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Somatic symptoms and concern regarding COVID-19 among Chinese college and primary school students: A cross-sectional survey

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ABSTRACT

The rapid, ongoing and worldwide coronavirus 2019 (COVID-19) pandemic represents a global public health emergency. Our objective was to explore the impact of the COVID-19 pandemic on somatic symptoms among Chinese college and primary school students, to provide reference data pertaining to the mental health of this population in the context of a public health emergency. In February and March 2020, we explored the somatic symptoms and concerns regarding COVID-19 of 399 college and primary school students in Sichuan Province using the Somatic Self-rating Scale (SSS) and a novel questionnaire, respectively. Logistic regression analysis and non-parametric tests were used to analyze the data. The incidence of somatic symptoms among college students was 34.85% (mild, 26.26%; moderate, 8.59%). The incidence of somatic symptoms in primary school students was 2.39% (all mild). Among the entire cohort, concern regarding COVID-19 was positively correlated with the occurrence of somatic symptoms. Somatic symptoms were more likely among college students expressing greater concern regarding the threat to life and health posed by COVID-19, and the efficacy of prevention and control measures. Among primary school students, only the concern for life and health was associated with a higher likelihood of somatic symptoms. Our data indicate that governments and other relevant agencies should implement different measures to prevent and control mental health disorders diseases in primary school and college students.

1. Introduction

In December 2019, coronavirus disease 2019 (COVID-19) broke out in China, thus representing another national public health emergency following the severe acute respiratory syndrome (SARS) outbreak in 2003. On January 30, 2020, the World Health Organization (WHO) declared that the COVID-19 outbreak was a global public health emergency (Chinese Center for Disease Control and Prevention, 2020; WHO, 2020).

COVID-19 is highly infectious and no specific treatment is yet available. Furthermore, if treatment is delayed, the likelihood of death is relatively high. All of these factors can significantly impact physical and mental wellbeing. According to a survey performed by the Chinese Academy of Social Sciences (Beijing, China), many people experienced negative emotions, including fear, anxiety, depression, during the COVID-19 outbreak; this is important because excessive negative emotions can lead to somatic symptoms that in turn cause significant physical and mental discomfort. Without appropriate intervention, psychosomatic disorders, including post-traumatic stress disorder (PTSD), may occur; these can seriously impact mental and physical health. Therefore, it is necessary to investigate concerns among the general population regarding COVID-19 and somatic symptoms, to provide reference data for practical and effective psychological interventions.

This study investigated psychosomatic symptoms among college and primary school students in response to the COVID-19 pandemic, and makes policy recommendations based on the results.

2. Objectives and methods

2.1. Objectives

From February to March, 2020, we carried out a cross-sectional observational study of primary and university students. Cluster sampling was conducted at a university and a primary school in Sichuan Province to obtain samples of college and primary school students. The
primary school sample included 230 students and 209 valid questionnaires (90.87%) were ultimately obtained. The final sample consisted of 93 boys and 116 girls. The college student sample included 220 students; 198 valid questionnaires (90.00%) were ultimately obtained. The final sample comprised 68 boys and 130 girls.

2.2. Method

The questionnaire pertaining to concerns regarding COVID-19 consisted of three sections: concerns regarding daily life necessities; concerns regarding the efficacy of prevention and control measures, such as surgical masks and disinfectants; and concerns regarding the threat to life and health posed by COVID-19, to both the respondent and their family. The Somatic Self-rating Scale (SSS) was designed by Mao Jialiang of the Department of Cardiology, Shanghai Renji Hospital (Shanghai, China). The test-retest reliability of the SSS was 0.96 and the Cronbach’s α coefficients was 0.89. The correlation coefficients of the four factors with the total scale score ranged from 0.76 to 0.88, the correlation coefficients of the four factors ranged from 0.56 to 0.70. Correlations with Zung’s Scales were in range of 0.74 to 0.80 while the four factors were in range of 0.55 to 0.74. Drawing the ROC curve and the area under the curve was 0.841. The SSS includes 20 items (scored from 1–4) that cover somatic, anxiety, depression and mixed anxiety-depression symptoms. The score for mixed anxiety-depression symptoms is based on the individual anxiety and depression scores. The SSS has shown good reliability and validity in previous studies (Zuoji, 2005; Li et al., 2008; Zhuang et al., 2010).

