Original Article

# Mental health status of infected children between 7 to 12 years old in Fangcang Shelter Hospital during the COVID-19 Shanghai lockdown in 2022: a cross-section study

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**Background:** There has been an increase in research on the potential adverse effects on children's mental health, especially depression and anxiety, during the coronavirus disease 2019 (COVID-19) pandemic over the past few months. Therefore, the aim of the present study was to investigate depression and anxiety symptoms among children in shelter hospitals during the 2022 Shanghai lockdown.

**Methods:** A total of 98 infected children aged 7–12 years were enrolled in this study between April 19 and June 4, 2022. The Children's Depression Inventory (CDI), Anxiety Scale for Children-Autism Spectrum Disorder (ASC-ASD), and Anxiety Scale or Children-Autism Spectrum Disorder Parent Form (ASC-ADS-P) were used to assess children's depression and anxiety symptoms. Children's guardians completed the survey by verbally asking their child/children the questions. The guardians additionally completed the ASC-ASD-P.

**Results:** The prevalence of depression and anxiety was 12.2% and 13.3%, respectively. A total of 66 respondents reported no physical symptoms. Linear regression showed that myalgia [7.198, 95% confidence interval (CI): 3.163–11.232], headache (7.189, 95% CI: 3.842–10.535) coryza (5.362, 95% CI: 2.654–8.070), and number of quarantine days (4.378, 95% CI: 3.409–5.348) were significantly correlated with higher levels of depression, whereas chills (14.337, 95% CI: 9.799–18.875), coryza (9.309, 95% CI: 6.467–12.152), headache (7.193, 95% CI: 3.182–11.204), myalgia (5.571, 95% CI: 0.684–10.459), number of quarantine days (3.190, 95% CI: 1.796–4.584), and gender (male) (–4.137, 95% CI: –6.609 to 1.665) were associated with anxiety scores. Persistent fever was correlated with depression (P=0.007), whereas physical discomfort, such as persistent fever, cough, sore throat, headache, myalgia, and coryza were correlated with anxiety (all P<0.05).

**Conclusions:** The findings of the present study indicated a moderate prevalence of depression and anxiety among infected children in a shelter hospital during the 2022 Shanghai lockdown. Therefore, the findings of this study could provide scientific basis for the development of targeted psychological intervention. It could be helpful for policy-makers to focus on psychological health among infected children and help to optimize future interventions.

**Keywords:** Children; mental health; depression; anxiety; coronavirus disease 2019 (COVID-19)

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## Introduction

An unprecedent and unexpected lockdown occurred in Shanghai in late March and May 2022 due to the rapid development of coronavirus disease 2019 (COVID-19). The lockdown had an impact on society, and particularly children who are prone to mental health conditions under such circumstances. Previous studies have reported negative physical and psychological costs, such as substantial anger, sleep disorders, or even suicide among adults (1,2). Therefore, there is an urgent need to understand children's mental health status for better further interventions.

Recent research has indicated varying degrees of psychological distress among people exposed to COVID-19 (3,4). However, few studies have been carried out to evaluate children's mental health, especially infected children referred to shelter hospitals in such an unprecedented lockdown in a metropolitan city. Therefore, the aim of the present study was to assess the mental health (especially depression and anxiety) of infected children quarantined at a shelter hospital during the Shanghai lockdown as a basis for future psychological intervention and treatment. The secondary objective was to identify positive or negative associations with children's mental health outcomes. We present the following article in accordance with the SURGE reporting checklist (available at https://tp.amegroups.com/article/view/10.21037/tp-22-539/rc).

## Methods

The present study was approved by the Ethics Committee of Pudong New Area People's Hospital (No. 2022-34), and was conducted according to the Declaration of Helsinki (as revised in 2013). All the participants' legal guardians provided informed consent to participate in this study.

