological capital (PsyCap) and sleep quality (SQ).

addition, PsyCap has been shown to be a robust predictor of sleep quality (42). PsyCap may also mediate the effects of dysfunctional sleep beliefs on wellbeing (43) and the pathway from organizational justice variability to employee sleep quality (44). Currently, there is little research on the sleep quality of postgraduate students during the lockdown.

In conclusion, this study examines interpersonal sensitivity, psychological capital, sleep quality, and depression to investigate the mental health of graduate students in the context of COVID-19 and campus lockdown, providing guidance for university mental health departments to deal with depression caused by COVID-19 and other pandemic diseases. Thus, our study further explores the mediating role of psychological capital and sleep quality on the pathway from interpersonal sensitivity to depressive symptoms, which are listed below along with a multiple mediation model (Figure 1):

Hypothesis 1: interpersonal sensitivity has a significant impact on depression among Chinese postgraduate students;

Hypothesis 2: PsyCap and sleep quality can independently mediate the relationship between interpersonal sensitivity and depression;

Hypothesis 3: PsyCap and sleep quality co-play a cascading mediating role in the pathway from interpersonal sensitivity to depression.

Materials and methods

Participants and procedure

The research sample data were collected from the Student Mental Health Center at a university in eastern China, 2 weeks into its campus static management (10–19 April 2022) after the reappearance of COVID-19 in the city in 2022. All participants completed the questionnaire by scanning a QR code and then filling it out. Inclusion criteria: postgraduate students enrolled in the target university; postgraduate students who volunteered to participate in the survey after reading the instructions.

Exclusion criteria: in principle, there are no exclusion criteria since the online questionnaire platform used for this research sets the restriction that the questionnaire cannot be submitted until the questions are answered. During data screening, researchers excluded the questionnaires that: (1) had obvious logical errors; (2) had a clear pattern of responses.

This study was approved by the Ethics Committee of Xuzhou Medical University. All procedures were carried out in accordance with relevant ethical guidelines and regulations.

Measurements

The survey consisted of two sections. First, the social, demographic, and other relevant characteristics of the postgraduate students were recorded *via* the questionnaire, including gender, age, grade, region, whether being an only child, whether living with parents during childhood, and whether having concerns about COVID-19, eating breakfast, and exercising or not. Second, the survey included four scales as the assessment tools (see below for details):

Depressive symptoms

The 9-item Patient Health Questionnaire Depression Scale (PHQ-9) was used to measure the severity of depressive symptoms. The PHQ-9 is the most widely used depression measure in the world and has shown good reliability and validity in the context of the pandemic (45). The scale consists of nine items, with each item rated from 0 ("never") to 3 ("almost every day"), and the total scores of 5, 10, 15, and 20 represent the thresholds for mild, moderate, moderately severe, and severe depressive symptoms, respectively. The PHQ-9 has been shown to have acceptable psychometric properties for screening depression among Chinese undergraduate students (46). In this study, Cronbach's alpha for the scale was 0.913.

Interpersonal sensitivity

The interpersonal sensitivity subscale of Symptom Checklist 90 (SCL-90) was used (47), which has been used among Chinese college students and has shown good reliability (48). The subscale consists of 9 items, and each of these is rated from 0 ("none") to 4 ("very severe"). A higher total score of all items indicates a higher level of interpersonal sensitivity. In this study, Cronbach's alpha for the scale was 0.921.

Psychological capital

The psychological capital of college students was measured by the Psychological Capital Questionnaire (PCQ-24), which was developed by Luthans et al. (37), and the Chinese version has shown good reliability (49). The scale consists of four dimensions and 24 items. Each item is scored on a 6-point Likert scale, with 1 indicating "strong disagreement" and 6 indicating "strong agreement." A higher score generally indicates a higher level of psychological capital. In this study, Cronbach's alpha for the PCQ-24 was 0.952.

Sleep quality

The Pittsburgh Sleep Quality Index (PSQI) was adopted to measure the sleep quality of individuals. The scale was developed

by Buysse et al. (50) and includes seven components so that each dimension has four items. The sum score of all items was the sleep quality index. The higher the score, the worse the quality of the individual's sleep. In addition, a total score > 5 was indicative of poor sleep quality. It has been demonstrated to be a reliable and valid method for assessing and screening sleep dysfunctions among Chinese college students (51). In our study, Cronbach's alpha for PSQI was 0.743.

Statistical analysis

Mean and standard deviation was used to describe the basic information of the data. Pearson's coefficient was used to show the correlation between the four variables (interpersonal sensitivity, depression, PsyCap, and sleep quality). Independent samples t-test and one-way analysis of variance (ANOVA) were employed to describe the distribution of the four variables. The PROCESS v 3.4 macro was used to test the serial multiple mediation model, and models 4 and 6 were selected (52). All of the above analyses were completed with SPSS 22.0, and all significance tests were two-tailed, $\alpha = 0.05$.

Results

Subjects and sample selection

We adopted G*Power 3.1.9.2 to calculate the sample size. A *post-hoc* analysis in G*Power was used to calculate the achieved power (1-β) of the sample size of our study. Since the process macro was based on the multiple regression model, the fixed model of linear multiple regression was set as the statistical test. The calculated parameters were as follows: the effect size f2 was entered as 0.15, α was 0.05, the total sample was 2554, and the number of final predictors was 12 (the number of tested predictors was 3). The result showed that the statistical power of the regression model was 100%, indicating that 2554 postgraduate students reached the necessary sample size.

Preliminary analyses

A total of 2,554 postgraduate students participated in the study (mean$_{year}$ = 25.85, standard deviation = 2.63), with 36.53% of male participants and 63.47% of female participants (Table 1).

In our study, the mean score of the PHQ-9 was 4.51, and the prevalence of mild, moderate, and severe depressive symptoms was 30.97, 6.58, and 1.45%, respectively. According to the PSQI threshold, the proportion of participants with poor sleep quality was 35.40%. The average score of interpersonal sensitivity and PsyCap were 1.91 and 104.92, respectively. Interestingly, there was a significant difference in the four variables among all postgraduate students who lived with parents during childhood ($p < 0.001$), were concerned about COVID-19 ($p < 0.001$), ate breakfast ($p < 0.001$), and exercised ($p < 0.001$). Specifically, the postgraduate students who did not live with parents when they were between 0 and 6 years old, were not concerned about COVID-19,

did not eat breakfast, and did not exercise had higher scores on interpersonal sensitivity, sleep quality, and depression, and lower scores on PsyCap.

Correlation analysis

Correlations for all variables are presented in Table 2. Depression was positively related to interpersonal sensitivity and sleep quality ($r = 0.508$ and 0.593, $p < 0.001$, respectively) and negatively related to PsyCap ($r = -0.546$, $p < 0.001$). Interpersonal sensitivity was also positively related to sleep quality ($r = 0.459$, $p < 0.001$). In addition, a negative correlation was identified between PsyCap and sleep quality ($r = -0.492$, $p < 0.001$).

Mediation analysis

As an essential first step, we tested the mediating role of PsyCap and sleep quality in the relationship between interpersonal sensitivity and depression, respectively. In the model with PsyCap as the mediator, interpersonal sensitivity had a negative association with PsyCap ($a = -0.547$, $p < 0.001$). With the statistically significant effect of PsyCap on depression ($b = -0.369$, $p < 0.001$), it appears that interpersonal sensitivity had a positive direct effect ($c' = 0.283$, $p < 0.001$), and further had an indirect effect on depression *via* partially mediating the role of PsyCap (indirect effect = 0.202, 95% bootstrap CI: 0.169–0.235) (Figure 2A).

In the model with sleep quality as a mediator, depression was positively affected by interpersonal sensitivity ($c' = 0.290$, $p < 0.001$) and sleep quality ($b = 0.450$, $p < 0.001$). In addition, sleep quality was also positively associated with interpersonal sensitivity ($a = 0.433$, $p < 0.001$). A significant indirect effect of interpersonal sensitivity on depression *via* sleep quality was observed (indirect effect = 0.195, 95% bootstrap CI: 0.169–0.222) (Figure 2B). H1 and H2 were supported by these findings.

After the single mediation model was tested, we conducted the serial multiple mediation model to verify H3. As shown in Figure 2C and Table 3 interpersonal sensitivity had a direct effect on depression (β = 0.183, $p < 0.001$). In addition, interpersonal sensitivity had a significant effect on PsyCap and sleep quality (β = −0.547 and 0.261, $p < 0.001$, respectively). Depression was impacted by PsyCap and sleep quality (β = −0.248 and 0.385, $p < 0.001$, respectively). As the basis of the serial model, a significant regression result was observed between PsyCap and sleep quality (β = −0.315, $p < 0.001$).

Table 4 shows the effect of the pathways of the serial model. In addition to the direct effect (β = 0.183, 95% bootstrap CI: 0.147–0.219), interpersonal sensitivity also had an indirect effect on depression *via* PsyCap and sleep quality (total indirect effect = 0.302, 95% bootstrap CI: 0.267–0.339). In the pathway *via* PsyCap only, the indirect effect was 0.136 (95% bootstrap CI: 0.108–0.166); and in the pathway *via* sleep quality only, the indirect effect was 0.100 (95% bootstrap CI: 0.080–0.122). In support of H3, the specific indirect effect of interpersonal sensitivity on depression through both mediators

TABLE 1 Sociodemographic characteristics of four variables among postgraduate students.

Category	N (%)	Depression		Interpersonal sensitivity		Psychological capital		Sleep quality	
		M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)
Total	2554	4.51 ± 4.69		1.91 ± 0.68		104.92 ± 16.39		4.69 ± 3.03	
Gender									
Male students	933 (36.5)	4.57 ± 5.16	$t = 0.459$ ($p = 0.647$)	1.95 ± 0.74	$t = 1.765$ ($p = 0.078$)	105.93 ± 17.22	$t = 2.301$ ($p = 0.021$)	4.54 ± 3.28	$t = -1.782$ ($p = 0.075$)
Female students	1621 (63.5)	4.48 ± 4.39		1.89 ± 0.64		104.34 ± 15.86		4.77 ± 2.88	
Age									
22–25	1361 (53.3)	4.43 ± 4.62	$F = 0.472$ ($p = 0.624$)	1.91 ± 0.69	$F = 2.321$ ($p = 0.098$)	105.01 ± 16.71	$F = 0.198$ ($p = 0.820$)	4.47 ± 2.88	$F = 9.745$ ($p < 0.001$)
26–30	1043 (40.8)	4.61 ± 4.74		1.90 ± 0.66		104.92 ± 15.89		4.86 ± 3.11	
>30	150 (5.9)	4.60 ± 4.94		2.03 ± 0.66		104.13 ± 16.92		5.43 ± 3.63	
Grade									
First	971 (38.0)	4.12 ± 4.45	$F = 7.620$ ($p = 0.001$)	1.89 ± 0.69	$F = 0.661$ ($p = 0.516$)	106.14 ± 16.14	$F = 4.927$ ($p = 0.007$)	4.38 ± 2.87	$F = 8.917$ ($p < 0.001$)
Second	914 (35.8)	4.96 ± 4.90		1.93 ± 0.68		103.79 ± 16.88		4.78 ± 3.01	
Third	669 (26.2)	4.48 ± 4.68		1.92 ± 0.66		104.70 ± 15.95		5.01 ± 3.26	
Region									
Rural	1474 (57.7)	4.66 ± 4.76	$t = 1.788$ ($p = 0.074$)	1.94 ± 0.68	$t = 2.397$ ($p = 0.017$)	104.26 ± 16.10	$t = -2.378$ ($p = 0.017$)	4.68 ± 2.93	$t = -0.164$ ($p = 0.869$)
Urban	1080 (42.3)	4.32 ± 4.58		1.88 ± 0.68		105.82 ± 16.74		4.70 ± 3.17	
Only child									
Yes	949 (37.2)	4.32 ± 4.57	$t = -1.597$ ($p = 0.110$)	1.89 ± 0.70	$t = -1.409$ ($p = 0.159$)	106.32 ± 16.40	$t = 3.322$ ($p = 0.001$)	4.60 ± 3.19	$t = -1.100$ ($p = 0.271$)
No	1605 (62.8)	4.63 ± 4.75		1.93 ± 0.66		104.10 ± 16.32		4.74 ± 2.94	
Living w/parents as a child									
Yes	2228 (87.2)	4.39 ± 4.61	$t = -3.567$ ($p < 0.001$)	1.89 ± 0.68	$t = -4.863$ ($p < 0.001$)	105.44 ± 16.44	$t = 4.189$ ($p < 0.001$)	4.61 ± 2.97	$t = -3.201$ ($p = 0.001$)
No	326 (12.8)	5.38 ± 5.11		2.08 ± 0.67		101.38 ± 15.60		5.24 ± 3.38	
Concerned about Covid-19									
Yes	2438 (95.5)	4.41 ± 4.55	$t = -3.653$ ($p < 0.001$)	1.90 ± 0.66	$t = -4.551$ ($p < 0.001$)	105.39 ± 16.07	$t = 5.570$ ($p < 0.001$)	4.63 ± 3.01	$t = -4.265$ ($p < 0.001$)
No	116 (4.5)	6.66 ± 6.56		2.29 ± 0.91		95.09 ± 19.61		5.97 ± 3.34	
Eating breakfast									
No	474 (18.6)	5.99 ± 5.39	$F = 45.743$ ($p < 0.001$)	2.05 ± 0.73	$F = 23.903$ ($p < 0.001$)	99.72 ± 17.22	$F = 50.726$ ($p < 0.001$)	5.68 ± 3.40	$F = 45.778$ ($p < 0.001$)
Seldom	954 (37.4)	4.80 ± 4.71		1.96 ± 0.67		103.67 ± 15.58		4.83 ± 3.02	
Usually	1126 (44.0)	3.65 ± 4.13		1.82 ± 0.65		108.17 ± 15.99		4.15 ± 2.75	
Physical exercise									
No	459 (17.9)	5.47 ± 5.19	$F = 15.709$ ($p < 0.001$)	2.07 ± 0.73	$F = 22.542$ ($p < 0.001$)	98.95 ± 16.78	$F = 52.114$ ($p < 0.001$)	5.51 ± 3.24	$F = 29.576$ ($p < 0.001$)
Seldom	1340 (52.5)	4.53 ± 4.58		1.92 ± 0.66		104.86 ± 15.67		4.71 ± 2.98	
Usually	756 (29.6)	3.92 ± 4.45		1.81 ± 0.66		108.66 ± 16.32		4.15 ± 2.89	

TABLE 2 Pearson's correlation between variables.

	Dep	IS	PsyCap	SQ
Depressive symptoms (Dep)	–			
Interpersonal sensitivity (IS)	0.508***	–		
Psychological capital (PsyCap)	−0.546***	−0.579***	–	
Sleep quality (SQ)	0.593***	0.459***	−0.492***	–

***$p < 0.001$.

in the serial pathway (PsyCap-sleep quality) is also significant (serial indirect effect = 0.066, 95% bootstrap CI: 0.053–0.080). Based on the above results, our three hypotheses are all supported.

Discussion

This study was conducted to explore the *status quo* of depression and the mediating role of PsyCap and sleep quality on the relationship between interpersonal sensitivity and depression among Chinese postgraduate students. We found a high self-reported prevalence of depression among postgraduate students using the validated self-report questionnaire during the lockdown period, which was generally higher than the result (33.87%) reported by Liang [16] in the same population. There are two possible reasons for this difference: the diversity between the two measurement tools [53] and the time points of the lockdown. The tool used to measure depression in the survey from which we obtained data was the PHQ-9, and Liang used the SDS (Self-rating Depression Scale). This survey was conducted during a lockdown in 2022, which was repeated due to the renewed outbreak of COVID-19. Once again, normal college life was disrupted by the lockdown, which may cause more depressive symptoms. In addition, it was found that 35.40% of the participants in the study had poor sleep quality, which is comparable to the findings in Cremasco's study [54]. The research by Cremasco included 2838 students and revealed that more than 45% of participants reported a decline in sleep quality. In China, postgraduate students need to meet certain academic requirements before graduation. In the context of the lockdown, students were unable to pursue their own research projects as usual. The concern about their graduation and further education resulted in longer sleep but poorer sleep quality, which was consistent with the previous study [21].