2.3. Statistical methods

Data were analyzed using SPSS software (ver. 20.0; IBM Corp., Armonk, NY, USA). The t-test, Kruskal-Wallis test, Spearman rank correlation, and binary logistic regression were used for the analyses. Statistical significance was set at P < 0.05.

2.4. Ethics

All subjects received detailed information regarding the purpose of the study. Written informed consent was obtained from all subjects for research participation and publication of the data. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Table 1
Composition ratio of concerns regarding COVID-19 in two samples (%).

| Degree of concern about | Daily life needs | Prevention and control measures | Life and health |
|------------------------|-----------------|---------------------------------|----------------|
|                        | Primary school | College | Primary school | College | Primary school | College |
| 1: Little or not        | 97.6            | 77.3    | 97.1           | 62.6    | 60.3            | 36.4    |
| 2: Occasionally (a few days but less than half the time) | 2.4            | 18.2    | 2.9            | 25.8    | 13.9            | 40.4    |
| 3: Often (half or more of the time) | 0.0            | 3.5     | 0.0            | 9.6     | 3.8             | 14.6    |
| 4: Every day or nearly every day | 0.0            | 1.0     | 0.0            | 2.0     | 22.0            | 8.6     |

3. Results

3.1. General information

A total of 209 primary school students completed the survey, including 127 and 82 in the fifth and sixth grades, respectively (93 boys and 116 girls). A total of 198 college students completed the survey, including 55 freshmen, 40 sophomores, 56 juniors and 47 seniors (68 boys and 130 girls).

3.2. Concerns regarding COVID-19

The results of concerns regarding COVID-19 are shown in Table 1. There are three domains: concerns regarding COVID-19 consisted of three sections: concerns regarding daily life necessities; concerns regarding the efficacy of prevention and control measures; and concerns regarding the threat to life and health posed by COVID-19, to both the respondent and their family. The Kruskal-Wallis test revealed significant differences between primary school and college students in the degree of concern in the three domains described above (Z1 = -6.264, P < 0.001; Z2 = -8.785, P < 0.001; Z3 = -2.596, P = 0.009).

The total concern score, obtained by summing the scores for the three domains, was 4.75 ± 1.73 for the college students and 3.93 ± 1.30 for the primary school students (t = 5.378, P < 0.001).

3.3. Somatic symptoms and psychological distress

The incidence of somatic symptoms among the college students was 34.85% (mild, 26.26%; moderate, 8.59%). The incidence of somatic symptoms among the primary school students was 2.39% (all mild). The total SSS scores, and the scores for each factor, are shown in Table 2. The t-test revealed significant differences between the primary school and college students for all of the scores (all P < 0.001).

Spearman rank correlation was used to analyze the correlation between the total SSS and total concern scores. The correlation coefficients were 0.79 (P < 0.001) and 0.90 (P < 0.001) for the primary school and college students, respectively.

For the college students, the correlation coefficients between the somatic, depression and anxiety symptom scores and the total concern score were 0.55, 0.86 and 0.71, respectively (all P < 0.001); for the primary school students, the respective correlation coefficients were 0.25 (P < 0.001), 0.95 (P < 0.001) and -0.033 (P = 0.638).

3.4. Factors influencing somatic symptoms

The control group for the binary logistic regression analysis of factors influencing somatic symptoms comprised subjects with normal somatic symptom scores (i.e., total SSS score < 30). Separate analyses were performed for the college and primary school students (Tables 3 and 4, respectively).

Among the college students, the likelihood of experiencing somatic symptoms was higher when concern regarding COVID-19 was greater, particularly regarding the necessities of daily life (odds ratio [OR] = 26.00; 95% confidence interval [CI]: 6.11, 110.61).

For the primary school students, only concern regarding the threat to life and health posed by COVID-19 significantly predicted somatic
The college students surveyed in this study expressed concerns regarding daily life necessities, the efficacy of prevention and control measures and, especially, the threat to life and health posed by COVID-19 (63.6% of respondents). All three of these concerns were linked to anxiety and depression. The incidence of somatic symptoms among the college students was 34.85% (mild, 26.26%; moderate, 8.59%). Among the three types of concern, concern regarding the necessities of daily life was the most important risk factor for somatic symptoms (OR = 2.50; 95% CI: 1.06, 5.85).

The primary school students were mainly concerned about the threat to life and health posed by COVID-19 (39.7% of respondents); furthermore, this concern was associated with anxiety, but not with depression. The incidence of somatic symptoms among the primary school students was 2.39% (all mild). Only concern regarding the threat to life and health was a significant risk factor for somatic symptoms (OR = 26.0; 95% CI: 6.11, 110.61).