### *Participants*

A total of 106 children aged between 7 and 12 years were referred to Hangtou Fangcang Shelter Hospital between April 19 and June 4, 2022. The survey consisted of the following 3 investigation forms: the Children's Depression Inventory (CDI) (5), the Anxiety Scale for Children-Autism Spectrum Disorder (ASC-ASD), and the Anxiety Scale for Children-Autism Spectrum Disorder Parent Form (ASC-ASD-P) (6). All the forms are available in Chinese. The children were verbally asked questions by their guardians, and then the guardians completed the survey (CDI and ASC-ASD). The guardians additionally completed the ASC-ASD-P. The surveys were distributed and collected by the onsite doctors at Hangtou Fangcang Shelter Hospital. No financial or other incentives were provided for completing the questionnaires. Any incomplete or random responses in any of the 3 forms were not included in the analysis.

### *Measures*

The CDI was used to assess the severity of symptoms of children's depression. Each symptom is presented as a series of 3 phrases, from which respondents choose the phrase that best expresses their feelings. A higher score indicates more depressive symptomatology.

The ASC-ASD was used to assess the anxiety of children, and consists of 24 items, which are divided into the following 4 subscales: performance anxiety (a 5-item subscale, with the highest score being 15), anxious arousal (a 6-item subscale, with the highest score being 18), separation anxiety (a 5-item subscale, with the highest score being 15), and uncertainty (an 8-item subscale, with the highest score being 24). Each item is rated on a 4-point scale from 0 ("never") to 3 ("always").

In addition, the children's guardians were also required to complete the ASC-ADS-P to further validate the gap between children's feeling and their guardians' feeling on anxiety. Similar to the ASC-ASD, the ASC-ADS-P is a 24-item parent version that comprises parents reports of their children's symptoms of anxiety across the same 4 subscales.

### *Statistical analysis*

We used $\chi^2$-test to evaluate categorical variables. Logistic regression was used to analyze the predictors of depression and anxiety symptoms. Linear regression was used to calculate the univariate associations between CDI scores, ASC-ASD scores, baseline characteristics (such as sex and number of quarantine days), and physical symptoms (such

 

as chills and headache). A two-sided P<0.05 indicated a statistically significant difference. All analyses were performed using SPSS version 24.0 (IBM, Armonk, NY, USA).

## Results

### *Participant characteristics*

Eight of the children's surveys were incomplete and could not be included in the analysis; therefore, a total of 98 children were finally enrolled in this work, with a response rate of 92.5%. In total, 42.9% of the participants were girls with an average age of 9.2±1.7 years, whereas 57.1% were boys with an average age of 8.4±1.8 years. In total, 64.3% of participants were the only child in the family (*Table 1*). Most of the participants (57.1%) lived with both parents and grandparents.

The average ASC-ASD score was 12.54±6.41, which was higher than the average ASC-ASD-P score of 9.93±5.64, indicating that parents reported fewer symptoms of their children's anxiety than the children reported.

### *Univariate analysis*

In total, 31.6% of respondents reported physical discomfort, with 16 (16.3%) having 1 symptom, 6 (6.1%) having 2 symptoms, and 9 (9.2%) having 3 or more symptoms.

As shown in *Table 2*, 17.3% of respondents had coryza, 12.2% had cough, 10.2% had headache, 8.2% had sore throat, 7.1% had muscle pain, 6.1% had chills, and 1% had a fever of 38 ℃ for at least 1 day.

Linear regression showed that myalgia [7.198, 95% confidence interval (CI): 3.163–11.232], headache (7.189, 95% CI: 3.842–10.535, coryza (5.362, 95% CI: 2.654–8.070), and number of quarantine days (4.378, 95% CI: 3.409–5.348) were significantly correlated with higher levels of depression, whereas chills (14.337, 95% CI: 9.799–18.875), coryza (9.309, 95% CI: 6.467–12.152), headache (7.193, 95% CI: 3.182–11.204), myalgia (5.571, 95% CI: 0.684–10.459), number of quarantine days (3.190, 95% CI: 1.796–4.584), and gender (male) (–4.137, 95% CI: –6.609 to 1.665) were associated with anxiety scores.