It was observed that the score of depression had a significant difference in postgraduate students with different options for grades, whether they lived with their parents when they were 0–6, concerning information, eating breakfast, and doing physical activity. In China, the postgraduate education system is three years, and academic research begins in the second year generally. since then they face the great academic pressure because they need to read literatures or do experiments, and publish academic papers. Postgraduate students who did not live with their parents between ages 0 and 6 showed higher depression scores. We speculated that this might be related to parent-child attachment in childhood, and the study showed that insecure attachment increased the risk of depression [55]. The insecurity of this attachment was magnified by the long-term lockdown, as the respondents were unable to meet with family members. Timely attention to the information related to the epidemic can give individuals a general understanding of epidemic prevention and control and reduce unnecessary panic and anxiety [56]. It has

FIGURE 2
The characteristics of models. In this figure, psychological capital (PsyCap) as an independent mediator of the model **(A)**; sleep quality (SQ) as an independent mediator of the model **(B)**; psychological capital (PsyCap) and sleep quality (SQ) jointly play a mediating role of the chain mediation model **(C)**. ***$p < 0.001$.
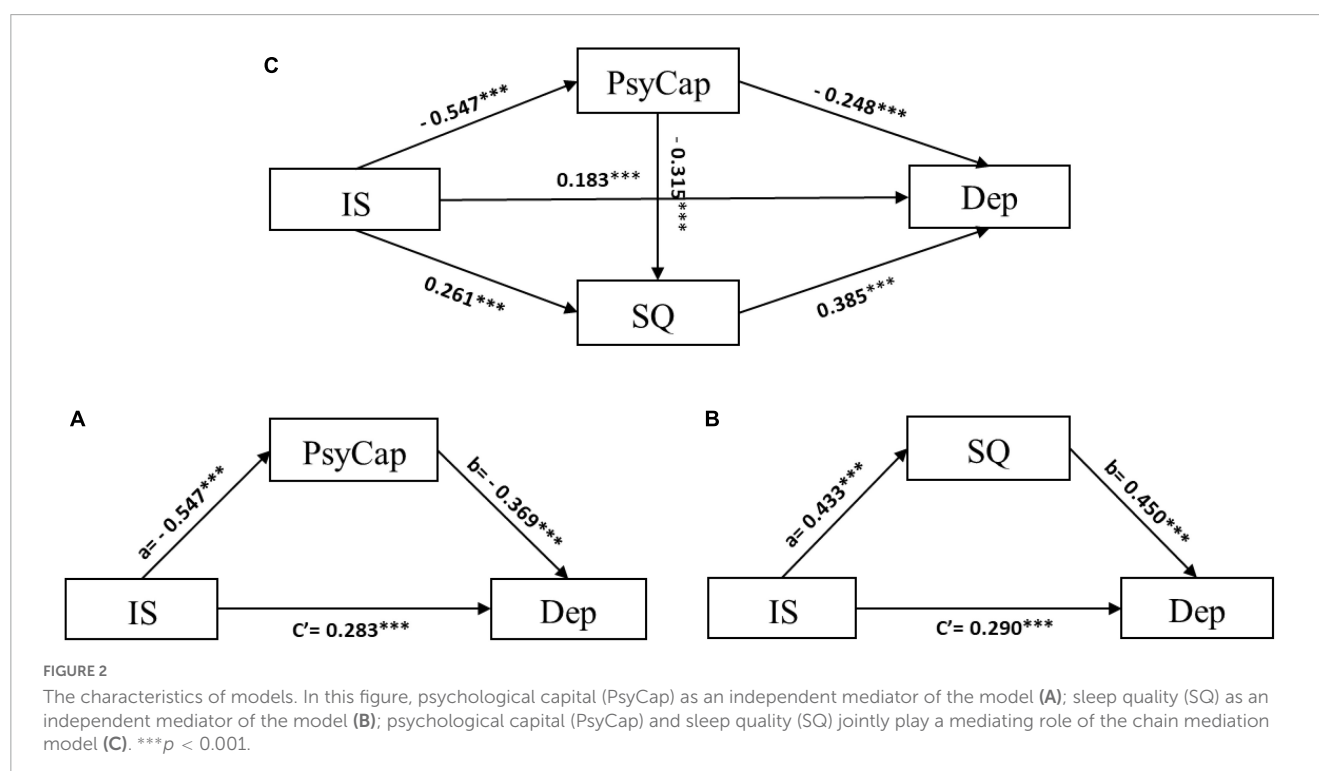
TABLE 3 Model characteristics of the serial multiple mediation models.

	Model 1 (Y = PsyCap)		Model 2 (Y = SQ)		Model 3 (Y = Dep)	
	B	t	B	t	B	t
(Constant)	0.155	0.941	−0.233	−1.348	0.161	1.056
Gender	−0.121	−3.603***	0.086	2.434*	−0.057	−1.812
Age	0.008	0.265	0.123	3.996***	−0.037	−1.365
Grade	−0.031	−1.406	0.035	1.511	0.003	0.154
Region	−0.012	−0.346	0.063	1.722	−0.032	−1.019
Only child	−0.086	−2.396*	−0.012	−0.305	0.009	0.276
Living w/Parents as a child	−0.032	−0.665	0.037	0.728	0.013	0.294
Concerned about COVID-19	−0.270	−3.540***	0.073	0.902	0.036	0.510
Eating breakfast	0.130	5.936***	−0.114	−4.923***	−0.061	−2.979**
Physical exercise	0.129	5.356***	−0.043	−1.673	0.047	2.102*
IS	−0.547	−33.844***	0.261	12.763***	0.183	9.853***
PsyCap			−0.315	−15.096***	−0.248	−12.954***
SQ					0.385	22.038***

*p < 0.05; **p < 0.01; ***p < 0.001.
IS, interpersonal sensitivity; PsyCap, psychological capital; SQ, sleep quality; Dep, depressive symptoms.

been found that the risk of depressive symptoms tends to increase with decreasing frequency of eating breakfast (57), and skipping breakfast was a risk factor for eating disorders which was related to depressive symptoms (58). Meanwhile, those who usually exercised had the lowest depression scores. A meta-analysis showed that physical activity has significant mental health benefits (59). In addition, a randomized experimental trial showed that a physical activity intervention was an effective approach to depression in college students during the pandemic (60). Adequate exercise can alleviate depression caused by the epidemic, whether it is to physically improve immunity (61) or to psychologically feel safe.

Interestingly, we also found that the scores of the other three model variables (interpersonal sensitivity, PsyCap, and sleep quality) had the same differential changes as depression in these students with different choices about having lived with parents in childhood, who were concerned about information on COVID-19, having breakfast and exercising. In general, postgraduate students

TABLE 4 The direct and indirect effect of the serial multiple models.

Pathway	Effect	SE	Bootstrap 95% CI	
			LLCI	ULCI
Direct	0.183	0.019	0.147	0.219
Indirect				
Total	0.302	0.018	0.267	0.339
ind1 (IS → PsyCap → Dep)	0.136	0.015	0.108	0.166
ind2 (IS → SQ → Dep)	0.100	0.011	0.080	0.122
ind3 (IS → PsyCap → SQ → Dep)	0.066	0.007	0.053	0.080

IS, interpersonal sensitivity; PsyCap, psychological capital; SQ, sleep quality; Dep, depressive symptoms.

who did not live with their parents in childhood, were not concerned about the epidemic, did not have breakfast, or did not exercise had the poorest mental health. Postgraduate students should pay attention to these aspects and make changes in these aspects to ease psychological symptoms.

Central to our research findings is the examination of PsyCap and sleep quality are postulated as jointly mediating variables in a model of the relationship between interpersonal sensitivity and depression. Our findings demonstrated that the serial multiple mediation effect of PsyCap and sleep quality in sequence and the separate mediation effect of them were both significant. The results also provided new insights into the differences in the strength of the indirect effect of PsyCap and sleep quality on this association. Specifically, it was found that the serial indirect effect of interpersonal sensitivity on depression through PsyCap was found to be stronger than the other two indirect effect pathways.

Our research found that interpersonal sensitivity has a significant impact on depression among Chinese postgraduate students. Some of the manifestations of interpersonal sensitivity are highly consistent with depression, especially characteristics such as sensitivity and suspiciousness, and low self-esteem (62). People with higher levels of interpersonal sensitivity do less well in maintaining long-term relationships; they may have few friends and always prefer to keep to themselves, leading to increased loneliness and eventually depression. Negative core beliefs about the self were central to the development of depression (63). A meta-analysis revealed that the COVID-19 lockdowns, which were characterized by isolation and reduced social contact, played a significant role in the increased negative emotional symptoms of college students (64). In addition, supervisors should provide timely advice related to the research and allow postgraduate students to present their work, which can develop students' skills (65). However, online contact weakened the communication effect between supervisors and students, which made students unable to receive timely feedback on their current work, which in turn, led

to increased negative emotions. The negative emotional symptoms amplified the effect of interpersonal sensitivity on postgraduate students' depression. Furthermore, a long period in a negative state may weaken an individual's positive state, as shown by the results of research conducted during school lockdowns, which found that the resilience in Chinese adolescents decreased due to the closures (66). High levels of interpersonal sensitivity may result in postgraduate students having worse interpersonal relationships, which may not be conducive to the expansion of their resources and may affect the development of their psychological capital, and further lead to depression. Therefore, as a high-order positive psychological variable, PsyCap mediated the relationship between interpersonal sensitivity and depression during the lockdown.

Furthermore, sleep quality also independently played a mediating role in the relationship, which was consistent with previous research (25). Studies have indicated that interpersonal problems can directly affect sleep quality (37), and more interpersonal stress was associated with more cognitive pre-sleep arousal (67). We infer that interpersonal sensitivity of graduate students may lead to negative emotional symptoms, which may lead to poor sleep quality. Daily negative emotion was reported to be associated with greater sleep problems (68) and to mediate the effect of spontaneous brain activity on sleep quality (69). Meanwhile, sleep quality was associated with depression (70). Evidence suggests that sleep is an important biological mechanism in mood regulation (71) and that repeated sleep disruption may have direct effects on recovery and health.

Our findings also revealed the serial multiple mediating roles of PsyCap and sleep quality in the pathway from interpersonal sensitivity to depression in Chinese postgraduate students. Sleep quality was negatively affected by PsyCap in our study, which was consistent with previous research in different populations (42, 43). The psychological capital of postgraduate students may be affected to varying degrees by interpersonal sensitivity, which may affect the quality of sleep through psychological capital, leading to depression. The significant result further confirmed the rationality of our hypothesis. Hence, university mental health departments should pay attention to the related factors (self-efficacy, hope, resilience, optimism, etc.) that can improve the PsyCap of postgraduate students, provide appropriate mental health education in peacetime and conduct relevant psychological training for the groups with low PsyCap. At the same time, postgraduate students should also be provided with sleep knowledge and health education to make them aware of the importance of adequate sleep.

Several limitations of our research should be acknowledged. First, due to the nature of the cross-sectional study, the causal relationship of the mediation model was not sufficiently effective. A longitudinal study method should be adopted to test the causal relationship. Second, our study only included postgraduate students from only one university, which limited the generalizability of our findings. The scope of the study should be expanded. Third, because the main aim of this study was to investigate an intervention mechanism, the effect of covariates on depression was not examined, which may have led to biased results.

Conclusion

This study provided empirical evidence on the pathways linking interpersonal sensitivity and depression among Chinese postgraduate students. The results showed that interpersonal sensitivity was significantly associated with depressive symptoms. Psychological capital and sleep quality played independent and cumulative mediating roles in the relationship between interpersonal sensitivity and depression. In addition, the single mediation model indicated that psychological capital had a greater impact than sleep quality on the relationship between interpersonal sensitivity and depression. The finding has important implications for the importance of positive psychological factors concerning the mental health of postgraduate students during the lockdown. Positive psychological interventions and sleep guidance should be considered to alleviate depressive symptoms in postgraduate students.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

This studies was involving human participants were reviewed and approved by the Xuzhou Medical University Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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A propensity score matching study: The prevalence of mental health problems among pregnant women at first antenatal care increased in Chongqing during the first wave of the COVID-19 pandemic

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Background: The 2019 coronavirus disease (COVID-19) pandemic increased the risks of mental health challenges, especially anxiety and depression. However, the impact of COVID-19 on mental health during pregnancy has not been fully established. Therefore, we investigated the impact of the COVID-19 pandemic on maternal mental health.

Methods: Two cohorts of pregnant women at their first antenatal care in the First Affiliated Hospital of Chongqing Medical University were enrolled in this study. One cohort was enrolled before the COVID-19 outbreak, from 1 June to 31 December 2019 (n=5,728, pre-COVID-19 group), while the other was enrolled during the COVID-19 pandemic, from 24 January to 23 March 2020 (n=739, COVID-19 pandemic group). Symptoms of depression, anxiety, and somatization disorders were assessed by the Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire-15 (PHQ-15), with a cutoff point of 10 for moderate-to-severe depression, anxiety, and somatoform symptoms. The propensity score matching method (1:1) was used to balance differences in demographic characteristics between groups. A chi-square analysis was performed to compare differences in demographic characteristics between the groups.

Results: Prevalence of moderate-to-severe depression, anxiety, and somatoform symptoms among pregnant women at their first antenatal care visit during the COVID-19 pandemic (9.5, 2.2, and 20.8%, respectively) was significantly lower than those before the pandemic (16.3, 4.4, and 25.7%, respectively) (p<0.05). Compared with the same period before the pandemic, during the pandemic, the number of women newly registered for antenatal care decreased by nearly 50%. There were significant differences in the distributions of demographic characteristics between the groups (p<0.05). After matching the demographic characteristics, differences in the prevalence of maternal mental health disorders between the groups reversed dramatically. Prevalence of moderate-to-severe depression, anxiety, and somatoform symptoms during the COVID-19 pandemic

in this population (2.3, 9.6, and 20.8%, respectively) was significantly higher than those before the pandemic (0.3, 3.9, and 10%, respectively) (*p*<0.05).

Conclusion: The COVID-19 pandemic increased mental health risks among pregnant women. As a large proportion of pregnant women with mental health challenges delay their prenatal care or change healthcare facilities after the outbreak of public health emergencies, there is a need to establish a balanced healthcare system in medical institutions at all levels.

Introduction

The COVID-19 pandemic presents a significant threat to the physical and mental health of patients, especially anxiety and depression (1, 2). Previously, we found that 20.7 and 30.2% of hospital workers experienced anxiety and depression during the COVID-19 pandemic (3). Yang et al. reported that the prevalence of anxiety and depression in the general population with different sociodemographic backgrounds was 12.6 and 24.3%, respectively (4). Moreover, during the pandemic, students exhibited relatively high incidences of anxiety and depression (5–7). Wang et al. revealed that 53.8% of their study participants ranked the psychological impact of COVID-19 from moderate to severe (8). Therefore, the impact of life-threatening public health emergencies on mental health is enormous and extensive.

Pregnancy is a normal physiological state in women of childbearing age. Due to hormonal changes, role transitions, and other psychosocial factors, pregnant women are more likely to develop depression and anxiety than non-pregnant women (9). Almost 16.3% of pregnant women experience depression during pregnancy, and the figure may be higher in low-and middle-income countries (10, 11). Untreated antenatal depression and anxiety may result in a series of short-and long-term negative effects on mothers, infants, and their families (12–14). Pregnant women are at higher risk for severe COVID-19 infections, which may increase the likelihood of preterm births (15–17). Moreover, during the COVID-19 pandemic, pregnant women exhibited higher risks for anxiety and depression than non-pregnant women (18). Mo et al. reported that the prevalence of depression and anxiety in pregnant women was 48.7 and 33.0%, respectively, and more than two-thirds of pregnant women showed concerns about COVID-19 (19). Wu et al. found that depression incidences in pregnant women increased after the COVID-19 outbreak, rising from 26 to 34.2%, accompanied by a significant increase in anxiety symptoms (20). Zhou et al. reported inconsistent findings, showing that pregnant women had fewer anxiety and depression symptoms and were less worried about being infected with COVID-19, compared to non-pregnant women (21, 22). Overall, evidence supports that the COVID-19 pandemic exerted severe negative impacts on the mental health of pregnant women (23–25). Therefore, timely screening and counseling interventions for depression and anxiety among pregnant women are crucial during the COVID-19 pandemic.

