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# Factors Related to Anxiety and Depression Among Adolescents During COVID-19: A Web-Based Cross-Sectional Survey

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## ABSTRACT




**Background:** The coronavirus disease 2019 (COVID-19) outbreak and subsequent disease-containment measures (such as school closures) significantly affected the lives of adolescents. We evaluated the mental-health status and factors associated with anxiety and depression among South Korean adolescents.

**Methods:** A nationwide online survey was conducted to evaluate the mental-health status of South Korean adolescents during the COVID-19 pandemic. In total, 570 adolescents aged 13–18 years were surveyed between May 27 and June 11, 2021. The participants completed the Generalized Anxiety Disorder Scale (GAD-7) and Patient Health Questionnaire (PHQ-9) to determine anxiety and depression symptoms, respectively. Stepwise logistic regression models were constructed to determine factors related to anxiety and depression.

**Results:** Among the study participants, 11.2% and 14.2% had anxiety and depression, respectively. The results suggested that several factors, such as the experience of COVID-19 infection and quarantine of oneself, a family member or an acquaintance, physical and mental health problems, and fear of one's local community being discriminated against as a COVID-19 area were related to anxiety and depression.

**Conclusion:** The present study identified COVID-19-related factors associated with anxiety and depression among adolescents, and provides insights regarding potential interventions to improve the mental health of adolescents. To promote the mental health of adolescents during the COVID-19 pandemic, special attention should be paid to individuals with physical or mental-health problems, and efforts should be made to reduce the negative social and emotional impacts of infection-control measures.

**Keywords:** COVID-19; Adolescents; Depression; Anxiety; Survey

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The authors have no potential conflicts of interest to disclose.

**Author Contributions**

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**INTRODUCTION**

The coronavirus disease 2019 (COVID-19) outbreak has significantly affected the lives of adolescents, especially subsequent disease-containment measures such as school closures, social distancing, and home quarantine. Schools have been closed in 188 countries, affecting more than 1.5 billion children and adolescents worldwide.<sup>1</sup> Disruption of daily routines may lead to poor mental and physical health.<sup>2</sup> Studies conducted during lockdowns reported that adolescents had altered dietary habits, reduced physical activity, and sleep disturbance.<sup>3-5</sup> Some adolescents did not have access to school-based healthcare services, special services for adolescents with disabilities, or nutrition programs.<sup>6</sup> The COVID-19 pandemic also adversely affected student learning and promoted digital media use among adolescents.<sup>7,8</sup>

Pandemics cause stress, worry, feelings of helplessness and risky behaviors among adolescents.<sup>9</sup> Previous studies have reported that age, sex, knowledge about COVID-19, degree of worry about infection, and confidence about overcoming the outbreak significantly influenced psychological status.<sup>10</sup> Additionally, lower education levels, use of negative coping styles, posttraumatic stress disorder, and employment were significantly associated with poor mental health among adolescents.<sup>11</sup> Studies also reported higher depression and anxiety levels among young females compared to males during the COVID-19 pandemic.<sup>12</sup> Furthermore, anxiety levels were significantly higher in adolescents compared to children.<sup>13</sup>

A survey reported that 19.0% and 17.5% of South Korean adults had anxiety and depression during the COVID-19 pandemic, respectively.<sup>14</sup> Age, COVID-19-related fear, and restrictions on daily life were associated with higher anxiety and depression levels. However, the associations of COVID-19-related factors with the mental-health status of adolescents have not been sufficiently investigated. It is essential to evaluate the mental-health status of adolescents to design effective interventions to mitigate the negative impacts of the pandemic and facilitate recovery therefrom.

We aimed to assess the prevalence of anxiety and depression, and the associated COVID-19-related factors among South Korean adolescents. Our hypothesis was that fear, perceived stigma, and stress related to COVID-19 may contribute to anxiety and depression in adolescents.