### *Univariate logistic*

For the depression subscale, 86 respondents (87.8%) had a normal score (<19), and 12 (12.2%) were considered to have clinical depression symptoms (score ≥19). For the anxiety subscale, 85 respondents (86.7%) did not have anxiety whereas 13 (13.3%) had significant levels of anxiety (score ≥20).

In this study, persistent fever was correlated with depression (P=0.007) (*Table 3*), whereas physical discomfort, such as cough, sore throat, headache, myalgia, and coryza were correlated with anxiety (all P<0.05) (*Table 4*).

## Discussion

A pandemic, such as COVID-19, along with an unexpected lockdown is an unprecedented experience and affects individuals differently. Despite evidence that viral infection and quarantine have negative effects on adults, there are limited studies regarding the impact on children's growth and development. Koller *et al*. found that children quarantined in hospital due to severe acute respiratory syndrome (SARS) often have feelings of sadness, attributed with feelings of loneliness, and missing and worrying about their families (7). In a study examining family psychological health, 30% of children were reported to have post-traumatic stress during the H1N1 epidemic (8). In the present study, we evaluated children's mental health status in a shelter hospital during the Shanghai lockdown. We mainly investigated depression and anxiety in children, as well as potential correlation factors. In our study, all the children were referred to the shelter hospital with COVID-19. In total, 66 of 98 (67.3%) respondents did not report any physical symptoms, 86 of 98 (87.8%) did not self-rate as having depression, and 85 of 98 (86.7%) did not self-rated as having anxiety. The depression and anxiety rates among the 98 children were 12.2% and 13.3%, respectively. Previously published studies reported a wide range of depression and anxiety rates among children and adolescents in lockdown and pandemic situation (9,10). For example, Yue *et al*. reported an anxiety rate of 1.84% among 1,356 children with an average age of 10.56 years and a depression rate of 2.22% among 1,352 children in lockdown (11). In contrast, Giannopoulou *et al*. reported a higher depression (63.8%) and anxiety (49.5%) among 459 Greek children in lockdown (12). This variance could be due to the different symptoms reported. Previous studies prior to the pandemic reported significant variances between reports of symptoms by children and their guardians (13). For example, parents are more likely to report fewer depression symptoms experienced by their own children than what their children would report (14), which was in line with our findings. The average ASC-ASD score

**Table 1** Demographic characteristics of the participants

| Factors | Female (n=42) | Male (n=56) | Total (n=98) |
|---|---|---|---|
| Age, years | | | |
| Group 1 (7–8 years) | 27 | 24 | 51 |
| Group 2 (9–12 years) | 15 | 32 | 47 |
| Only child | | | |
| Yes | 34 | 39 | 73 |
| No | 8 | 17 | 25 |
| Family status | | | |
| Nuclear family (living with parents) | 19 | 15 | 34 |
| Extended family (living with parents and grandparents) | 21 | 35 | 56 |
| Single-parent family | 2 | 6 | 8 |
| Other (i.e., step-family) | 0 | 0 | 0 |
| Parents working as medical staff | | | |
| Yes | 2 | 3 | 5 |
| No | 40 | 53 | 93 |
| Infected parents | | | |
| Father infected | 5 | 10 | 15 |
| Mother infected | 6 | 13 | 19 |
| Both infected | 31 | 33 | 64 |
| None | 0 | 0 | 0 |
| Educational level of father | | | |
| Primary education level and below | 14 | 10 | 24 |
| Secondary education level | 23 | 19 | 42 |
| University education level and above | 5 | 27 | 32 |
| Educational level of mother | | | |
| Primary education level and below | 10 | 13 | 23 |
| Secondary education level | 29 | 18 | 47 |
| University education level and above | 3 | 25 | 28 |
| Number of quarantine days | | | |
| 2–3 weeks | 2 | 2 | 4 |
| 3–4 weeks | 8 | 9 | 17 |
| 4–5 weeks | 20 | 19 | 39 |
| >5 weeks | 12 | 26 | 38 |