Most of the current studies on maternal mental health during the COVID-19 pandemic focused on anxiety and depression among pregnant women and their associated risk factors (26–28). To the best of our knowledge, only five studies compared maternal mental health

disorders before and after the COVID-19 outbreak [two from China (20, 29), one from Saudi Arabia (30), one from Canada (31), and one from Turkey (32)]. Among them, two studies compared differences in the prevalence of mental health disorders in the same group of pregnant women at two time points (pre-and post-COVID-19 outbreak), with small sample sizes (101 and 63 cases), while the remaining three studies compared different groups of pregnant women recruited at two time periods (pre-and post-COVID-19 outbreak). Given the limited number of studies, there is a need to elucidate depression and anxiety incidences among pregnant women during the COVID-19 pandemic. In May 2019, our hospital established an obstetrics multi-disciplinary team clinic that consisted of psychiatrists, obstetricians, and psychological consultants and conducted a free online mental health assessment for all pregnant women at their first antenatal care visit to our obstetrics clinic. The COVID-19 outbreak in 2020 provided us with coincidental data on maternal mental health pre-and post-COVID-19 outbreak, which made it possible to explore the impact of the COVID-19 pandemic on maternal mental health from a real-world perspective. Our findings provide valuable information and a basis for relevant policy-making after public health emergencies.

Methods

Study design and population

This was a cross-sectional study performed in Chongqing, southwest China. Study participants were enrolled from the department of obstetrics, the First Affiliated Hospital of Chongqing Medical University, from 1 June to 31 December 2019 (pre-COVID-19 period) and from 24 January to 23 March 2020 (COVID-19 pandemic period). Pregnancy was established by B-ultrasonography, and the women were required to complete the free online psychological assessment questionnaire at their first prenatal care visit. Pregnant women who did not partake in the assessment or who were illiterate were excluded from this study. Written informed consent was obtained from all participants before evaluation. This study was approved by the ethical committee of Chongqing Medical University, China.

Data collection and quality control

Data collection and quality control were performed as previously described (33). General information and psychological assessment

data for pregnant women were obtained through the exclusive QR code and website. Access to online assessments was restricted as the unique telephone number for each pregnant woman was used for the log-ins. The online questionnaire comprehensively introduced the aim of the project and provided the assessment instructions for each specific scale. All participants completed these assessments on their own, with two trained nurses on hand to answer any questions they had. After submission of the assessments, the nurse wrote down the scale scores.

All entries were set as compulsory questions, and the IP address verified by the mobile phone of the tester could only save the final answer on the test day. Questionnaires would only be submitted after completing all items. Otherwise, the system would automatically identify the outcome as incomplete. Online psychological assessments have been adopted for depression screening among pregnant women (33). We set the test time based on the pre-test results and deleted the questionnaires whose test duration was <180 s.

Demographic information

Participants' basic demographic information, including age, last menstrual period, residence (rural vs. urban), nationality (Han vs. minority), marital status (married, unmarried, or divorced), level of education (middle school or lower, high school, college, and master's degree or higher), occupation (fixed or self-employed and unemployed), parity (nulliparous vs. multiparous), and gestational weeks, was collected at interview.

Assessment of depression, anxiety, and somatization symptoms

The Chinese version of Patient Health Questionnaire-9 (PHQ-9) is a 9-item scale that is used to evaluate depressive symptoms in the preceding 2 weeks before assessment, with scores ranging from 0 to 3 for each item: 0 = "none," 1 = "several days," 2 = "more than half the days," and 3 = "nearly every day." Findings were categorized as follows: 0–4 as normal, 5–9 as mild depression, 10–14 as moderate depression, 15–19 as moderate-to-severe depression, and 20–27 as severe depression. A cutoff total score of 10 was defined as depression, while sensitivity and specificity were 88 and 86%, respectively (34). In this study, Cronbach's alpha for PHQ-9 was 0.87.

The Chinese version of Generalized Anxiety Disorder-7 (GAD-7) was used to evaluate the severity of anxiety in the preceding 2 weeks. GAD-7 uses a four-point Likert scale (35) with scores ranging from 0 to 3 for each item: 0 = "none," 1 = "several days," 2 = "more than half the days" and 3 = "nearly every day." Findings were categorized as follows: 0–4 as normal, 5–9 as mild anxiety, 10–14 as moderate anxiety, and 15–21 as severe anxiety. The positive screening for anxiety symptoms was defined with a cutoff score of 10 or higher, sensitivity of 89%, and specificity of 82% (36). In this study, Cronbach's alpha for PHQ-9 was 0.84.

The Chinese version of Patient Health Questionnaire-15 (PHQ-15) was used to assess somatic symptoms in the preceding 4 weeks, with scores ranging from 0 to 2 for each item: 0 = "no disturbance," 1 = "little disturbance," and 2 = "much disturbance" (37). Findings were categorized as follows: 0–4 as normal, 5–9 as mild

somatic symptoms, 10–14 as moderate somatic symptoms, and 15–30 as severe somatic symptoms. A cutoff point of ≥10 was used to assess the presence of somatic symptoms, with a sensitivity of 80.2% and a specificity of 58.5% (38). In this study, Cronbach's alpha for PHQ-9 was 0.86.

Statistical analysis

Data were analyzed using the IBM SPSS 22.0 software. Descriptive statistics were used to present the study variables and demographic characteristics. A chi-square analysis was used to compare differences between groups. The propensity score matching method (1:1) was used to balance differences in distributions of demographic characteristics, with the grouping variable as the dependent variable (COVID-19 pandemic = 1, pre-COVID-19 = 0), demographic characteristics (age, residence, marital status, education, occupation, pregnancy weeks and gravidity) as covariates, and matching tolerance as 0 for categorical variables. A total of 710 accurate matching pairs were obtained for analyses. A p-value ≤ 0.05 was the threshold for significance.

Results

Between 1 June and 31 December 2019 (pre-COVID-19), 5,780 pregnant women completed the online psychological assessment at their first antenatal care visit. Of those, 52 women were excluded due to being in the postpartum period or due to missing any results from PHQ-9, GAD-7, or PHQ-15. Thus, 5,728 questionnaires were analyzed. Between 24 January and 23 March 2020 (during the COVID-19 pandemic), 747 pregnant women finished the online questionnaire. Eight questionnaires were excluded either because the women were in the postpartum period or because of missing results from any scale. A total of 739 questionnaires were analyzed. Most of the enrolled participants were aged between 25 and 34 years (n = 4,764; 73.7%), were of Han nationality (n = 6,119; 94.6%), were married (n = 5,745; 88.8%), were employed (n = 5,306; 82%), and were in their first trimesters (n = 4,672; 72.2%) (Table 1).

During the COVID-19 pandemic, 272/739 (36.8%) pregnant women exhibited different degrees of depressive symptoms. Prevalence of mild, moderate, moderate-to-severe, and severe depressive symptoms was 27.3, 7.6, 1.6, and 0.3%, respectively. A total of 111/739 (15%) pregnant women had different degrees of anxiety symptoms. The prevalence of mild, moderate, and severe anxiety symptoms was 12.9, 1.8, and 0.4%, respectively. The prevalence of moderate-to-severe depression (PHQ-9 ≥ 10), anxiety (GAD-7 ≥ 10), and somatoform symptoms (PHQ-15 ≥ 10) during the COVID-19 pandemic was 9.5% (n = 70), 2.2% (n = 16), and 20.6% (n = 152), respectively. Before the COVID-19 outbreak, the prevalence of moderate-to-severe depression, anxiety, and somatoform symptoms was 16.3, 4.4, and 25.7%, respectively (Table 2). The prevalence of depression, anxiety, and somatoform symptoms among pregnant women during their first antenatal care during the COVID-19 pandemic was significantly lower than those before the COVID-19 outbreak (p < 0.05; Table 2).

To clarify the impact of the COVID-19 pandemic on maternal mental health, we first queried the number of pregnant women who

TABLE 1 Demographic characteristics of the two groups.

Characteristic	Total sample (n=6,467)	COVID-19 pandemic (n=739)	Pre-COVID-19 (n=5,728)	χ^2/F	Value of p
Age, No. (%)				21.704	<0.001*
≤24	729 (11.3)	75 (10.1)	654 (11.4)		
25–29	2,638 (40.8)	316 (42.8)	2,322 (40.5)		
30–34	2,126 (32.9)	258 (34.9)	1,868 (32.6)		
35–39	653 (10.1)	78 (10.6)	575 (10.0)		
≥40	321 (5.0)	12 (1.6)	309 (5.4)		
Residence, No. (%)				2.562	0.109
Rural	2,935 (45.4)	315 (42.6)	2,620 (45.7)		
Urban	3,532 (54.6)	424 (57.4)	3,108 (54.3)		
Race, No. (%)				4.891	0.027*
Han nationality	6,119 (94.6)	712 (96.3)	5,407 (94.4)		
Others	348 (5.4)	27 (3.7)	321 (5.6)		
Marital status, No. (%)				18.34	<0.001*
Married	5,745 (88.8)	691 (93.5)	5,054 (88.2)		
Unmarried/divorce	722 (11.2)	48 (6.5)	674 (11.8)		
Education, No. (%)				31.975	<0.001*
Middle school or less	622 (9.6)	52 (7.0)	570 (10.0)		
High school	921 (14.2)	103 (13.9)	818 (14.3)		
Technical secondary school	2,064 (31.9)	294 (39.8)	1,770 (30.9)		
College	2,400 (37.1)	229 (31)	2,171 (37.9)		
Master or higher	460 (7.1)	61 (8.3)	399 (7.0)		
Gravidity, No. (%)				10.127	0.001*
Primigravida	2,806 (43.4)	361 (48.8)	2,445 (42.7)		
Multigravida	3,661 (56.6)	378 (51.2)	3,283 (57.3)		
Occupation, No. (%)				51.801	<0.001*
Fixed/self employed	5,306 (82)	677 (91.6)	4,629 (80.8)		
Not employed	1,161 (18)	62 (8.4)	1,099 (19.2)		
Gestational weeks, No. (%)				60.433	<0.001*
First trimester (<14)	4,672 (72.2)	493 (66.7)	4,179 (73.0)		
Second trimester (14–28)	1,249 (19.3)	214 (29)	1,035 (18.0)		
Third trimester (>28)	546 (8.4)	32 (4.3)	514 (9.0)		

p-values were calculated using the chi-square test.
*Statistically significant: $p < 0.05$.

had newly registered for antenatal care in our hospital before, during, and after the COVID-19 pandemic. In Figures 1A,B, during the COVID-19 pandemic, the number of pregnant women decreased by nearly 50%, compared with the same period before the pandemic. The number of pregnant women gradually increased over time as the lockdown ended, but it was still down by at least 12% when compared with the same month in the previous year at a timepoint of nearly 6 months after the COVID-19 pandemic. Second, we compared differences in demographic characteristics among pregnant women in the two groups (pre-COVID-19 vs. COVID-19 pandemic). Table 1 shows that there were significant differences in distributions of demographic characteristics (age, Han nationality, education level, gestational weeks, marital status, occupation, and gravidity) among

pregnant women in the two groups ($p < 0.05$). Compared to the pre-COVID-19 period, the proportions of pregnant women in the elderly age (>40 years) (1.6% vs. 5.4%), middle school degree or below (7% vs. 10%), ethnic minorities (3.7% vs. 5.6%), multigravida (51.2% vs. 57.3%), unemployed (8.4% vs. 19.2%), and unmarried/divorced (6.5% vs. 11.8%) were significantly lower during the COVID-19 pandemic ($p < 0.05$).

Hence, findings from the two groups with demographic mismatch do not inform on whether the COVID-19 pandemic exerted positive or negative effects on the mental health of pregnant women. To eliminate the effects of demographic distribution differences on analysis, 710 exact matches were obtained via propensity score matching (Table 3). There were no significant differences in

TABLE 2 Results of PHQ-9, GAD, and PHQ-15 between the two groups.

Mental health problems	COVID-19 pandemic (n=739)	Pre-COVID-19 (n=5,728)	χ^2	Value of p
PHQ-9 level, No. (%)			52.897	<0.001*
No depression symptoms	467 (63.2)	2,842 (49.6)		
Mild depression	202 (27.3)	1,953 (34.1)		
Moderate depression	56 (7.6)	699 (12.2)		
Moderate–severe depression	12 (1.6)	187 (3.3)		
Severe depression	2 (0.3)	47 (0.8)		
GAD-7 level, No. (%)			27.12	<0.001*
No anxiety symptoms	628 (85.0)	4,396 (76.7)		
Mild anxiety	95 (12.9)	1,080 (18.9)		
Moderate anxiety	13 (1.8)	175 (3.1)		
Severe anxiety	3 (0.4)	77 (1.3)		
PHQ-15 level, No. (%)			19.325	<0.001*
No somatic symptoms	298 (40.3)	1,905 (33.3)		
Mild somatic symptoms	289 (39.1)	2,352 (41.1)		
Moderate somatic symptoms	129 (17.5)	1,165 (20.3)		
Severe somatic symptoms	23 (3.1)	306 (5.3)		
Depression positive			23.207	<0.001*
PHQ-9≥10	70 (9.5)	933 (16.3)		
PHQ-9<10	669 (90.5)	4,795 (83.7)		
GAD positive			8.226	0.004*
GAD-7≥10	16 (2.2)	252 (4.4)		
GAD-7<10	723 (97.8)	5,476 (95.6)		
Somatoform disorders positive			9.101	0.003*
PHQ-15≥10	152 (20.6)	1,471 (25.7)		
PHQ-15<10	587 (79.4)	4,257 (74.3)		

p-values were calculated using the chi-square test. PHQ, Patient Health Questionnaire-15; GAD-7, Generalized Anxiety Disorder.
*Statistically significant: p<0.05.

distributions of age, residence, ethnicity, education level, gravidity, occupation, marital status, and gestational weeks between the two newly matched groups (p>0.05; Table 3). Prevalence of moderate-to-severe anxiety (GAD-7≥10), depression (PHQ-9≥10), and somatoform symptoms (PHQ-15≥10) among pregnant women during the COVID-19 pandemic was 2.3, 9.6, and 20.8%, respectively, significantly higher than those in the pre-COVID-19 period (0.3, 3.9, and 10%) (p<0.05; Table 4).
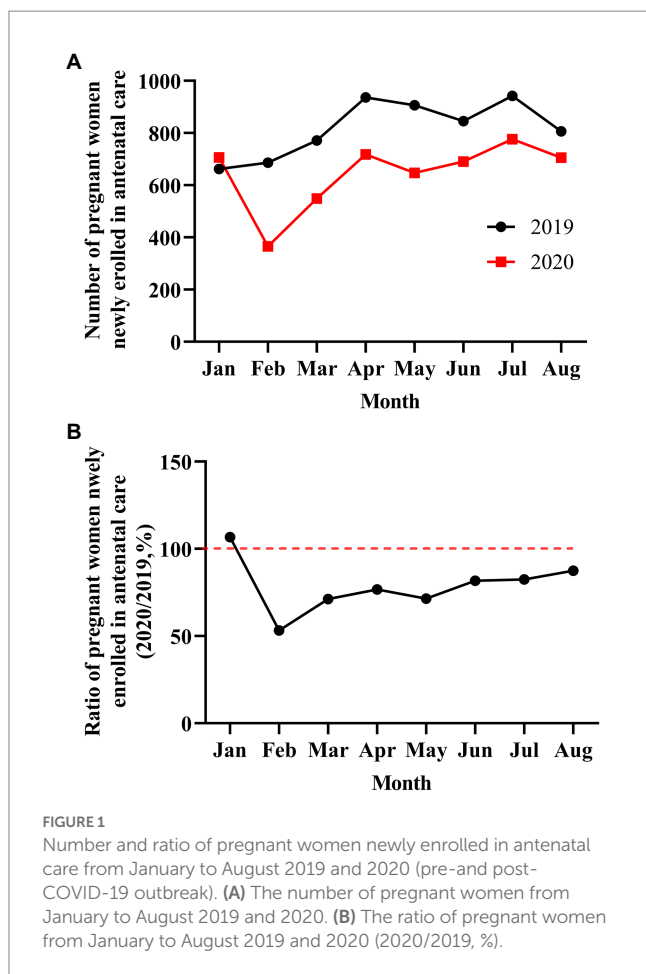
Discussion

We investigated the impact of the COVID-19 pandemic on maternal mental health. We found that 9.5, 2.2, and 20.8% of pregnant women at their first antenatal care visit during the COVID-19 pandemic suffered from moderate-to-severe depression, anxiety, and somatoform symptoms, respectively. The prevalence of depression and anxiety in our study was significantly lower than that reported by other groups. For instance, a multicenter network study reported that 32% of Chinese pregnant women had depression (PHQ-9≥10) or anxiety (GAD-7≥5) during the COVID-19 pandemic (39). Jones

et al. reported that anxiety and depression might have affected more than half of perinatal women during the first national lockdown in England (40). A multi-country network cross-sectional study in Europe reported that 15 and 11% of pregnant women had moderate-to-severe depressive symptoms (Edinburgh Depression Scale≥13) and generalized anxiety symptoms (GAD≥10) (26). However, the prevalence of depression in our study is lower than the 5.3% reported by Zhou et al. (21), comparable to the 9.8% reported by Wu et al. (41). These differences in prevalence might be due to different regions, study population, screening tools, and inconsistent cutoff points used to assess depression and anxiety. Overall, anxiety and depression are common mental challenges for pregnant women. Therefore, timely screening for mental health disorders and providing interventions is important for the health of pregnant women and their fetuses (42).