**METHODS****Participants and procedures**

A nationwide online survey was conducted by the Korean Society for Traumatic Stress Studies (KSTSS), which is concerned with disaster mental health, to determine the mental-health status of adolescents during the COVID-19 pandemic. The survey was commissioned by Korea Research and conducted from May 27 to June 11, 2021. This study employed multistage, clustering, and stratified sampling options considering regions and schools as stratified variables. The inclusion criteria were adolescents aged 13 to 18 years, and were provided with the written informed consent to complete the self-reported online questionnaire. The consents from legal representatives of the participants were collected as well. The exclusion criteria were those who did not complete the questionnaire. The final national sample of this study included 570 participants.

### Generalized anxiety and depression symptoms

The Generalized Anxiety Disorder Scale (GAD-7) was used to measure self-reported anxiety symptoms. Adolescents were asked to indicate how often they experienced each symptom on a four-point Likert scale ranging from 0 (not at all) to 3 (nearly every day).<sup>15</sup> Total scores on the GAD-7 range from 0 to 21, with higher scores indicating greater anxiety. A score of 10 was considered the cut-off for anxiety.

Depression was assessed using the nine-item Patient Health Questionnaire (PHQ-9), which is commonly used to screen for depression. The PHQ-9 item scores range from 0 (not at all) to 3 (nearly every day), and total scores range from 0 to 27.<sup>16,17</sup> A score of 10 was considered the cut-off for depression.

### Predicted relevant factors

We identified 30 items from seven domains as being potentially relevant to anxiety depression (Supplementary Table 1). The demographic characteristics of the participants, including the age (continuous variable), sex (boy or girl), and region of residence (urban or rural), were recorded. We also collected information on personal experience, or that of family members or acquaintances, regarding COVID-19 infection and quarantine (yes or no). Nine questions assessing COVID-19-related fears were developed for this study. Participants rated fear on a four-point Likert scale ranging from 0 (strongly disagree) to 3 (strongly agree); thus, higher scores indicated greater fear of COVID-19. A three-item questionnaire assessing COVID-19-related stigma was adapted from a previous influenza A (H1N1) study.<sup>18</sup> The three items were rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree) (i.e., 'Infected people cause harm to society,' 'Infected people harbor a lethal virus in their bodies,' and 'Infected people are disgusting'). Two items were used to determine the number of hours spent pursuing online education per day. An 11-item questionnaire was developed to assess COVID-19-related daily distress; items were rated on a four-point Likert scale ranging from 0 (never experienced) to 3 (experienced extremely frequently). A Korean version of the three-item Sheehan Disability Scale was developed to assess the disruption of daily life due to COVID-19.<sup>19</sup> Participants were required to indicate the level of disruption associated with each item on a 10-point scale ranging from 1 (no disruption) to 10 (extreme disruption). Item scores were averaged to obtain a mean score (range: 1-10), with higher scores indicating greater COVID-19-related disruption.

### Statistical analysis

Descriptive statistics (number and proportion) are presented for the demographic variables and COVID-19 contagion data. We calculated the odds ratios (ORs) and 95% confidence intervals (CIs) for the relationships between demographic variables and symptoms of anxiety and depression using univariate logistic regression analyses. Stepwise logistic regression models were constructed to identify items related to anxiety and depression symptoms from among the seven domains. Sensitivity analysis was performed to analyze the associations of the factors of interest with symptoms of anxiety and depression according to sex. Two-tailed statistical tests were conducted and  $P < 0.05$  was considered statistically significant. R software (version 4.1.1; R Foundation for Statistical Computing, Vienna, Austria) was used to perform the statistical analyses.

### Ethics statement

The present study protocol was reviewed and approved by the Institutional Review Board of Kangwon National University (approval number: KWNUIRB-2020-03-004-008). Informed consent was submitted by all subjects when they were enrolled.

## RESULTS

### General characteristics of the participants

**Table 1** presents the descriptive characteristics of the 570 participants. Among the participants, 341 (59.8%) were middle-school students, 280 (49.1%) were boys, and 200 (38.6%) had experience with COVID-19 infection or quarantine (self, family member, or acquaintance). Anxiety (GAD-7 score  $\geq 10$ ) and depression (PHQ-9 score  $\geq 10$ ) were observed in 64 (11.2%) and 81 (14.2%) participants, respectively (**Table 1**).