**Table 2** Association between physical symptoms, demographic characteristics, and mental health status of children

| Variable | Total (n=98), n (%) | Depression | | | Anxiety | | |
|---|---|---|---|---|---|---|---|
| | | $R^2$ | $A^{R2}$ | B (95% CI) | $R^2$ | $A^{R2}$ | B (95% CI) |
| Persistent fever (>38 ℃ for at least 1 day) | | 0.036 | 0.026 | 10.361 (–0.431 to 21.152) | 0.000 | –0.010 | –0.546 (–13.400 to 12.307) |
| Yes | 1 (1.0) | | | | | | |
| No | 97 (99.0) | | | | | | |
| Chills | | 0.057 | 0.047 | 5.420* (0.945 to 9.896) | 0.291 | 0.283 | 14.337*** (9.799 to 18.875) |
| Yes | 6 (6.1) | | | | | | |
| No | 92 (93.9) | | | | | | |
| Cough | | 0.000 | –0.010 | –0.184 (–3.554 to 3.186) | 0.000 | –0.010 | –0.331 (–4.272 to 3.609) |
| Yes | 12 (12.2) | | | | | | |
| No | 86 (87.8) | | | | | | |
| Sore throat | | 0.002 | –0.009 | –0.876 (–4.908 to 3.155) | 0.000 | –0.010 | –0.368 (–5.100 to 4.364) |
| Yes | 8 (8.2) | | | | | | |
| No | 90 (91.8) | | | | | | |
| Headache | | 0.159 | 0.150 | 7.189*** (3.842 to 10.535) | 0.117 | 0.107 | 7.193** (3.182 to 11.204) |
| Yes | 10 (10.2) | | | | | | |
| No | 88 (89.8) | | | | | | |
| Muscle pain (Myalgia) | | 0.116 | 0.106 | 7.198*** (3.163 to 11.232) | 0.051 | 0.041 | 5.571* (0.684 to 10.459) |
| Yes | 7 (7.1) | | | | | | |
| No | 91 (92.9) | | | | | | |
| Coryza | | 0.139 | 0.130 | 5.362*** (2.654 to 8.070) | 0.306 | 0.298 | 9.309*** (6.467 to 12.152) |
| Yes | 17 (17.3) | | | | | | |
| No | 81 (82.7) | | | | | | |
| Number of quarantine days | | 0.456 | 0.450 | 4.378*** (3.409 to 5.348) | 0.177 | 0.168 | 3.190*** (1.796 to 4.584) |
| Less than 1 week | 4 (4.1) | | | | | | |
| 1 week to 2 weeks | 17 (17.3) | | | | | | |
| 2 weeks to 4 weeks | 39 (39.8) | | | | | | |
| More than 4 weeks | 38 (38.8) | | | | | | |
| Gender | | 0.016 | 0.006 | –1.405 (–3.619 to 0.081) | 0.103 | 0.094 | –4.137** (–6.609 to 1.665) |
| Male | 56 (57.1) | | | | | | |
| Female | 42 (42.9) | | | | | | |

*, P<0.05; **, P<0.01; ***, P<0.001. CI, confidence interval.

**Table 3** Correlation between physical symptoms and depression

| CDI | OR | Lower | Upper | P value |
|---|---|---|---|---|
| Persistent fever | 0.113 | 0.065 | 0.198 | 0.007 |
| Chills | 0.87 | 0.803 | 0.941 | 0.345 |
| Cough | 0.62 | 0.073 | 5.282 | 0.659 |
| Sore throat | 0.867 | 0.799 | 0.94 | 0.27 |
| Headache | 3.762 | 0.824 | 17.168 | 0.071 |
| Myalgia | 1.212 | 0.133 | 11.036 | 0.864 |
| Coryza | 0.947 | 0.188 | 4.77 | 0.947 |

CDI, Children's Depression Inventory; OR, odds ratio.