We found that 16.4, 4.4, and 25.7% of pregnant women had moderate-to-severe depression, anxiety, and somatoform symptoms during their first prenatal care before the COVID-19 attack, respectively, significantly higher than that during the COVID-19 pandemic. This finding was contrary to the results of previous studies and our expectations that pregnant women might have experienced higher risks of depression, anxiety, and distress under the stress of the

FIGURE 1
Number and ratio of pregnant women newly enrolled in antenatal care from January to August 2019 and 2020 (pre-and post-COVID-19 outbreak). **(A)** The number of pregnant women from January to August 2019 and 2020. **(B)** The ratio of pregnant women from January to August 2019 and 2020 (2020/2019, %).

COVID-19 outbreak (20, 30–32). We postulated that this outcome was partly due to better family support and less work pressure, which are protective factors for anxiety and depression among pregnant women. Nausea and vomiting are very common complaints during early pregnancy, affecting almost 60–80% of pregnant women (43). In addition, spontaneous abortion is the most common complication in the first trimester of pregnancy. These factors might be responsible for the high rates of anxiety and depression in early pregnancy. During the COVID-19 pandemic, Chongqing was under a comprehensive "lockdown," including mandatory homestays, travel bans, and traffic controls (44). Staying at home kept pregnant women away from the pressure of work and gave them more time to recover from morning sickness. Moreover, more family companionship, support, and communication due to mandatory homestays may have reduced anxiety among pregnant women with regard to early pregnancy reactions, miscarriage, and mother role transition (45).

We also postulated that pregnant women with high levels of anxiety and depression are more likely to delay their expected first antenatal care or choose nearer health facilities for antenatal care due to their greater fear of contracting COVID-19 (46), which may partly explain the low prevalence of depression and anxiety among pregnant women in clinics during the COVID-19 pandemic. Our hospital is one of the comprehensive teaching hospitals with the largest scale and strongest professional skills in China. The obstetrics department is the diagnosis and treatment center for high-risk pregnancy in Chongqing

and a prenatal diagnosis and fetal medicine center in western China. Before the COVID-19 outbreak, pregnant women with complicated comorbidities and complications were referred to our obstetrics department for antenatal care and delivery. High-risk pregnancy and pregnancy comorbidities or complications are independent risk factors for anxiety and depression in pregnant women (41, 47, 48). The lockdown may have prevented pregnant women with high-risk pregnancies outside the main urban areas of Chongqing from visiting our hospital for antenatal care during the COVID-19 pandemic, which might have led to the low prevalence of anxiety and depression in the obstetric clinic.

The contrasting outcomes were also attributed to mismatched distributions of demographic characteristics. There was a significantly low proportion of elderly women (>40 years), unemployed, low education level, ethnic minorities, multigravida, unmarried, or divorced cases in the first trimester among pregnant women during the COVID-19 pandemic than that in the pre-COVID-19 period. These demographic characteristics are closely related to anxiety and depression and are even considered to be risk factors for mental health disorders (2). Acheanpong et al. reported that elder maternal age and low educational level were significantly high among women with antenatal depression (49). In a previous meta-analysis, higher levels of education and better living conditions were found to be protective factors while low socioeconomic status was among the major risk factors (50). Ho-Fung et al. documented that unemployment is an associated risk factor for poor perinatal mental health (51). Wu et al. found that unmarried/divorced/widowed and unemployed cases in their first trimester of pregnancy had increased risks of antenatal anxiety and depression in the post-COVID-19 pandemic era (41). Multigravida and ethnic minorities also increase the risks of depression and anxiety among pregnant women (50, 52). Therefore, lower proportions of pregnant women with these potential risk factorsmight partly explain fewer pregnant women reported the symptoms of depression, anxiety, and somatoform disorders during the COVID-19 pandemic.

However, the significant differences in the distribution of socio-demographic characteristics between the two periods may not reflect the impact of the COVID-19 pandemic on the mental health of pregnant women. Propensity score matching is one of the statistical methods for controlling differences in variables between groups (53). After matching all sociodemographic characteristics with significant differences between the groups, we found that more pregnant women exhibited symptoms of depression, GAD, and somatoform disorders during the COVID-19 pandemic (2.3, 9.6, and 20.8%), relative to the pre-COVID-19 period (0.3, 3.9, and 10%). The results indicate that the COVID-19 pandemic increased the risks of anxiety and depression among pregnant women, consistent with evidence from previous studies. As a new and unknown viral disease, the COVID-19 pandemic may have caused stress, fear of illness, worries of infection, and unemployment, which in turn increased the risk of anxiety and depression (54, 55). Kakaraparthi et al. and Ayaz et al. found that the prevalence of anxiety and depression among pregnant women was significantly increased after the COVID-19 outbreak (pre-and post-COVID-19 outbreak) (30, 32). Zhou et al. and Berthelot et al. compared differences in the prevalence of mental health disorders between the different groups enrolled in the pre-and post-COVID-19 outbreak and reported consistent results (20, 31). Furthermore, it has

TABLE 3 Demographic characteristics between the two matched groups.

Characteristic	COVID-19 pandemic (n=710)	Pre-COVID-19 (n=710)	χ^2/F	Value of p
Age, No. (%)			0	1
≤24	69 (9.7)	69 (9.7)		
25–29	314 (44.2)	314 (44.2)		
30–34	244 (34.4)	244 (34.4)		
35–39	71 (10)	71 (10)		
≥40	12 (1.7)	12 (1.7)		
Residence, No. (%)			0	1
Rural	307 (43.2)	307 (43.2)		
Urban	403 (56.8)	403 (56.8)		
Race, No. (%)			2.01	0.156
Han nationality	684 (96.3)	673 (94.8)		
Others	26 (3.7)	37 (5.2)		
Marital status, No. (%)			0	1
Married	669 (94.2)	669 (94.2)		
Unmarried/divorce	41 (5.8)	41 (5.8)		
Education, No. (%)			0	1
Middle school or less	48 (6.8)	48 (6.8)		
High school	98 (13.8)	98 (13.8)		
Technical secondary school	285 (40.1)	285 (40.1)		
College	222 (31.3)	222 (31.3)		
Master or higher	57 (8)	57 (8)		
Gravidity, No. (%)			0	1
Primigravida	342 (48.2)	342 (48.2)		
Multigravida	368 (51.8)	368 (51.8)		
Occupation, No. (%)			0	1
Fixed/self employed	658 (92.7)	658 (92.7)		
Not employed	52 (7.3)	52 (7.3)		
Gestational weeks, No. (%)			0	1
First trimester (<14)	489 (68.9)	489 (68.9)		
Second trimester (14–28)	193 (27.2)	193 (27.2)		
Third trimester (>28)	28 (3.9)	28 (3.9)		

p-values were calculated using the chi-square test.
*Statistically significant: $p < 0.05$.

been reported that up to 40–60% of pregnant women may have had anxiety and depression during the COVID-19 pandemic ([19], [56]). Therefore, we considered that pregnant women had higher risks of anxiety and depression during the COVID-19 pandemic. Unfortunately, a great proportion of pregnant women with anxiety and depression may not have attended the clinic for antenatal care. This phenomenon led to significantly low rates of anxiety and depression among pregnant women who came to clinics for their first antenatal care compared to the pre-pandemic period.

To our knowledge, our hospital is the only medical institution in Chongqing providing screening services for mental health disorders among pregnant women at their first antenatal care visit. In general,

obstetricians might often pay more attention to the physical conditions of pregnant women and fetuses and overlook the mental health challenges. Currently, most medical institutions lack screening systems and corresponding intervention programs for maternal mental health disorders. We speculate that pregnant women with or at high risk for anxiety and depression may delay their prenatal care or change the healthcare facilities after public health emergencies indicated the necessity of developing a balanced healthcare system and accelerating the development of appropriate screening and intervention systems for maternal anxiety and depression in medical institutions at all levels. There is a need to understand the mental health of pregnant women who do not attend antenatal care after

TABLE 4 Results of PHQ-9, GAD, and PHQ-15 between the two matched groups.

Characteristics	COVID-19 epidemic ($n=710$)	Pre-COVID-19 ($n=710$)	χ^2	Value of p
PHQ-9 level, No. (%)			28.764	<0.001*
No depression symptoms	443 (62.4)	524 (73.8)		
Mild depression	199 (28)	158 (22.3)		
Moderate depression	54 (7.6)	20 (2.8)		
Moderate–severe depression	12 (1.7)	7 (1)		
Severe depression	2 (0.3)	1 (0.1)		
GAD-7 level, No. (%)			77.392	<0.001*
No anxiety symptoms	602 (84.8)	695 (97.9)		
Mild anxiety	92 (13)	13 (1.8)		
Moderate anxiety	13 (1.8)	1 (0.1)		
Severe anxiety	4 (0.4)	1 (0.1)		
PHQ-15 level, No. (%)			55.928	<0.001*
No somatic symptoms	282 (39.7)	408 (57.5)		
Mild somatic symptoms	280 (39.4)	231 (32.5)		
Moderate somatic symptoms	125 (17.5)	64 (9)		
Severe somatic symptoms	23 (3.2)	7 (1)		
Depression positive			17.875	<0.001*
PHQ-9 ≥ 10	68 (9.6)	28 (3.9)		
PHQ-9 < 10	642 (90.4)	682 (96.1)		
GAD positive			11.029	0.001
GAD-7 ≥ 10	16 (2.3)	2 (0.3)		
GAD-7 < 10	694 (97.7)	708 (99.7)		
Somatoform disorders positive			32.01	<0.001*
PHQ-15 ≥ 10	148 (20.8)	71 (10.0)		
PHQ-15 < 10	562 (79.2)	639 (90)		

p-values were calculated using the chi-square test. PHQ, Patient Health Questionnaire-15; GAD-7, Generalized Anxiety Disorder.
*Statistically significant: $p < 0.05$.

public health emergencies. Strengthening the publicity of mental health knowledge, improving the public's ability to identify common psychological disorders such as anxiety and depression, and providing a network, convenient psychological evaluation systems, and decompression skills might be conducive to further promoting the mental health outcomes of pregnant women.

This study has some limitations. First, even though almost all pregnant women at their first antenatal care in our hospital during the COVID-19 pandemic were enrolled in our study, the sample size was small. Second, this study was only a single-center cross-sectional study, not a multicenter longitudinal follow-up study, which might have increased bias. Third, this study used the self-rating questionnaire to evaluate antenatal anxiety and depression among pregnant women, which might also have led to assessment bias. Hence, in future, a multicenter longitudinal follow-up study with a large sample size would be conducted to investigate the mental health disorders among pregnant women at different stages after the outbreak of public health emergencies by combining self-assessment and clinician-administered assessment scales.

Conclusion

The COVID-19 pandemic increased the risk of mental health disorders among pregnant women. There were significant differences in the prevalence of anxiety, depression, and somatoform symptoms between the two COVID-19 periods before and after propensity score matching, which clarifies the impact of the COVID-19 pandemic on mental health among pregnant women and dispels the false impression that the prevalence of anxiety and depression among pregnant women at their first antenatal care in the clinic during the pandemic was significantly low. Our findings provide the theoretical evidence for promoting the balanced development of the medical system and the establishment of screening and intervention systems for maternal mental health disorders.

Statement

We confirm that we have complied with our institution's intellectual property regulations and there are no impediments to

publication, including the timing of publication, with respect to intellectual property.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of the First Affiliated Hospital of Chongqing Medical University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JG and XL analyzed the data and wrote the manuscript. JH, YG, AZ, and WC helped to design the questionnaire and collected the data. MA and QZ developed the online assessment systems. LC, SL, and XY helped the patients finish the questionnaires. LK conceived the experiments, was a fund provider, and was involved in writing the review. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Check for updates

Parent–child relationships and psychological distress: survey of parents from low-income families after the COVID-19 pandemic

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Introduction: This study aims to shed light on parent–child relationships and the psychological health of parents from low-income families after the easing of the COVID-19 pandemic restrictions.

Methods: This cross-sectional study recruited 553 parents of children aged 13–24 years in low-income community settings. The Parent–Child Conflict scale of the Parental Environment Questionnaire (PEQ) was used to measure parent–child conflict. Psychological distress was assessed using the Depression, Anxiety, and Stress Scale short form (DASS-21).

Results: The study revealed a low level of parent–child conflict in the overall study population, with a median PEQ of 48.0 (interquartile range [IQR] 36 to 48). Concerning demographics, married parents reported a likelihood of having a higher level of parent–child conflict over 3 times higher than single parents (OR = 3.18 95%, CI 1.30−7.75). More parent–child conflicts were also found in parents aged 60−72 years old who were unemployed, retired, or housewives and from lower-income groups. In regard to lifestyle factors, a higher level of physical activity and having enough sleep were associated with lower levels of parent–child conflict. Only approximately 1% of the participants reported symptoms of depression, anxiety, or stress.

Discussion: Low risk exists for parent–child conflict and psychological sequelae following the easing of the COVID-19 pandemic restrictions, which could be due to various support measures implemented by the government. Vulnerable parents identified as being at risk of parent–child conflict warrant attention in future advocacy efforts.

KEYWORDS

youth-parent conflict, PEQ, post pandemic, B40, DASS-21

1. Introduction

The COVID-19 pandemic is considered the worst global health catastrophe of the century. Since it was first reported in December 2019, in Wuhan, Hubei province, China (1), the novel coronavirus rapidly spread around the world and caused enormous adverse health, economic, and social impacts on the entire human population (2). Crisis-related hardship is having a tremendous impact on parents' and children's psychological well-being (3, 4). The adverse psychological effect of the COVID-19 pandemic on parents and their children's relationships is

a new and unpredictable situation facing many families. The pandemic has exacerbated decreased parent–child interactions and their relational quality. Parents faced notable challenges during the COVID-19 pandemic, in particular during the period of social isolation, as they needed to juggle work and family life. As a result, negative parent–child interactions and conflicts were commonly reported during the COVID-19 pandemic (5, 6). Parent–child conflict must not be underestimated as elevated rates of conflict have been found to contribute to the development of socio-emotional dysfunction in school-age children through adolescence (7). Additionally, problematic family functioning and a negative home environment can have lasting detrimental impacts on child development (8, 9). Not only did the pressure of parenting during the COVID-19 pandemic jeopardise the well-being of children but, more importantly, such stressors may also have exerted an impact on various aspects of parents' mental and physical health spheres; hence, primary prevention of parent–child conflict is crucial.