### Selection of factors related to anxiety and depression among adolescents

**Supplementary Figs. 1 and 2** display the ORs for the associations between the predictive factors and symptoms of anxiety and depression, obtained using univariate analysis. We conducted a stepwise logistic regression analysis to detect items from among the seven domains related to anxiety and depression symptoms. Four such factors were related to anxiety symptoms: 'physical or mental health problems' ( $P < 0.001$ ), 'fear of one's local community being discriminated against as a COVID-19 area' ( $P < 0.001$ ), 'fear of infection' ( $P = 0.005$ ), and 'conflict with and mistrust of neighbors' ( $P = 0.015$ ) (**Table 2**). The four factors related to depression were 'physical and mental health problems' ( $P < 0.001$ ), 'fear of one's local community being discriminated against as a COVID-19 area' ( $P < 0.001$ ), 'discontent with response and support of government' ( $P = 0.001$ ), and 'fear of transmitting infection to others' ( $P = 0.023$ ) (**Table 3**).

### Sensitivity analysis

The associations between the factors of interest and symptoms of anxiety and depression are presented in **Supplementary Tables 2 and 3**, stratified by sex. The ORs for the association between 'one's physical or mental health problems' and anxiety was 3.91 (95% CI = 1.82–8.41) in boys and 1.67 (95% CI = 1.00–2.77) in girls. No significant association was found between 'fear of infection' and anxiety among girls ( $P = 0.063$ ), or between 'conflict and mistrust of neighbors' and anxiety among boys ( $P = 0.524$ ). Girls who were afraid that their local community may be discriminated against as a suspected COVID-19 area did not have a higher risk of depression ( $P = 0.329$ ). Depression was not significantly associated with 'discontent with response and support of government' ( $P = 0.275$ ) or 'fear of transmitting infection to others' ( $P = 0.167$ ) among boys.

**Table 1.** Characteristics of participants, according to the symptoms of anxiety or depression

Variables	Total	GAD-7 (Anxiety) <sup>c</sup>		PHQ-9 (Depression) <sup>d</sup>	
	No. (%)	OR (95% CI)	P value	OR (95% CI)	P value
Age					
< 16	341 (59.8)	0.84 (0.50–1.43)	0.536	0.81 (0.50–1.31)	0.398
$\geq 16$	229 (40.2)	1		1	
Sex					
Boys	280 (49.1)	0.67 (0.40–1.15)	0.150	0.75 (0.47–1.21)	0.251
Girls	290 (50.9)	1		1	
Residential region <sup>a</sup>					
Urban	300 (52.6)	0.83 (0.49–1.39)	0.476	0.81 (0.51–1.30)	0.384
Rural	270 (47.4)	1		1	
COVID-19 contagion <sup>b</sup>					
Yes	220 (38.6)	1.58 (0.94–2.66)	0.088	2.12 (1.32–3.40)	0.002
No	350 (61.4)	1		1	

GAD7 = General Anxiety Disorder-7, PHQ-9 = Patient Health Questionnaire-9, OR = odds ratio, CI = confidence interval, COVID-19 = coronavirus disease 2019.

<sup>a</sup>The urban area included 8 metropolitan cities and the rural area included 9 provinces; <sup>b</sup>Experience with COVID-19 infection or quarantine (self, family member, or acquaintance); <sup>c</sup>The anxiety symptom was based on GAD-7 cut-off scores of 10; <sup>d</sup>The depression symptom was based on PHQ-9 cut-off scores of 10.

**Table 2.** Stepwise binary logistic regression models for anxiety

Variables	Univariate model		Multivariate model	
	OR (95% CI)	P value	OR (95% CI)	P value
Physical or mental health problems	3.09 (2.25–4.25)	< 0.001	2.41 (1.65–3.53)	< 0.001
Fear of one’s local community being discriminated against as a COVID-19 area	3.33 (2.32–4.78)	< 0.001	2.20 (1.47–3.30)	< 0.001
Fear of infection	4.00 (2.57–6.24)	< 0.001	2.05 (1.25–3.38)	0.005
Conflict with and mistrust of neighbors	2.41 (1.81–3.21)	< 0.001	1.54 (1.09–2.18)	0.015

COVID-19 = coronavirus disease 2019, OR = odds ratio, CI = confidence interval.