**Table 4** Correlation between physical symptoms and anxiety

| ASC-ASD | OR | Lower | Upper | P value |
|---|---|---|---|---|
| Persistent fever | 0.866 | 0.801 | 0.936 | 0.694 |
| Chills | 0.076 | 0.037 | 0.155 | <0.001 |
| Headache | 5.852 | 1.385 | 24.72 | 0.009 |
| Myalgia | 6.075 | 1.185 | 31.154 | 0.017 |
| Coryza | 37.143 | 8.253 | 167.166 | <0.001 |
| Quarantine | 8.528 | 1.933 | 37.634 | <0.001 |

ASC-ASD, Anxiety Scale for Children-Autism Spectrum Disorder; OR, odds ratio.

was 12.54±6.41, which was higher than the average ASC-ASD-P score of 9.93±5.64 (intraclass correlation coefficient: 0.433, 95% CI: 0.258–0.581, P<0.001), indicating that parents reported fewer symptoms of their children's anxiety than the children reported.

Previous research on mental illness indicates that physical discomfort is associated with elevated depression and anxiety (15). Physical discomfort, such as persistent fever, was also found to be correlated with depression and anxiety among children in the present study (all P<0.05). In terms of demographic factors, children and women were more likely to have depression and anxiety during a pandemic (16-18). However, in this study, neither age nor gender was correlated with increased depression and anxiety symptoms (age: $\chi^2$-test =1.107, P=0.954; $\chi^2$-test =1.961, P=0.855; sex: $\chi^2$-test =0.285, P=0.594; $\chi^2$-test =2.136, P=0.144). This could be due to the small study sample.

It is important for policy-makers to consider children's mental health during pandemics, which is often neglected. The findings of this study could provide scientific basis for the development of targeted psychological intervention in the future. Our findings present the following clinical and policy implications. First, it is important for researchers and government officials to identify high-risk groups in order to carry out early psychological intervention. Second, health officials need to identify the psychological needs of people experienced physical symptoms during pandemics. Our findings indicate that children with specific symptoms, including chills, persistent fever, and cough, are more susceptible to higher levels of depression and anxiety. Health officials should consider psychological support and interventions for those who present with these symptoms, especially those who are hospitalized. Finally, governments should provide up-to-date and accurate health information to reduce the adverse psychological reactions caused by inaccurate information (19).

### *Our study has some limitations*

First, the study sample was relatively small, which could limit the applicability and generalization of the outcomes. Second, as the surveys were completed by children's guardians, the results and conclusions could be affected by the respondents' level of understanding and their cooperation, particularly if their guardians are involved. Finally, is that we have no idea how long the current assessment results will last. Therefore, we aim to follow-up with the participants for a better understanding of the period that our results will last for.

## Conclusions

The findings of the present study indicate that physical symptoms and quarantine have a negative impact on infected children, and are particularly correlated with depression and anxiety. The study results can improve our understanding of the impact of pandemics, such as COVID-19, on children's mental health and can provide better guidance on developing strategies and interventions for children with depression and anxiety.

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## Footnote

*Reporting Checklist:* The authors have completed the SURGE reporting checklist. Available at https://tp.amegroups.com/article/view/10.21037/tp-22-539/rc

*Data Sharing Statement:* Available at https://tp.amegroups.com/article/view/10.21037/tp-22-539/dss

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at https://tp.amegroups.com/article/view/10.21037/tp-22-539/coif). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of Pudong New Area People's Hospital (No. 2022-34), and all the participants' legal guardians provided informed consent to participate in this study.



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