The impact of parent–child conflict on the physical and psychological health of parents should not be neglected. Although little has been reported on the effect of parent–child conflict on parents, pandemic-related stress in adults may have exacerbated pre-existing conditions and prospectively increased the risk of hypertension, coronary heart disease, and stroke (10). In regard to the psychological impact, there have been several reports on parenting stress affecting parental mental well-being during the COVID-19 pandemic in Asia as well as Western countries (6, 11, 12). The current evidence also suggests that the pandemic triggered an array of family issues in low-income families and economically vulnerable households (13). As parental unemployment, financial insecurity, and economic hardship caused substantial parenting stress during the COVID-19 pandemic (14, 15), parent–child conflict may have had a disproportionate impact on vulnerable parents.

It is well established that parent's demographics are significantly related to parenting styles and children's psychological adjustment (16). Little is known about parent's demographics impact on parent–child relationship in the wake of the COVID-19 pandemic restrictions in Malaysia. Understanding parent–child conflict amongst a range of socioeconomic and demographic factors is important in designing equitable and appropriate support for a broad spectrum of individuals. It is also well known that the COVID-19 pandemic has negatively altered families' lifestyles. Parents and children not meeting recommended lifestyle behaviours such as sleep time, physical activity, screen time and nutrition intake were found to be negatively associated with parent's stress levels during the COVID-19 pandemic (17). It is uncertain whether it is possible for family to return to their normal pre-pandemic lifestyles. Establishing the relationship between lifestyle behaviours and parent–child relationship will provide insights to health authorities in designing intervention to promote healthy new normal lifestyle behaviours that foster harmonious family relationships.

In Malaysia, declining psychological and mental well-being during the COVID-19 pandemic has been reported in several studies (18–20); however, the impact of the pandemic specifically on parents and family relationships has been relatively understudied. With the pandemic broadly under control worldwide, Malaysia started relaxing its COVID-19 restrictions at the beginning of May 2022. Little is known about the parent–child relationship and whether it affects the psychological well-being of parents in low-income communities in Malaysia. It is also unknown whether the pandemic has had lasting implications for parent–child relationships after the easing of the coronavirus restrictions. Understanding the post-pandemic well-being of parents in vulnerable communities and identifying their risks and negative consequences may provide useful insights into intervening efforts. Hence, this study's research questions focus on investigating the state of parent–child conflict and associated demographics and lifestyle factors after the government began to relax the social distancing regulations. Furthermore, this study explores the potential association between parent–child relationships and the psychological distress of parents.

2. Methods

2.1. Participants

The sample of parents in this study was recruited from residents in the People Housing Project, also known as the Programme Perumahan Rakyat (PPR), a government settlement programme for people from the low-income group (B40 or bottom 40% of the Malaysian household income) in the state of Selangor and the Federal Territory of Kuala Lumpur, Malaysia. Field enumerators were trained to recruit eligible parents and assist them in answering the survey questions. A convenience sampling approach was used. Google Surveys was used to gather data from the survey. The inclusion criteria were being parents in the PPR and having children who are in their young adulthood (aged 13 to 24 years). The questionnaire (Appendix 1) consisted of an assessment of the demographic characteristics of parents, lifestyle factors (alcohol consumption, exercise, healthy diet, and sleep quality), parent–child conflict, and psychological distress. The data collection period was from May to November 2022.

2.2. Assessment of parent–child conflict

The Parent–Child Conflict Scale of the Parental Environment Questionnaire (PEQ) (21 was administered to determine the respondents)' perceptions of the parent–child relationship. The items have been shown to reliably assess five dimensions of parent–child relationships (21). Parent–child conflict refers to disharmonious or intense interactions during which both the parents and children show negative behaviours and emotions. The Parent–Child Conflict Scale consists of 12 items assessing aspects of parent–child relationship relationships on a 4-point scale (1 = definitely true, 4 = definitely false). The scores ranged from 12 to 48. All 12 items were summed, and higher overall scores reflected lower parent–child conflict. We examined the reliability of the parent–child conflict scale and the Cronbach's α was 0.982, suggesting that the measure has a high level of internal consistency. To our best knowledge, parent–child conflict has never been assessed in the Malaysian population. In this study, the parent–child conflict scale was demonstrated to have a high internal reliability compared to other studies where the Cronbach's α were reported to range from 0.080 to 0.090 (22–24).

2.3. Assessment of depression, anxiety, and stress

Psychological distress was measured using the Depression, Anxiety, and Stress Scale short form (DASS-21) (25). The scale has three

subscales – namely Depression (DASS-21-D), Anxiety (DASS-21-A), and Stress (DASS-21-S). There are seven items in each subscale; the score of each subscale ranges from 0 to 21, with higher scores indicative of more severe symptoms of depression, anxiety, and/or stress. The cut-offs for depression (moderate 14–20, severe 21–27, and extremely severe ≥28), anxiety (moderate 10–14, severe 15–19, and extremely severe ≥20), and stress (moderate 19–25, severe 26–33, and extremely severe ≥34) were calculated (26). We also calculated the reliability of the subscales in this study. The Cronbach's α for the subscales DASS-21-D, DASS-21-A, and DASS-21-S in this study was 0.975, 0.965, and 0.965, respectively, implying a high level of internal consistency. This indicate that the DASS-21 scale is a reliable psychometric instrument when used in the current study population. A former study in Malaysia reported Cronbach's alphas of 0.956 for the overall scale, 0.927 for the DASS-21-D, 0.865 for the DASS-21-A and 0.882 for the DASS-21-S (19).

2.4. Statistical analyses

Scale reliability was examined using Cronbach's alpha for internal consistency. The baseline characteristics and lifestyle factors of the study participants were summarised and categorised into two groups based on a higher and a lower score of parent–child conflict. The Kolmogorov–Smirnov and Shapiro–Wilk tests of normality were applied to understand the distribution of the data. The distribution of parent–child conflict was not normal; hence, the median (interquartile range) was used in the reporting of the results. Due to the small sample size, the association between categorical data was assessed using Fisher's exact test. Univariate and multivariable logistic regression analyses were conducted to explore the demographics and lifestyle factors associated with parent–child conflict. Only significant factors in the univariate analyses, with a value of p of <0.05, were selected for the multivariable regression analysis. Odds ratios (OR), 95% confidence intervals (95% CI), and value of ps were calculated for each independent variable. The model fit of multivariable logistic regression analysis was assessed using the Hosmer–Lemeshow goodness-of-fit test (27). All the statistical analyses were performed using the Statistical Package for the Social Sciences version 20.0 (IBM Corp., Armonk, NY, United States).

2.5. Ethical considerations

This research was approved by the University of Malaya Research Ethics Committee (UM.TNC2/UMREC–1579). The respondents were informed that their participation in this research was voluntary and all consented. Data security and participants' confidentiality were maintained at all levels of data management. Due to the sensitivity of the issue, the availability of counseling services was made known to the study participants and contact information was available to participants who needed counseling or mental health services. None of the parents reported that they were distressed or psychologically uneased by participating in the study and none used the counseling services provided.

3. Results

A total of 553 complete responses were received. The baseline characteristics of the study population are shown in the first and second columns of Table 1. There were almost equal responses from men (49.9%) and women (50.1%). The majority of parents (62.4%) were aged 50 to 59 years and of Malay ethnicity (64.0%). Over half reported an average household income of MYR2001–MYR3000. Regarding lifestyle factors, two-thirds (66.5%) reported sometimes/often engaging in physical exercise (37.6%) and 70.7% stated that they have practised healthy eating in the past 3 months. None reported consuming alcohol. Figure 1 shows the distribution of responses for the PEQ items. A total of 17.7% declared that it was *definitely true/probably true* that they often lose their temper with their children, followed by 16.6% who reported that it was *definitely true/probably true* that they often have misunderstandings with their children, and 13.6% said that it was *definitely true/probably true* that they often argue with their children.

As shown in Table 1, the total PEQ score of the study participant range was 12 to 48, and the median PEQ score was 48.0 (interquartile range [IQR] 36 to 48). The PEQ score was categorised as 12–47 or 48, based on the median split; as such, a total of 275 (49.7, 95% CI 45.5–54.0) were categorised as having a score of 12–47 and 278 (50.3, 95% CI 46.0–54.5) were categorised as having a score of 48. Regarding demographics, for parents aged 60–72 years, the odds of having lower PEQ scores were significantly lower than those of parents aged 50–59 years (OR = 0.34, 95% CI 0.19–0.63). For ethnicity, the odds of having lower PEQ scores were higher amongst the Malay (OR = 3.92, 95% CI 2.14–7.19) and Chinese (OR = 3.87, 95% CI 1.74–8.64) respondents than amongst the Indian respondents. Parents who are skilled workers were found to have lower odds of having lower PED scores (OR = 0.46, 95% CI 0.27–0.77) than those not in employment (unemployed, housewife, or retired). Although there were no significant differences in the multivariate model, univariate analyses showed that households with a higher income reported a significantly lower level of parent–child conflict. The odds of having lower PEQ scores were significantly higher for married parents (OR = 3.18, 95% CI 1.30–7.75) than for widowed, divorced, or separated parents.

All three lifestyle factors were significantly associated with the level of PEQ scores in the univariate analyses. In the multivariate model, only physical exercise and adequate sleep remained significant. Parents who reported *never/seldom* engaging in physical exercise (OR = 2.73, 95% CI 1.49–5.01), practising healthy eating (OR = 1.30, 95% CI 0.68–2.48), and having enough sleep (OR = 1.85, 95% CI 1.00–3.42) were found to have higher odds of lower PEQ scores.

In total, only four parents were found to have symptoms of depression and stress, and six parents reported symptoms of anxiety. The proportions of parent–child conflict scores by symptoms of depression, anxiety, and stress are shown in Table 2. The proportions of depression, anxiety, and stress symptoms by demographic and lifestyle factors are shown in Appendix 2. The number of parents with symptoms of depression, anxiety, and stress was too small for important existing effects to be determined.

4. Discussion

The COVID-19 pandemic poses a threat to the well-being of children and families, particularly those in low-income communities. This study investigates the state of parent–child conflict and parents' psychological health after the easing of social distancing. We hoped to gain insights into the potential long-term impact of the COVID-19 pandemic on family

TABLE 1 Factors associated with parent−child conflict (N=553).

	Frequency (%)	Univariable analysis			Multivariable analysis
		Score 12−47 (n=275)	Score 48 (n=278)	p-value	Score 12−47 vs. score 48 OR (95% CI)
Socio demographic characteristics					
Age group (years)					
28–49	122 (22.1)	96 (78.7)	26 (21.3)	p < 0.001	1.84 (0.86–3.95)
50–59	345 (62.4)	115 (33.3)	230 (66.7)		0.34 (0.19–0.63)**
60–72	86 (15.6)	64 (74.4)	22 (25.6)		Reference
Gender					
Male	276 (49.9)	130 (47.1)	146 (52.9)	0.234	
Female	277 (50.1)	145 (52.3)	132 (47.7)		
Ethnicity					
Malay	354 (64.0)	220 (62.1)	134 (37.9)	p < 0.001	3.92 (2.14–7.19)***
Chinese	58 (10.5)	30 (51.7)	28 (48.3)		3.87 (1.74–8.64)**
Indian	140 (25.3)	25 (17.9)	115 (82.1)		Reference
Other	1 (0.2)	0 (0.0)	1 (100.0)		–
Marital status					
Married	507 (91.7)	266 (52.5)	241 (47.5)	p < 0.001	3.18 (1.30–7.75)*
Widowed/ Divorced/ Separated	46 (8.3)	9 (19.6)	37 (80.4)		Reference
Occupational type					
Professional and managerial	45 (8.1)	31 (68.9)	14 (31.1)	p < 0.001	0.61 (0.26–1.47)
Skilled worker	239 (43.2)	80 (33.5)	159 (66.5)		0.46 (0.27–0.77)**
Unskilled worker	117 (21.2)	75 (64.1)	42 (35.9)		1.45 (0.79–2.65)
Retired/ Unemployed/ Housewife	152 (27.5)	89 (58.6)	63 (41.4)		Reference
Average monthly household income (MYR)					
2000 and below	58 (10.5)	38 (65.5)	20 (34.5)	0.027	0.61 (0.26–1.47)
2001–3,000	321 (58.0)	149 (46.4)	172 (53.6)		0.82 (0.49–1.37)
3,001–5,000	174 (31.5)	88 (50.6)	86 (49.4)		Reference
Residence area					
Urban	535 (96.7)	260 (48.6)	275 (51.4)	0.004	Reference
Sub-urban	18 (3.3)	15 (83.3)	3 (16.7)		2.61 (0.62–11.02)
Lifestyle					
Doing physical exercises in the past 3 months					
Never/Seldom	185 (33.5)	141 (76.2)	44 (23.8)	p < 0.001	2.73 (1.49–5.01)**
Sometimes/ Often	368 (66.5)	134 (36.4)	234 (63.6)		Reference
Practising healthy eating in the past 3 months					
Never/Seldom	162 (29.3)	123 (75.9)	39 (24.1)	p < 0.001	1.30 (0.68–2.48)
Sometimes/ Often	391 (70.7)	152 (38.9)	239 (61.1)		Reference
Have enough sleep in a week in the past 3 months					
Never/Seldom	136 (24.6)	104 (76.5)	32 (23.5)	p < 0.001	1.85 (1.00–3.42)*
Sometimes/Often	417 (75.4)	171 (41.0)	246 (59.0)		Reference

*p < 0.05, **p < 0.01, ***p < 0.001, Hosmer–Lemeshow test, chi-square: 37.603, p < 0.001, Nagelkerke R^2: 0.452.

FIGURE 1
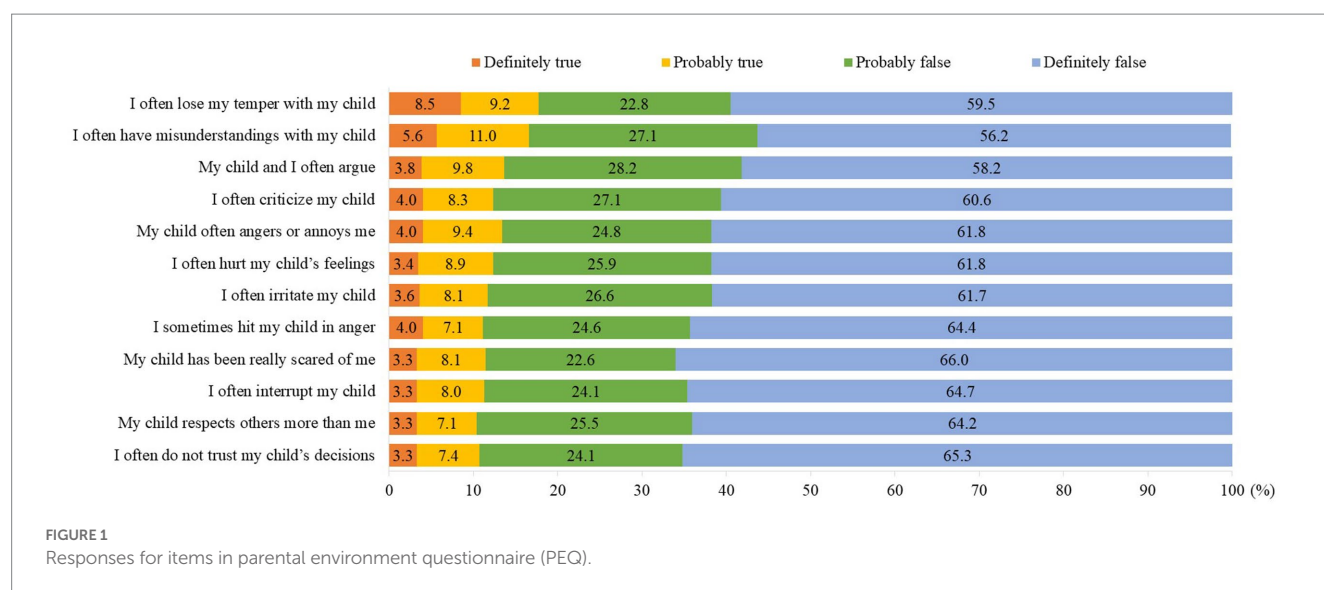Responses for items in parental environment questionnaire (PEQ).