**Table 3.** Stepwise binary logistic regression models for depression

Variable	Univariate model		Multivariate model	
	OR (95% CI)	P value	OR (95% CI)	P value
Physical or mental health problems	3.51 (2.58–4.77)	< 0.001	2.76 (1.94–3.90)	< 0.001
Fear of one’s local community being discriminated against as a COVID-19 area	2.67 (1.96–3.63)	< 0.001	1.98 (1.39–2.83)	< 0.001
Discontent with response and support of governments	2.28 (1.77–2.93)	< 0.001	1.69 (1.25–2.27)	0.001
Fear of transmitting infection to others	2.97 (2.05–4.30)	< 0.001	1.64 (1.06–2.51)	0.023

COVID-19 = coronavirus disease 2019, OR = odds ratio, CI = confidence interval.

## DISCUSSION

We conducted an online self-administered survey of South Korean adolescents, and found that 11.2% and 14.2% of them had anxiety and depression, respectively. “Experience of infection or quarantine by self, or with family member or acquaintance,” “physical and mental health problems,” and “fear of one’s local community being discriminated against as a COVID-19 area” were significant risk factors for anxiety and depression.

Several studies have evaluated the effects of the COVID-19 pandemic on general adolescents’ mental health.<sup>12,20,21</sup> The prevalence rates of anxiety (11.2%) and depression (14.2%) in this study differ from those of previous studies, which may be explained by differences in COVID-19 incidence, methods of investigation, and the infection-control measures in place when each study was carried out. In a study conducted in Daegu Metropolitan City in South Korea, where the number of confirmed cases was high early in the pandemic, the prevalence rates of anxiety and depression in adolescents were 12.3% and 19.8%, respectively, which are higher than those in the present study.<sup>22</sup> In addition, studies conducted at the height of the epidemic in China reported depression prevalence estimates ranging from 19% to 46%. A national survey reported that 25.5% of South Korean adolescents were depressed, as based on a single question: “Has your life been disrupted by depression for 2 weeks or more in the past 12 months?” In contrast, the present study used a dedicated depression scale to measure the prevalence of moderate-to-severe depression; the use of this more specific measure of depression may account for the difference between the two studies.<sup>23</sup> It is noteworthy that our findings are supported by recent students’ mental health survey performed by the Korean government.<sup>24</sup> The Ministry of Education reported that the rate of anxiety and depression of middle and high school students was 7.0% and 12.2%, respectively. In addition, according to the survey, nearly 30% of elementary school students admitted that their anxiety and depression increased since COVID-19 outbreak than those before. A meta-analysis of previous studies showed that adolescent anxiety and depression increased two- to four-fold during the COVID-19 pandemic.<sup>21</sup> Special care for adolescents’ mental health would be necessary since anxiety and depression may cause negative impact on the daily functioning, and depression is associated with an increased risk of self-harm and suicide.

The risk factors for adolescent anxiety and depression identified in the present study are similar to those in previous studies. The mental health of adolescents with pre-existing



conditions, such as asthma, diabetes, or COVID-19-like symptoms such as fever, cough, and difficulty breathing, is more affected by COVID-19 than that of those without such conditions or symptoms.<sup>25</sup> Almost 13.4% of adolescents worldwide have mental-health problems.<sup>26</sup> Adolescents with pre-existing mental-health disorders, such as attention-deficit/hyperactivity disorder, anxiety, depression, mood disorders, and behavioral disorders, constitute a vulnerable group during disasters such as epidemics. During disaster situations, vulnerable individuals may be unable to visit the hospital, which may interrupt their treatment, leading to worsening symptoms or the development of new conditions (such as anxiety or depression).<sup>27</sup> Therefore, individuals with pre-existing conditions should be provided with information to help them continue their treatment.