The above results showed that the stress caused by the COVID-19 outbreak manifested differently between the primary school and college students. Most college students have achieved independence and they tended to worry about all aspects of COVID-19; accordingly, their somatic symptoms were more severe than those of the primary school students, who are not independent (i.e., are sheltered by parents and schools). During the COVID-19 pandemic, the primary school students tended to only be concerned about the direct threat to life and health; daily life necessities and the efficacy of prevention and control materials are likely more of a concern for their parents. Based on our data, governments and other relevant agencies should implement mental health interventions that take account of the differences between primary school and college students.

4.1. Safeguarding mental health among college students

Concerns regarding daily life necessities, the efficacy of prevention and control measures, and the threat to life and health posed by COVID-19 were all risk factors for somatic symptoms among our college students, where the stress of the pandemic could lead to anxiety and depression. Other surveys conducted during the same period found that exposure to social media was positively correlated with negative emotions, such as depression and anxiety (Gao et al., 2020; Jinghui et al., 2020). This is especially relevant to college students, who are more exposed to social media than any other group. The college students in this study were cognizant of all aspects of the COVID-19 pandemic. Especially during the early stage of the pandemic, many stores in China were selling masks, alcohol and other products relevant to prevention and control of the virus, but may be in short supply. This may have caused the students to worry about the threat to life and health posed by COVID-19, thus exacerbating overall psychological distress and somatic symptoms. Similar findings were reported during the SARS outbreak (Xu et al. 2004).

Some somatic symptoms are similar to those of COVID-19 infection, such as gastrointestinal symptoms, which may lead college students to suspect that they are infected, thus further exacerbating health concerns (National Health Commission of the people's Republic of China, 2020).

Studies have found that early prevention and control of COVID-19 confers protection against psychological distress and were associated with low anxiety levels. During the SARS outbreak in 2003, early prevention and control were associated with moderate anxiety levels (Wang et al., 2020; Liu et al., 2003). It can be inferred that if they receive appropriate health education, people understand that effective prevention and control measures can protect them from infection, thus reducing concerns regarding the threat to life and health. Another study found that health education specifically aimed at improving knowledge of COVID-19 among highly educated people can help them maintain an optimistic attitude, and promotes implementation of appropriate prevention and control measures (Chen et al., 2020; Zhong et al., 2020).

Thus, governments and relevant agencies should plan ahead and deliver public health education that improves resilience to psychological distress in the face of a pandemic.

A buffering effect of good social support during public emergencies has been reported (Zhang and Ma, 2020). Investigations of the SARS outbreak in 2003 showed that college students with good social support experienced less physical and mental distress (Court et al., 2004; Wang et al., 2020).

In summary, interventions based on biological, psychological and sociological research, and incorporating Response mode, are needed for college students. Individuals who develop severe somatic symptoms can be treated with psychotropic drugs, and the similarity between mild somatic and COVID-19 symptoms should be emphasized to quell their fears, perhaps via public information campaigns Xiao and Zhang, 2020. The effects of rumors and negative information on public opinion should be controlled, and appropriate health education is necessary to prevent the spread of the virus, improve psychological resilience, and empower individuals to take effective preventive action (Zhang-qing, 2019).

| Table 2 |
The total SSS scores and the scores for each factor in two samples (Mean ± SD).

|           | College         | Primary school | T    |
|-----------|----------------|----------------|------|
| Total SSS | 28.30 ± 7.67   | 21.54 ± 2.61   | 11.78*** |
| Somatization | 13.14 ± 3.32  | 10.31 ± 1.20   | 11.33*** |
| Anxiety    | 10.30 ± 3.11   | 8.08 ± 1.48    | 9.15*** |
| Depression | 9.27 ± 3.47    | 6.33 ± 1.07    | 11.44*** |

Note: *** indicates P < 0.001

4. Discussion

Concerns regulating the threat to life and health post by COVID-19 manifested differently between the primary school and college students. During the COVID-19 pandemic, the primary school students were mainly concerned about the

| Table 3 |
Binary Logistic regression analysis of factors influencing somatic symptoms in college student sample.