TABLE 2 Factors associated with depression, anxiety, and stress.

Psychological distress							
	Frequency (%)	Depression		Anxiety		Stress	
		Moderate/ Severe/Extremely severe(n =4)	p-value	Mild/Severe/ Extremely severe (n =6)	p-value	Mild/Severe/ Extremely severe (n =4)	p-value
Parental environmental questionnaire							
Total parent–child conflict score							
Low score (score 12–47)	275 (33.5)	3 (1.1)	0.308	5 (1.8)	0.106	3 (1.1)	0.308
High score (score 48)	278 (66.5)	4 (0.4)		1 (0.4)		4 (0.4)	

well-being. Understanding the impact of the pandemic on these outcomes is critical for developing resources and interventions for future pandemics as well as the provision of support for families in need.

The results revealed that only a minority of parents have been adversely affected by the pandemic. Despite a general low level of parent–child conflict, the minority of parents who exhibited a high level of parent–child conflict should not be overlooked as it is a key issue in family well-being and represents whole-family functioning. Without the pandemic, parent–child conflict is a normal part of family life and often escalates during the teenage years. The biological, psychological, and social changes occurring during adolescence may have a salient impact on parent–child relationships (28). Given that adolescents' and parents' reactions to pubertal development are common and may contribute to changes in family dynamics (29), interventions to promote healthy parent–child relationships should be a part of public health promotion, particularly at the height of the social restrictions imposed by a pandemic.

In this study, parent–child conflict appears to be more prevalent amongst parents of the oldest age range, 60–72 years, than amongst those aged 50–59 years. This implies that younger parents in this study are more likely to compromise in parent–child relationships. Intergeneration conflicts and tension between older parents and their children are not uncommon and have been reported in the past literature (30, 31). The results indicate a need for widespread family

support and psycho-social interventions to reduce intergenerational conflicts, particularly during a pandemic lockdown. Our finding also suggests that older parents may benefit more from interventions.

An important insight of the study is that parents who were retired, unemployed, or housewives reported more parent–child conflict. Additionally, our study revealed a significant association between income and parent–child conflict in the univariate analysis. This could suggest the impact of economic pressure on family tension. Furthermore, an association between economic hardship and poor parent–adolescent relationships and intra-family conflict has been reported (32, 33). It has also been found that economic pressure is related to parental depressive symptoms, heightening couple conflict, which in turn results in harsh parenting and causes depressive symptoms in children (34). Our results indicate that hardcore poor households may need help to prevent or mitigate family-related conflicts.

Parent–child conflict and marital distress may coexist (35, 36). This perhaps explains the higher level of parent–child conflict amongst two-parent families in this study. There is mounting evidence showing that the COVID-19 pandemic and lockdown have led to greater conflicts and difficulties amongst couples (37–39). Notably, the COVID-19 quarantine has resulted in changes in marital life, exacerbated couple strains, and subsequently induced parent–child conflict. The findings suggest that psychological interventions geared towards promoting healthy couple relationships may hold promise for

reducing mental strain in both parents and their children and ultimately enhance positive parent–child relationships.

Our findings indicate that practising healthy lifestyle behaviours has a positive effect on parent–child conflict reduction. Stress undermines health and well-being (40), and healthy lifestyle behaviours reduced people's anxiety and sadness and improved their mental health during the COVID-19 pandemic (41). The study results may act as a basis for the promotion of family-centred intervention programs to encourage healthy behaviours in both parents and their children.

The current study found that there was generally a low prevalence of reported depression, anxiety, and stress symptoms amongst the sampled parents. The level of depression, anxiety, and stress symptoms found in this study were lower than comparable data from our previous study in Malaysia during the lockdown period (19). A more recent study found improvement in mental health amongst the public in Malaysia once the country was moving to ease the pandemic restrictions (42). Substantial relief from distress was also similarly found in Italy, and it was reported that end of strict lockdown, partial mitigation of preventive measures, relaunch of commercial, sport and school activities facilitate a psychological post-lockdown upswing in many people (43).

Despite a low level of psychological stress and parent–child conflict, the findings of this study imply that it is still crucial to maintain a healthy parent–child relationship after the pandemic. The Malaysian government has implemented various initiatives for low-income communities to alleviate the cost of living and burdens faced due to the COVID-19 pandemic. Amongst them were Bantuan Khas COVID-19 (BKC) cash aid assistance, income or employment loss assistance, and the implementation of financial relief in the form of loan moratorium or postponement of repayments for loans (44, 45). Low-income families are still continuously supported in recovering from the effects of COVID-19. This has perhaps brought positive benefits in relation to families' financial burden and psychological well-being amongst the low-income groups. Despite a low level of depression, anxiety and stress, our findings provide key insights into the importance of continuous positive parenting and the need to reduce conflicts within the family and sustain healthy relationships even though normal economic activities and lifestyles have resumed.

There are some limitations to the current study that need to be considered when interpreting the results. Firstly, the cross-sectional design used could not infer a causal relationship. Secondly, the study sample represents a convenience sample of parents living in PPR houses. The key disadvantage of convenience sampling is that the sample lacks clear generalizability. Additionally, we only recruited parents from PPR houses in one state and federal territory in Malaysia; hence, the findings may not be generalised to the entire population of low-income housing residents in Malaysia. Future research should include a more representative sample. Additionally, the study relied on parents' self-reports; therefore, socially desirable responses to sensitive questions in this study may be a source of bias leading to inaccurate self-reports and erroneous study conclusions. Finally, perhaps the most important limitation is the small sample in this study that reported symptoms of depression, anxiety, and stress; thus, the consequences of poor parent–child conflict for the mental well-being of parents were unable to be established. With the above-mentioned limitations, the findings of this study should be interpreted with caution. Despite the disadvantages, this study provides valuable data to fill the gap in the literature on the prevalence of parent–child conflict and its associated factors in low-income communities in Malaysia. This study also offers valuable information on the psychological effect of COVID-19 on the low-income population after the easing of the movement lockdown.

5. Conclusion

Based on data from our study sample, we found a low level of parent–child conflict and a small proportion of parents with severe to extremely severe anxiety, depression, and stress symptoms after the easing of the COVID-19 pandemic restrictions. Nonetheless, our study yielded several informative findings. In particular, it identified the socially vulnerable parent groups in low-income communities who should be the target for policies and services to overcome the aftermath of the COVID-19 pandemic and to equip them better in the event of future pandemics. Two-parent families, older parents, and parents who are economically disadvantaged are at higher risk of parent–child conflict. Establishing healthy lifestyle behaviours may be a key strategy in the prevention of parent–child conflict. In short, policies should take into consideration the implications of the lockdown for parents and their children. Provision of providing psycho-social intervention along with support to ease financial burden would be essential.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by this research was approved by the Universiti Malaya Research Ethics Committee (UM.TNC2/UMREC–1579). The patients/participants provided their online informed consent to participate in this study.

Author contributions

Funding

Acknowledgments

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1158698/full#supplementary-material

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COVID-19 responses and coping in young Malaysians from low-income families

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Introduction: This study aimed to shed light on how young people from low-income families were responding to COVID-19.

Methods: This cross-sectional study recruited young people aged between 18 and 24 years from the low-income-group communities. A convenience sampling approach was used. Google Surveys were used to gather data from the survey. The questionnaire consisted of an assessment of demographic characteristics, lifestyle factors, parent–youth conflict (Parental Environment Questionnaire, PEQ), resilient coping (Brief Resilient Coping Scale, BRCS), and psychological distress (Depression, Anxiety, and Stress Scale-short form, DASS-21).

Results: A total of 561 complete responses were received. The results showed a low level of parent–child conflict in the overall study population, with a median PEQ of 48.0 [interquartile range (IQR) 36−48]. Higher parent–child conflicts were found in females than in males (OR = 1.75, 95% CI 1.19−2.57) and in youth from households with an income below MYR 2000 than those earning MYR 3,001−5,000 (OR = 4.39, 95% CI 2.40−8.03). A low prevalence of depression (12.5%), anxiety (15.2%), and stress (6.4%) was found. Parent−child conflict remains the strongest significant predictor for higher levels of depression (OR = 10.90, 95% CI 4.31−27.57), anxiety (OR = 11.92, 95% CI 5.05−28.14), and stress (OR = 4.79, 95% CI 1.41−16.33) symptoms. Poor resilient coping was the second strongest predictor for depression and anxiety symptoms. Regarding lifestyle factors, a lower level of physical exercise was associated with higher symptoms of depression. By demographics, females reported more severe symptoms of depression and anxiety than males. Young people from low-income households reported greater severity in symptoms of depression, anxiety, and stress than those from high-income households. Young people who are employed also reported greater severity of anxiety symptoms than those who are unemployed.

Discussion: The COVID-19 pandemic continues to have an unpredictable impact on the lives of vulnerable youth in low-income families that warrants attention in future advocacy efforts.

KEYWORDS

BRCS, DASS-21, parent-youth conflict, pandemic, PEQ

Introduction

The novel coronavirus that caused COVID-19 has caused tremendous adverse events in the economic, health, and social wellbeing of people worldwide [1]. People of different ages, however, are impacted differently in all aspects of life; in particular, the pandemic poses considerable risks to and long-lasting impacts on adolescents and young people in various aspects with regard to employment, education, and mental wellbeing [2]. Young people, especially vulnerable youth and those from low social classes, have been more heavily affected and report a strong impact of the COVID-19 crisis [3].

Parents, too, faced unique challenges during the pandemic, including fear and uncertainty of the health risks, in addition to stress from mobility constraints, isolation measures, working from home, financial impact, and the closure of schools and child-care facilities [4, 5]. A large European study reported that parents experienced deteriorating wellbeing associated with home-schooling [6]. Prominent evidence of deterioration in parents and their child's mental and behavioral health during the first month of the pandemic was also reported [7, 8]. Collectively, pandemic-related stressors experienced by parents and their children have had negative implications on family relationships [9]. Frequent negative parent–child interactions and conflicts with their children have been reported during the pandemic [10, 11]. It has been noted that during the pandemic, sustaining mental health problems and family conflict is important to promote family members to practice healthy behaviors recommended by public health authorities [8]. Undoubtedly, there is a growing concern about the psychological manifestations of the pandemic and parent–child wellbeing. The pandemic has triggered an array of psychological and family issues but the major concern is whether the pandemic-related stressors experienced remain after the pandemic and continue to pose a major threat to family harmony. Emergent symptoms of post-traumatic stress disorder (PTSD) in the context of the COVID-19 pandemic have been a concern, while some researchers have warned of a "second pandemic" of PTSD in the wake of the damage caused by this pandemic [12].

In Malaysia, several cross-sectional surveys point to significant declines in psychological and mental health among the general public [13–15]; however, the impact on young people and particularly family relationships during the pandemic was relatively understudied. With the pandemic broadly under control, Malaysia started relaxing COVID-19 restrictions at the beginning of May 2022. Little is known whether the pandemic has lasting implications for young people in Malaysia. To fill this gap, the main aim of the present study was to explore the wellbeing of young people from low-income communities, by exploring their current state of parent–child conflict, resilient coping, and psychological distress. Specifically, we explore parent–youth conflict, coping, and healthy lifestyles in the prediction of psychological distress. This is particularly relevant as the pandemic lockdown has eased and normal life has resumed. We hypothesized that pandemic lockdowns and restrictions may create stressful conflict between young people and their parents, leading to greater psychological distress. In contrast, higher personal resilient coping attenuated the negative effect of conflict on their psychological stress levels. The findings of this study could be invaluable for mitigating the long-term consequences facing young people and their parents, as well as identifying recommendations that can be utilized in the case of any future pandemics.

Methods

Participants

The sample of young people was recruited from residents in the People Housing Project also known as the Program Perumahan Rakyat (PPR), a government settlement program for people from the low-income group (the Bottom 40% of the Malaysian household income or B40), in the state of Selangor and the Federal Territory of Kuala Lumpur, Malaysia. Malaysian households are classified into three income groups: Bottom 40% (B40), Middle 40% (M40), and Top 20% (T20). The B40 groups comprised 2.91 million households, and their monthly income is <RM4,850 (USD 1,099) [16]. The average household income of the B40 group is MYR 3,172 (USD 718) [16]. M40 is a group of households with a monthly income between RM4,850 and 10,959 (USD 1,099–2,483), whereas the T20 monthly income is over RM10,960 (USD 2,483) [16].

Field enumerators were trained to recruit eligible participants and assist them in answering the survey questions. A convenience sampling approach based on a "random walk" door-to-door recruitment strategy was used. Google Surveys were used to gather data from the survey. Participants who completed the surveys were assisted by field enumerators. Participants were also asked to refer their peers to take part in the study. Inclusion criteria were young people staying with their parents in the PPR and aged between 18 and 24 years. The questionnaire (Appendix 1) consisted of an assessment of demographic characteristics, lifestyle factors (smoking, alcohol consumption, exercise, healthy diet, and sleep quality), parent–child conflict, resilient coping, and psychological distress. The questionnaire is developed in English and translated into Malaysia's national language. The standard back-translation method was used, whereas the translated text was re-translated back into English by an independent translator. Both the English and Malaysia's national language versions of the questionnaire have also gone through content validation by experts and were subsequently pilot tested before conducting the survey.

The sample size was calculated using the online Raosoft sample size calculator [17]. With an estimate of a response distribution of 50%, a confidence level of 95%, a margin error of 5%, and an estimate of a total of 39,000 B40 households in the state of Selangor and the Federal Territory of Kuala Lumpur [18, 19], the required sample size was 381. The study was conducted between May and August 2022. A total of 561 complete responses were received, which is 1.5 times larger than the estimated sample size.

Assessment of parent–child conflict

The Parental Environment Questionnaire (PEQ) [20] was administered to tap perceptions of the parent–child relationship in the present study. The PEQ consists of 12 items assessing aspects of their relationships on a 4-point scale (1 = *definitely true*, 4

= *definitely false*). The score ranged from 12 to 48, all 12 items were summed, and higher overall scores reflected lower parent–child conflict. To the best of our knowledge, parent–child conflict has never been assessed in the Malaysian population. Cronbach's α value for Malaysia's national language version of PEQ in this study was 0.982, suggesting that the measure has a high level of internal consistency.

Assessment of resilient coping

The Brief Resilient Coping Scale (BRCS) is a 4-item measure designed to capture tendencies to cope with stress using a 5-point Likert scale "from '1' = *describes me not at all* to '5' = *describes me very well*" (21). Total sum scores range from 4 to 20, with a higher score implying higher resilient coping. Scores of 4–13 indicate low resilient coping, 14–16 indicate medium resilient coping, and 17–20 indicate high resilient coping (21). Cronbach's α value for the BRCS scale in this study was 0.941, suggesting that the measure has a high level of internal consistency.

Assessment of psychological distress

Psychological distress was measured using the Depression, Anxiety, and Stress Scale-short form (DASS-21) (22). Scores on three subscales— namely Depression (DASS-21-D), Anxiety (DASS-21-A), and Stress (DASS-21-S)—were generated. There are seven items in each subscale; the score of each subscale ranges from 0 to 21, with higher scores indicative of more severe symptoms of depression, anxiety, and/or stress. The cutoffs for depression (moderate 14–20, severe 21–27, and extremely severe ≥ 28), anxiety (moderate 10–14, severe 15–19, and extremely severe ≥ 20), and stress (moderate 19–25, severe 26–33, and extremely severe ≥ 34) were calculated (23) Cronbach's α value for the subscales DASS-21-D, DASS-21-A, and DASS-21-S in this study was 0.958, 0.944, and 0.952, respectively. This indicates that the DASS-21 scale used in our study population is a reliable psychometric instrument. The DASS-21 translated to Malaysia's national language used in a former study in Malaysia reported Cronbach's alpha values of 0.956 for the overall scale, 0.927 for the DASS-21-D, 0.865 for the DASS-21-A, and 0.882 for the DASS-21-S (14).