In this study, the fear that one's region of residence may be discriminated against as an area infected by COVID-19 was found to be a risk factor for anxiety and depression. This finding supports those of other studies, such as the findings from a study of patients with mild COVID-19 that the stigma of being infected was a risk factor for anxiety and depression.<sup>28</sup> Another study reported that the level of stigma experienced by patients with Middle East respiratory syndrome was a predictor of the development of post-traumatic stress disorder at 1 year later.<sup>29</sup> In the present study, the "fear of infection" was weakly associated with anxiety, while the "fear of spreading infection" was associated with depression. Public stigma refers to negative attitudes and beliefs that lead to fear, rejection, avoidance, and discrimination by other people. During the Ebola outbreak, the country where the outbreak occurred was named the "infected country".<sup>30</sup> Even in the early days of the COVID-19 pandemic, "fake news" and misinformation, as well as stigma, were widespread among healthcare workers and COVID-19 patients.<sup>31</sup> According to a longitudinal study of adolescents, experiencing discrimination can lead to feelings of depression and alienation, school maladjustment, and poor academic performance.<sup>32</sup> This study showed that adolescents were afraid of being treated differently on returning to their school or community after receiving treatment for COVID-19, or if the entire school was shut down due to contact with a COVID-19 patient.

Based on the above findings, the experience of infection or self-quarantine (oneself, a family member, or an acquaintance) will likely be significantly associated with anxiety and depression. Infection or self-quarantine involves not only a threat to one's health and life due to the infection itself but also secondary problems such as stress due to disruption of one's schedule, the negative perceptions of other people, associated stigma, and infection-control measures. The mental health of COVID-19 patients declines significantly during self-quarantine, with adolescents being affected to a greater degree than adults.<sup>33</sup> In particular, adolescents are more concerned with the government's infection-control measures than COVID-19 itself, which increases their levels of anxiety and depression, and decreases their satisfaction with life.<sup>34</sup> Therefore, even asymptomatic or mildly symptomatic COVID-19 adolescent patients should be considered high-risk groups and provided with accurate information to prevent negative social and emotional consequences of infection control measures.

There were several limitations to this study. First, we used a self-administered online survey, which may have led to over- or under-estimation of the results. Because this study was conducted during the pandemic, the online method used was the best option available. Importantly, this is the first study to use reliable and valid scales to measure depression and anxiety in South Korean adolescents during the COVID-19 pandemic. Second, the study results cannot be generalized to all adolescents, although we aimed to ensure a representative study population by including an equal proportion of males and females, middle- and high-school

students, and metropolitan and non-metropolitan residents. Third, the survey did not evaluate all factors that can affect adolescent mental health. Due to the nature of the web-based survey, we did not include an excessive number of questionnaire items to prevent low response rates and/or accuracy; therefore, only selected items were included. The questionnaire items focused on factors related to COVID-19, such as associated fear, stigma, and life stress.

In conclusion, we conducted a self-administered online survey of South Korean adolescents. The prevalence rates of anxiety and depression were estimated to be 10% and 20%, respectively. In addition, the following factors were found to be related to depression and anxiety: physical and mental health problems, and fear of one's local community being discriminated against due to COVID-19 infection-control measures. To improve the mental health of adolescents during the COVID-19 pandemic, special attention should be paid to patients with preexisting mental-health problems, and efforts should be made to reduce the negative social and emotional impacts of infection control measures.

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## SUPPLEMENTARY MATERIALS

### Supplementary Table 1

The summary of predicted factors for the symptoms of anxiety and depression

[Click here to view](#)

### Supplementary Table 2

Multivariate logistic regression for anxiety across sex

[Click here to view](#)

### Supplementary Table 3

Multivariate logistic regression for depression across sex

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### Supplementary Fig. 1

Plot for odds ratios of the associations of anxiety with each factor.

[Click here to view](#)

### Supplementary Fig. 2

Plot for odds ratios of the associations of depression with each factor.

[Click here to view](#)

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