| Partial regression coefficient | Standard error of partial regression coefficient | Wald | P    | OR      | OR95%CI Lower limit | Upper limit |
|--------------------------------|-----------------------------------------------|------|------|--------|-------------------|-------------|
| Gender                         | 0.35                                          | 0.54 | 0.43 | 0.111  | 1.42              | 0.50        | 4.06        |
| Grade                          | -0.02                                         | 0.24 | 0.00 | 0.951  | 0.99              | 0.61        | 1.59        |
| Concerns regulating daily life needs | 0.26                                           | 0.74 | 19.46| 0.000*** | 26.00           | 6.11        | 110.61      |
| Concerns regulating the efficiency of prevention and control measures | 1.93                                           | 0.39 | 24.03| 0.000*** | 6.89             | 3.18        | 14.89       |
| Concerns regulating the thread to life and health post by COVID-19 | 0.72                                           | 0.26 | 7.72 | 0.005*** | 2.06             | 1.24        | 3.43        |
| Constant                       | -8.98                                         | 2.79 | 10.34| 0.001*** | 0.00             |             |             |

Note: ** indicates P < 0.01, *** indicates P < 0.001.
Table 4

| Factor                        | Partial regression coefficient | Standard error of partial regression coefficient | Wald | P     | OR   | OR95%CI     |
|-------------------------------|--------------------------------|-------------------------------------------------|------|-------|------|-------------|
| Gender                        | 0.26                           | 1.04                                            | 0.06 | 0.803 | 1.30 | 0.17        | 9.98        |
| Grade                         | -1.16                          | 1.18                                            | 0.96 | 0.328 | 0.31 | 0.03        | 3.20        |
| Concerns regulating daily needs| 2.27                           | 1.45                                            | 2.43 | 0.119 | 9.64 | 0.56        | 166.70      |
| Concerns regulating the efficiency of prevention and control measures | -18.60                          | 15624.94                                       | 0.00 | 0.999 | 0.00 | 0.00        | =           |
| Concerns regulating the thread to life and health post by COVID-19 | 0.91                           | 0.44                                            | 4.42 | 0.036 | 2.50 | 1.06        | 5.85        |
| Constant                      | 16.09                          | 15624.94                                       | 0.00 | 0.999 | 9728060.37 |             |             |             |

Note: * indicates P < 0.05

4.2. Safeguarding mental health among primary school students and other children

Our primary school students were mostly concerned about the direct threat to life and health posed by COVID-19; daily life necessities and the efficacy of prevention and control of materials are likely to be the domain of parents. Thus, for primary school students, education should be aimed at promoting understanding that appropriate action can reduce the threat to life and health posed by major disasters, including pandemics.

The stress response of a child to a disaster largely depends on the support provided by, and responses of, his or her parents; children respond according to the behaviour of the adults in their lives. When parents respond calmly and confidently in the face of a disaster, they are best able to support their children. The US Centers for Disease Control and Prevention (CDC) noted that children’s responses to disasters are influenced by those of their family and community, as well as by family resources, relationships and communication among family members, and overall community resilience (CDC, 2019).

Therefore, in the midst of public health emergencies such as the COVID-19 outbreak, efforts to safeguard the psychological health of children should begin with their parents. Appropriate health education for parents is needed so that they are able to deal with the stress of an outbreak and thus protect their children from psychological distress. Health education for parents should be tailored according to their specific characteristics. Parents with a similar level of education to college students can benefit from interventions aimed at the latter group.

4.3. Summary

Anxiety and depressive symptoms are common in response to the COVID-19 pandemic (Rajkumar, 2020), similar to the mental health problems documented during the early stage of the SARS outbreak (Liu et al., 2003). While an appropriate level of stress can improve the body’s response mode, the autonomic nervous system and cortex are negatively affected; this can lead to psychosomatic and somatic symptoms and, in turn, to psychological problems and mental illness (Xiang et al., 2020). This survey found that stress due to the COVID-19 pandemic manifested differently in college and primary school students, likely due to differences in their social experiences and sources of support. Government and relevant agencies should implement different measures to safeguard the mental and psychological health of particular groups. Response mode could be incorporated into mental health interventions, which should principally be aimed at stabilizing the emotional state but must also emphasize aspects of social policy (Xiao and Zhang, 2020).

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CRediT authorship contribution statement

Shengyi Liu: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Supervision. Ying Liu: Formal analysis, Investigation, Data curation, Writing - review & editing. Yong Liu: Investigation, Resources.

Declaration of Competing Interest

The authors declare there is no conflicts of interest regarding the publication of this paper.

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Supplementary materials

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