Statistical analyses

Descriptive statistics were computed on the dependent and independent variables. Frequency tables, charts, and proportions were used for data summarization. The proportion and its respective 95% confidence interval (CI) were calculated. We checked the assumption of normality, and parametric tests are used if the data follow a normal distribution; otherwise, non-parametric methods are used to compare groups. We ran univariate analyses followed by multivariable logistic regression analysis, including all factors showing significance ($p < 0.05$), to determine predictive factors of the three dimensions of the psychological distress of the DASS-21. Odds ratios (ORs), 95% confidence intervals (95%

CIs), and p-values were calculated for each independent variable. Only significant factors in the univariate analyses, with a p-value of <0.05, were selected for the multivariable regression analysis. The model fit of the multivariable logistic regression analysis was assessed using the Hosmer–Lemeshow goodness-of-fit test (24). All statistical analyses were performed using the Statistical Package for the Social Sciences version 20.0 (IBM Corp., Armonk, NY, USA). A p-value of <0.05 was considered statistically significant.

Ethics considerations

This study was approved by the University of Malaya Research Ethics Committee (UM.TNC2/UMREC−1579). Participants were informed that their participation was voluntary. To consent to participate, participants were required to click "Yes, I consented to participate in this study". The privacy of the participants and confidentiality of the data obtained were maintained. The availability of counseling services was made known to the study participants, and contact information was also provided to participants who need counseling or mental health services. Nevertheless, none of the participants reported severe psychological distress and reached out to the counseling services provided.

Results
Sociodemographics and lifestyle

A total of 561 complete responses were received. The complete participants' demographics are shown in the first and second columns of Table 1. The majority of the study participants were aged between 18 and 21 years (69.7%). There was an almost equal amount of male and female participants. Nearly two-thirds (63.6%) reported a household family income of MYR 2,001–3,000. As shown in Table 1, only a minority reported ever smoking (17.3%) and consuming alcohol (12.1%). Over two-thirds (34.8%) reported often practicing healthy eating and doing physical exercises (37.6%) in the past 3 months.

3.2. Parent−child conflict

Figure 1 shows the distribution of responses for the PEQ items. A total of 11.2% reported that there are often misunderstandings with their parents, followed by 10.9% who reported they often seem to annoy their parents, and 10.9% reported that their parents do not trust them to make their own decisions. The total PEQ score of the study participant ranged from 12 to 48, and the median PEQ score was 48.0 [interquartile range (IQR) 36–48]. The PEQ score was categorized as 12–47 or 48, based on the median split; as such, a total of 203 (36.2%, 95% CI 32.2–40.3) were categorized as having a score of 12–47, and 358 (63.8%, 95% CI 59.7–67.8) were categorized as having a score of 48. As shown in Appendix 2, by demographics, the odds of lower PEQ scores were more prominent among females than males (OR = 1.75, 95% CI 1.19–2.57) and in youth from

TABLE 1 Factors associated with psychological distress.

	Overall	Depression			Anxiety			Stress		
		Univariable analysis		Multivariable analysis	Univariable analysis		Multivariable analysis	Univariable analysis		Multivariable analysis
		Mild/moderate/severe/extremely severe (n = 70)		Mild/moderate/severe/extremely severe vs. Normal[a]	Mild/moderate/severe/extremely severe (n = 86)		Mild/moderate/severe/extremely severe vs. Normal[b]	Mild/moderate/severe/extremely severe (n = 36)		Mild/moderate/severe/extremely severe vs. normal[c]
	N (%)	n (%)	p-value	OR (95% CI)	n (%)	p-value	OR (95% CI)	n (%)	p-value	OR (95% CI)
SOCIO DEMOGRAPHIC CHARACTERISTICS										
Age group (years)										
18–21	391 (69.7)	49 (12.5)	1.000		53 (13.6)	0.097		29 (7.4)	0.189	
22–24	170 (30.3)	21 (12.4)			33 (19.4)			7 (4.1)		
Gender										
Male	281 (50.1)	16 (5.7)	p < 0.001	Ref	22 (7.8)	p < 0.001	Ref	4 (1.4)	p < 0.001	Ref
Female	280 (49.9)	54 (19.3)		3.11 (1.35–7.19)**	64 (22.9)		4.79 (2.10–10.91)***	32 (11.4)		3.37 (0.98–11.63)
Occupation status										
Student	354 (63.1)	47 (13.3)	0.352		49 (13.8)	0.013	1.01 (0.27–3.74)	28 (7.9)	0.154	
Employed	137 (24.4)	18 (13.1)			31 (22.6)		4.29 (1.05–17.46)*	6 (4.4)		
Unemployed	70 (12.5)	5 (7.1)			6 (8.6)		Ref	2 (2.9)		
Average monthly household income (MYR)[¶]										
2,000 and below	100 (17.8)	51 (51.0)	p < 0.001	5.93 (2.23–15.75)***	59 (59.0)	p < 0.001	6.50 (2.59–16.27)***	29 (29.0)	p < 0.001	4.18 (1.30–13.51)*
2,001–3,000	357 (63.6)	10 (2.8)		0.51 (0.18–1.49)	16 (4.5)		0.57 (0.22–1.51)	2 (0.6)		0.14 (0.03–0.81)*
3,001–5,000	104 (18.5)	9 (8.7)		Ref	11 (10.6)		Ref	5 (4.8)		Ref
Residence area										
Urban	484 (86.3)	57 (11.8)	0.199		69 (14.3)	0.088		27 (5.6)	0.074	
Sub-urban	77 (13.7)	13 (16.9)			12 (22.1)			9 (11.7)		

(Continued)

TABLE 1 (Continued)

	Overall	Depression				Anxiety				Stress			
		Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis	
		Mild/ moderate/ severe/ extremely severe (n = 70)		Mild/ moderate/ severe/ extremely severe vs. Normal[a]		Mild/ moderate/ severe/ extremely severe (n = 86)		Mild/ moderate/ severe/ extremely severe vs. Normal[b]		Mild/ moderate/ severe/ extremely severe (n = 36)		Mild/ moderate/ severe/ extremely severe vs. normal[c]	
	N (%)	n (%)	p-value	OR (95% CI)		n (%)	p-value	OR (95% CI)		n (%)	p-value	OR (95% CI)	
LIFESTYLE													
Smoking status in the past 3 months													
Never smoke	464 (82.7)	61 (13.1)	0.398			76 (16.4)	0.163			35 (7.5)	0.012	4.34 (0.48–39.11)	
Ever smoke	97 (17.3)	9 (9.3)				10 (10.3)				1 (1.0)		Ref	
Alcohol intake in the past 3 months													
Never drink alcohol	493 (87.9)	67 (13.6)	0.031	1.02 (0.26–4.10)		82 (16.6)	0.019	1.03 (0.29–3.62)		35 (7.1)	0.108		
Ever drink alcohol	68 (12.1)	3 (4.4)		Ref		4 (5.9)		Ref		1 (1.5)			
Doing physical exercises in the past 3 months													
Never/seldom	137 (24.4)	44 (32.1)	p < 0.001	7.49 (1.46–38.49)*		50 (36.5)	p < 0.001	2.44 (0.59–10.09)		23 (16.8)	p < 0.001	4.14 (0.42–41.28)	
Sometimes	213 (38.0)	20 (9.4)		5.13 (1.02–25.78)*		27 (12.7)		2.33 (0.58–9.28)		11 (5.2)		4.32 (0.43–43.22)	
Often	211 (37.6)	6 (2.8)		Ref		9 (4.3)		Ref		2 (0.9)		Ref	
Practicing healthy eating in the past 3 months													
Never/seldom	143 (25.5)	39 (27.3)	p < 0.001	0.39 (0.06–2.32)		46 (32.2)	p < 0.001	1.15 (0.22–6.03)		21 (14.7)	p < 0.001	0.81 (0.06–10.32)	
Sometimes	223 (39.8)	25 (11.2)		0.27 (0.05–1.52)		34 (15.2)		0.91 (0.18–4.58)		13 (5.8)		0.52 (0.04–6.19)	
Often	195 (34.8)	6 (3.1)		Ref		6 (3.1)		Ref		2 (1.0)		Ref	
Have enough sleep in a week in the past 3 months													
Never/seldom	124 (22.1)	36 (29.0)	p < 0.001	0.80 (0.26–2.46)		46 (37.1)	p < 0.001	0.92 (0.32–2.65)		18 (14.5)	p < 0.001	0.42 (0.11–1.57)	
Sometimes	208 (37.1)	22 (10.6)		1.01 (0.33–3.03)		26 (12.5)		0.74 (0.26–2.08)		11 (5.3)		0.57 (0.16–2.05)	
Often	229 (40.8)	12 (5.2)		Ref		14 (6.1)		Ref		7 (3.1)		Ref	

(Continued)

TABLE 1 (Continued)

	Overall	Depression				Anxiety				Stress			
		Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis	
		Mild/moderate/severe/extremely severe (n = 70)		Mild/moderate/severe/extremely severe vs. Normal[a]		Mild/moderate/severe/extremely severe (n = 86)		Mild/moderate/severe/extremely severe vs. Normal[b]		Mild/moderate/severe/extremely severe (n = 36)		Mild/moderate/severe/extremely severe vs. normal[c]	
	N (%)	n (%)	p-value	OR (95% CI)	n (%)	p-value	OR (95% CI)	n (%)	p-value	OR (95% CI)				

Parent-child conflict													
Total Parental Environment Questionnaire (PEQ) score													
Low score, High conflict (12–47)	203 (36.2)	63 (31.0)	p < 0.001	10.90 (4.31–27.57)***	75 (36.9)	p < 0.001	11.92 (5.05–28.14)***	32 (15.8)	p < 0.001	4.79 (1.41–16.33)*				
High score, low conflict (48)	358 (63.8)	7 (2.0)		Ref	11 (3.1)		Ref	4 (1.1)		Ref				
Coping													
Total Brief Resilient Coping Scale (BRCS) score													
Low resilient coping (4–13)	98 (17.5)	32 (32.7)	p < 0.001	9.16 (3.34–25.11)***	40 (40.8)	p < 0.001	6.63 (2.68–16.43)***	12 (12.2)	0.028	1.85 (0.60–5.67)				
Medium resilient coping (14–16)	339 (60.4)	28 (8.3)		3.64 (1.40–9.48)**	30 (8.8)		2.42 (1.01–5.79)*	16 (4.7)		1.59 (0.55–4.54)				
High resilient coping (17–20)	124 (22.1)	10 (8.1)		Ref	16 (12.9)		Ref	8 (6.5)		Ref				

*p < 0.05. **p < 0.01. ***p < 0.001.

[a]Hosmer–Lemeshow test, chi-square: 7.796, p-value: 0.454; Nagelkerke R^2: 0.580.

[b]Hosmer–Lemeshow test, chi-square: 2.631, p-value: 0.955; Nagelkerke R^2: 0.602.

[c]Hosmer–Lemeshow test, chi-square: 11.848, p-value: 0.158; Nagelkerke R^2: 0.477.

¶1.USD = 4.41 MYR.
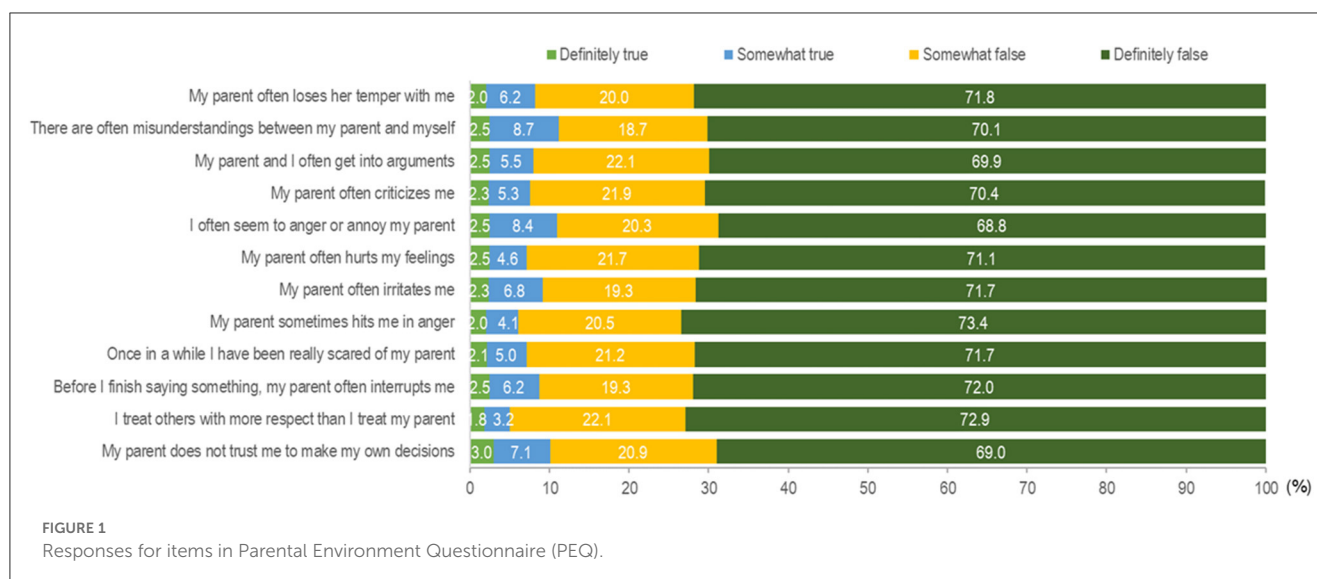
FIGURE 1
Responses for items in Parental Environment Questionnaire (PEQ).

households with an income below MYR 2,000 than those earning MYR 3,001–5,000 (OR= 4.39, 95% CI 2.40–8.03).

Resilient coping

The responses for the 4-item BRCS are shown in Figure 2. Of the 5-point Likert scale, the majority responded with 4 or 5 for all four items. As shown in Table 1, the majority (60.4%) reported median resilient coping (scores 14–16), followed by high resilient coping (scores 17–20) (22.1%). Figure 3 shows the distribution of responses in the DASS-21 items. Figure 4 shows the severity rating of DASS-21. A vast majority were found to have a normal score range in the three emotional states of depression, anxiety, and stress.

Psychological distress

Table 1 shows the proportion of participants with depression, anxiety, and stress symptoms. On the whole, depression, anxiety, and stress symptoms were reported in 12.5% ($n = 70$), 15.2% ($n = 86$), and 6.4% ($n = 36$) of participants, respectively. Multivariable logistic regression analysis showed that the parent–child conflict remains the strongest significant predictor for a higher level of depression (OR = 10.90, 95% CI 4.31–27.57), anxiety (OR = 11.92, 95% CI 5.05–28.14), and stress (OR = 4.79, 95% CI 1.41–16.33) symptoms.

Resilient coping was the second strongest predictor for depression and anxiety. There was an inverse association between resilient coping and depression and anxiety symptoms. Participants with a resilient coping score of 4–13 were associated with higher symptoms of depression than those with a resilient coping score of 17–20 (OR = 9.16, 95% CI 3.34–25.11). A resilient coping score of 4–13 was associated with higher anxiety symptoms than those with resilient coping scores of 17–20 (OR = 6.63, 95% CI 2.63–16.43).
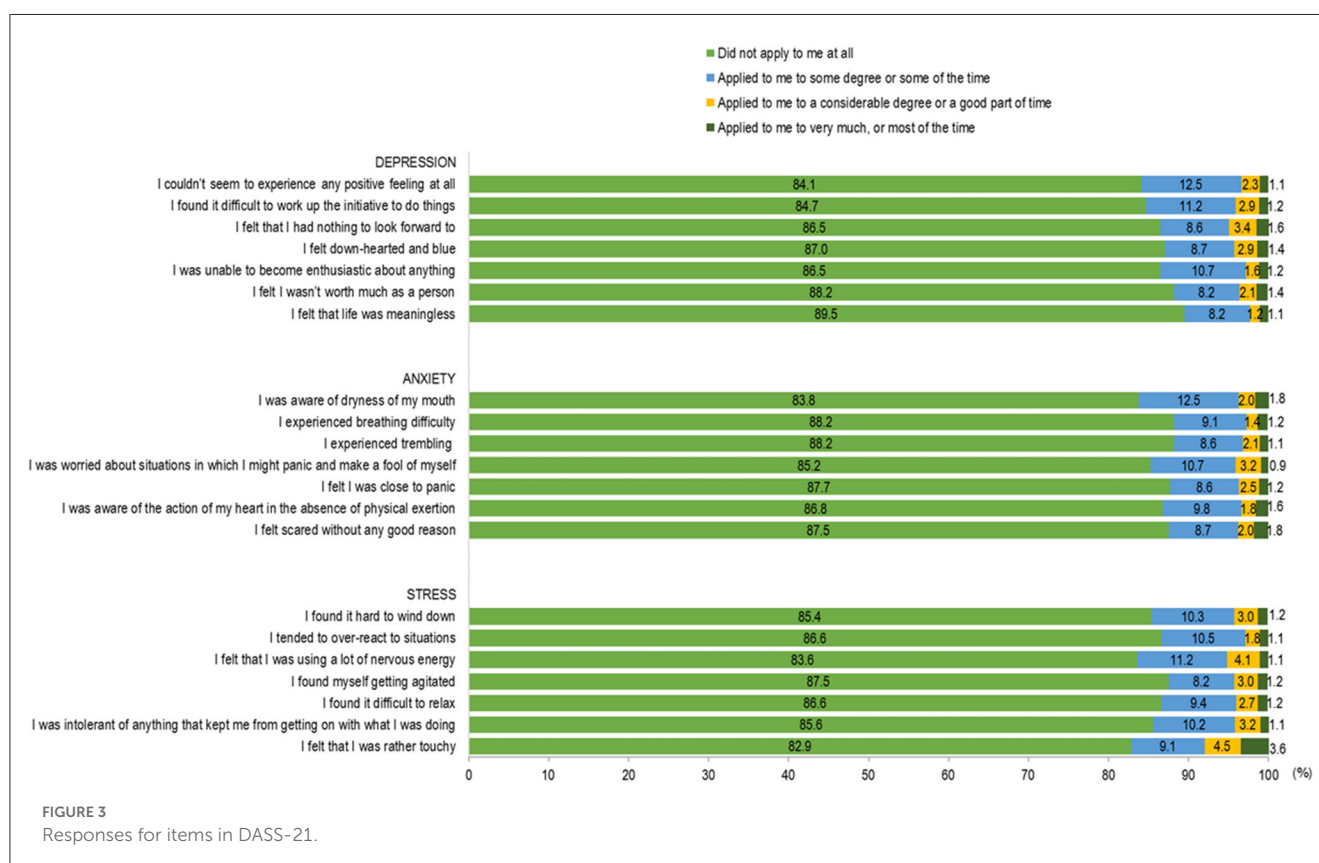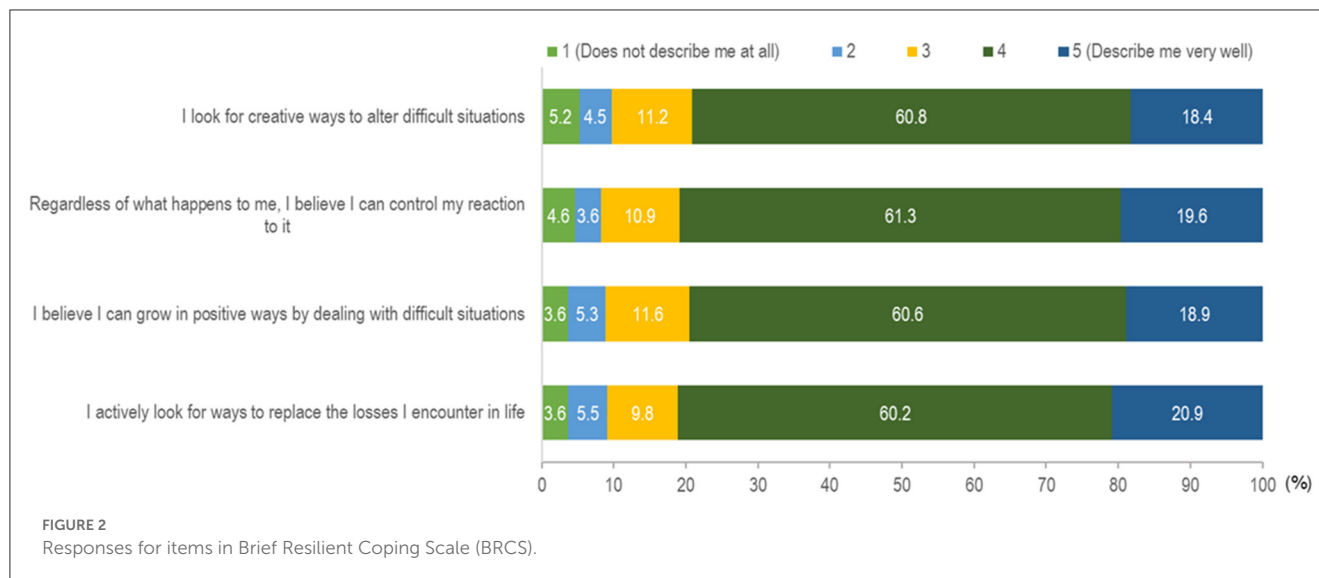
Regarding lifestyle factors, participants who reported never or seldom carrying out the physical exercise in the past 3 months reported higher symptoms of depression (OR = 7.49, 95% CI 1.46–38.49). By demographics, females reported more severe symptoms of depression (OR = 3.11, 95% 1.35–7.19) than males. Young people from households with an income of MYR 2,000 and below have greater severity in symptoms of depression than those of households with an income between MYR 3,001 and 5,000 (OR = 5.93, 95% CI 2.23–15.75). Similarly, females reported greater severity in symptoms of anxiety (OR = 4.79, 95% 2.10–10.91) than males, and young people from a household income of MYR 2,000 and below reported greater severity in symptoms of anxiety than those of an income between MYR 3,001 and 5,000 (OR = 6.50, 95% CI 2.59–16.27). Young people who are employed also reported greater severity of anxiety symptoms than those who are unemployed (OR = 4.29, 95% CI 1.05–17.46). For stress symptoms, households with an income of MYR 2,000 and below reported higher stress levels than those with an income between MYR 3,001 and 5,000 (OR = 4.18, 95% CI 1.30–13.51).

Discussion

The current study explored the responses and coping of Malaysian youth in low-income communities after the ease of the COVID-19 pandemic restrictions. Understanding the impact of the pandemic on these outcomes is critical for developing resources and interventions for families during and after the pandemic. This study sampled youth from a government settlement program and is known as the People's Housing Project (PPR). The PPR is an initiative by the Malaysian government to provide income earners under the Bottom 40% (B40) income groups to find a home and eradicate squatter areas in Malaysia. In this study, a high proportion had incomes of ≤MYR 3,000 (81.4%), and a small proportion (18.5%) reported income between MYR 3,001 and 5,000. This implies that our study population closely represents the B40 group.

The results revealed that a minority of young people are adversely affected by the pandemic. Despite parent–child conflicts

FIGURE 2
Responses for items in Brief Resilient Coping Scale (BRCS).

FIGURE 3
Responses for items in DASS-21.

reported by a minority of young people in this study, it should not be underestimated as a healthy parent–child relationship is not only a key issue in family wellbeing, but it also represents whole-family functioning. Without the pandemic, parent–child conflict is a normal part of family life and often escalates during the teenage years. The biological and psychological changes in adolescence and youth may have a salient impact on parent–child relationships (25). Given that parent–adolescent conflict also has significant consequences for adolescent adaptation (26) and

adolescents' behavioral and academic outcomes (27), intervention to promote positive parent–child relationships should be a part of public health priorities, particularly during social restrictions or crises.

In this study, parent–child conflict appears to be more prevalent among females and young people from the lowest income bracket in the underprivileged community. The finding of this study is in concordance with earlier studies before the COVID-19 pandemic that similarly found gender differences, with females showing an

FIGURE 4
Severity rating of DASS-21.
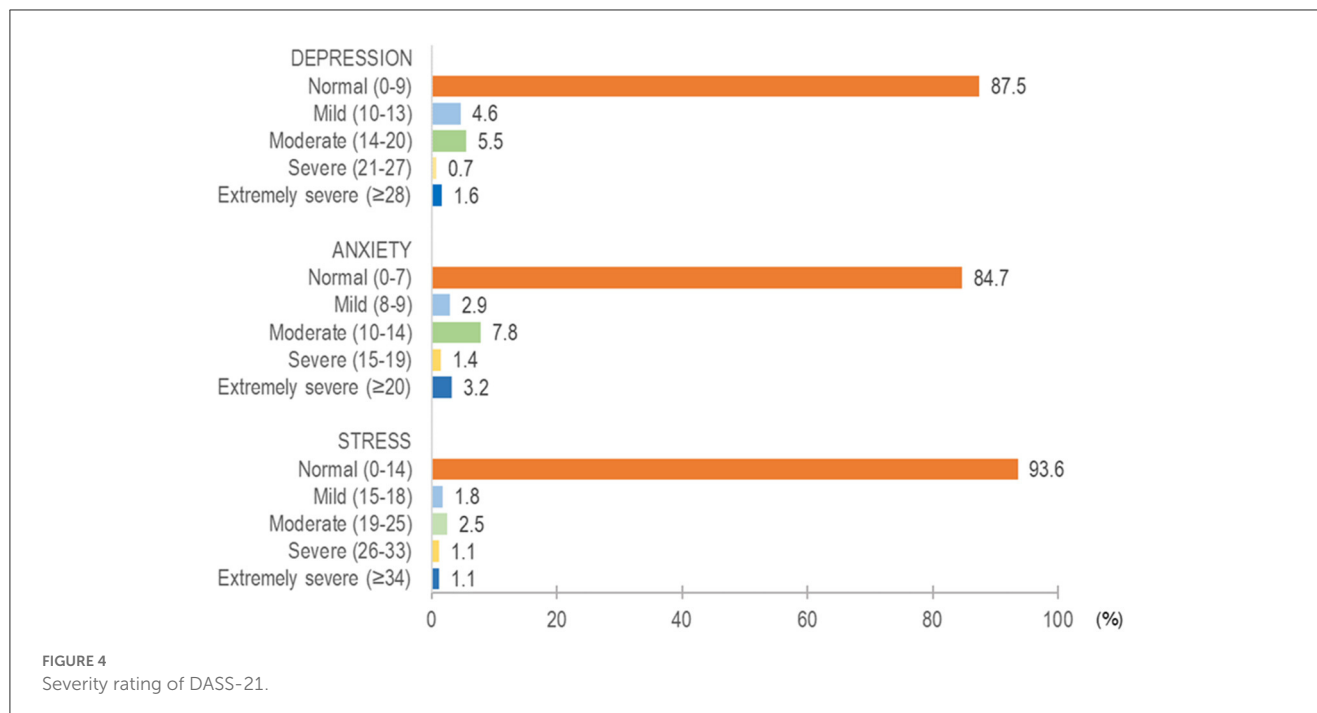
increase in parent–adolescent conflict intensity more than males (28, 29). Notably, females showed higher emotional expression (30) and higher sensitivity to stressors than their male counterparts (31), and this perhaps explains the higher parent–child conflicts in females. Interventions with parents and adolescents to prevent parent–child conflict should be used with an emphasis on young females. The association between lower income and poorer parent–adolescent conflict found in this study has also been reported in another study (32). Economic pressure was reported to have a significant impact on intra-family conflict (33). Our results indicate that households with more severe economic pressure may need help to prevent or mitigate family-related conflicts.

The current study found that there is generally a low prevalence of reported depression, anxiety, and stress symptoms among the sampled youth. Despite a low level of psychological distress, an important finding of this study is the strong association between parent–child conflict and psychological distress. The finding is congruent with a previous study that similarly reported a higher level of parent–child conflict was concurrently associated with greater depression symptoms among adolescents (34). Despite a low level of psychological stress and parent–child conflict, the findings of this study imply that it is still crucial to maintain a healthy parent–child relationship in shaping young people's mental health after the pandemic. Our findings provide key insights into the importance of positive parenting and the need to reduce conflicts within the family to sustain the mental health of young people even though economic activities and lifestyles have resumed normally.

The findings also revealed that females and those from low-income households are more likely to suffer higher psychological distress, hence providing insights into the vulnerable group of youth that should be targeted for counseling intervention to improve their mental wellbeing. Additionally, this study also found that young people who are employed were found to have higher anxiety symptoms than those who are unemployed or students.

The COVID-19 pandemic has caused great concern regarding the overall mental health of employees worldwide. In particular, the pandemic has resulted in young adults facing an increased amount of psychological impairment linked to job insecurity and worsening career prospects (35). Our finding suggests that psychological interventions aimed at supporting mental health resilience among young people in work settings are essential in the post-COVID-19 period.

Of particular importance to highlight is that the majority of youth reported medium or high resilient coping, and resilient coping was the second strongest predictor for all three dimensions of psychological distress in this study. Resilience is an important predictor of the mental health of young people, primarily with respect to its positive indicator (36). Similarly, a study showed that strengthening resilience may lead to better mental wellbeing in young people (36). In this study, the majority of youth showed good and moderate resilient coping; this perhaps explains the low level of parent–youth conflicts and psychological distress reported in this study. It has been suggested that resilience-building programs for adolescents and youths are essential in increasing adaptability in the event of a future crisis or pandemic of infectious disease (37). Therefore, building and nurturing stress-resilient attitudes are essential to cultivating youth to be less vulnerable despite the experience of negative events.

There are some limitations to the current study that needs to be considered when interpreting the results. First, the cross-sectional design used could not infer a causal relationship. Second, the study sample represents a convenience sample of youth living in the PPR houses. The key disadvantage of convenience sampling is that the sample lacks clear generalizability. Furthermore, we only recruit youth from PPR houses in one state and federal territory in Malaysia; hence, the finding may be generalized to the entire population of low-income housing residents in Malaysia, a low-income community in Malaysia. Future research should include a more representative sample. Third, we cannot preclude

the existence of recall errors and measurement bias when using retrospectively recalled information about lifestyle practices in the past 3 months. Finally, socially desirable responses to sensitive questions in this study may be one of the sources of bias leading to inaccurate self-reports and an erroneous study conclusion. Therefore, the findings of this study should be interpreted with caution.

Conclusion

Young people from a low-income community reported low levels of parent–child conflict and psychological stress after the ease of the COVID-19 pandemic restrictions. Parent–child conflict is more prominent in females and young people from households with low-income earnings. Parent–child conflict was found to play a very prominent role in the increase in psychological distress. Family relationships are consequential for the psychological wellbeing of young people; therefore, it is necessary to pay attention to restoring family relationships during the post-pandemic period. The ability to cope with stress remains an important factor in reducing psychological distress; hence, young people should be provided support in building crisis resilience to enable them to cope adaptively with future stressful encounters. The study also identified the socially vulnerable youth groups in low-income communities, who should be the target for policies and services to overcome the aftermath impact of the COVID-19 pandemic and to better equip them in the event of future pandemics.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the University of Malaya Research Ethics Committee (UM.TNC2/UMREC–1579). The patients/participants provided their written informed consent to participate in this study.

Author contributions

LW, NF, SY, ZM, ZH, and YL contributed to the concept, design, and manuscript review. LW and HA contributed to the literature search, data acquisition, and statistical analysis. All authors contributed to the manuscript and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2023.1165023/full#supplementary-material

APPENDIX 1
Survey questionnaire.

APPENDIX 2
Parental Environment Questionnaire (PEQ) score by demographic characteristics.

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