

# Gender Based Susceptibility to Mental Health Issues in Adolescents during the Pandemic

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# Gender Based Susceptibility to Mental Health Issues in Adolescents during the Pandemic

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## Abstract

**Background:** Adolescence, the transitional phase between childhood and adulthood, is a stressful, fragile, and critical period. While the COVID-19 pandemic has introduced numerous stressors affecting the mental health of all age groups, adolescents are particularly vulnerable. However, there is limited research focusing on the impact of COVID-19 on this population.

**Objective:** This study aimed to explore the impact of COVID-19, coping strategies, depression, anxiety, and post-traumatic stress disorder (PTSD) in adolescents during the pandemic.

**Methods:** This web-based cross-sectional survey study included 217 adolescents in Southern California, USA, between 2020 and 2021. Self-report measures include demographic questionnaires, COVID-19 impact, types of coping strategies used during COVID-19, depression, anxiety, and PTSD analyses. Chi-Square tests were used for depression and anxiety, and ANOVA was used for PTSD analysis.

**Results:** Female gender was identified as a risk factor for depression, anxiety, and PTSD. Approximately 24.2% of participants had a family member or someone close who was infected with COVID-19 during the pandemic, which was a significant factor for both anxiety and PTSD. More than half of participants (56.8%) were Asian-Americans, but there was no significant difference in depression, anxiety and PTSD among different racial/ethnic groups. About a quarter of the participants reported experiencing depression or anxiety. The mean score for PTSD was 8.08 (SD = 5.70). Social media and the internet were the most frequently used coping strategies, with 67.3% of participants utilizing each.

**Conclusions:** Considering our findings, prevention programs focusing on mental health, including routine screening, should be implemented at community level for adolescents. School programs fostering healthy social interactions and education on coping strategies should also be implemented for both families and adolescents. Clinical Trial: None

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## Original Manuscript

# Gender Based Susceptibility to Mental Health Issues in Adolescents during the Pandemic

## Introduction

***Pandemics and Adolescents' Mental Health:*** The COVID-19 pandemic has significantly affected everyone, particularly adolescents.<sup>1</sup> Adolescents, being in a crucial developmental stage, are particularly vulnerable to mental health issues. Their emotional regulation systems mature before those responsible decision-making, increasing their susceptibility to anxiety, aggression, and risky behaviors.<sup>2</sup> Socially, they rely more on peer interactions for development, with schools and community groups playing key roles in their socialization.<sup>3,4</sup> These interactions, vital for combatting issues like low self-esteem and depression, were significantly disrupted by early COVID-19 public health recommendation like social distancing, limited interaction with peers and school closures. Such disruptions could lead to long-term psychological and physiological impacts, highlighting the need to focus on adolescent mental health during the pandemic, given their vulnerability.<sup>4,5</sup> Therefore, it is important to understand the adolescent mental health status during COVID-19, given their susceptibility to mental health challenges.

Attention on adolescents' health during COVID-19 pandemics is limited, especially in the U.S., with most studies conducted in China, Australia and Japan. Studies on Chinese adolescents during the COVID-19 pandemic reported depression rates between 19.7% and 43.7%, anxiety rates between 24.9% and 37.4%, and a post-traumatic stress disorder (PTSD) rate of 14.4%.<sup>6-9</sup> In Japan, Isumi et al. (2020)<sup>10</sup> reported a 1.34-fold increase in child suicide rates in May 2020 compared to March 2020. Australian adolescents saw significant rises in depression and anxiety, alongside drops in life satisfaction during the pandemic.<sup>3</sup>

The shift to online learning and reduced physical and social activity has marked a drastic change in adolescents' lifestyles, contributing to increased screen time and more sedentary behaviors.<sup>11</sup> In the U.S., there was a 50.6% rise in emergency department visits by adolescent girls for suicide attempts in February 2021 compared to 2019.<sup>12</sup> Interestingly, U.S. Hispanic adolescents with mental health issues before the COVID-19 pandemic experienced a significant decrease during the pandemic, possibly due to enhanced family interactions. However, the results of this study may not be generalized to the diverse U.S. adolescents because of the large proportion of the Hispanic sample.<sup>1</sup>

***Adolescents' Coping Strategies during COVID-19:*** Research on how adolescents adapted to restrictions on social and outdoor activities during the COVID-19 pandemic is scarce. One study highlighted that common coping strategies of the young adults aged between 18-24 included "just staying indoors" followed by "talking to people", "maintaining a positive outlook", and "trying to do some online school work".<sup>13</sup> Another study found that children and adolescents engaged in spiritual/emotional activities, cognitive/social activities with family at home, exercise, and managing healthy sleep.<sup>14</sup> Despite the numerous stressors impacting U.S. adolescents' mental health during COVID-19, there's a gap in research specifically addressing prevention and the mental health consequences for this at-risk group. Thus, examining the link between COVID-19 and mental health among U.S. adolescents is crucial.

This study aims to investigate the association of COVID-19, coping mechanisms, and mental health challenges among adolescents in California during the pandemic. Specific aims are: 1) to describe the prevalence of COVID-19 within the family or among someone close (through ties of kinship or affection), 2) to describe coping strategies used by adolescents, and 3) to identify whether demographic variables and being personally impacted by COVID-19 are related to depression, anxiety, and post-traumatic stress disorder (PTSD).

## Methods

**Study Design and setting:** This study used a cross-sectional design to describe the relationship between COVID-19 and mental health issues among adolescents in California. This study was approved by the Institutional Review Board (IRB). The web-based survey was conducted between October 2020 and February 2021, targeting adolescents in Southern California, USA. The inclusion criteria for this study were: 1) boys and girls between 12 and 17 years old, 2) able to communicate verbally and/or in writing in English, 3) has access to an electronic device to complete the survey, and 4) both parent consent and participant assent for the survey study. The principal investigator assessed the participants' eligibility. A convenience sampling method was used to recruit potential participants, including school nurses from Hispanic or Black backgrounds, parent associations, student science clubs and by distributing flyers in shopping malls. A web-based self-report survey was developed using Qualtrics software, and a survey link was sent to potential participants. Both English and Spanish versions of the parent consent form were provided. An electronic gift card of \$5.00 was sent to participants.

**Measures: Demographic Questionnaire:** Included gender (male & female), age (12-14 years old & 15-17 years old), and race/ethnicity (non-Hispanic White, Asian, & Hispanic).

**COVID-19 Impact:** Assessed by two (yes/no) questions: 1) Family member/household infection with COVID-19. and 2) Close contact death due to COVID-19. Combined into a single variable if participants responded yes to either question. **Coping Strategies during COVID-19** Participants indicated yes/no for various coping methods, including social media, internet use, video/computer games, sleep, eating, TV watching, phone calls, outdoor/indoor activities (walking, gardening, or shopping, etc.), indoor activities, and reading (books, newspapers, or magazines, etc.).

**Mental Health Problems:** The Patient Health Questionnaire-4 (PHQ-4) assesses depression and anxiety using a 4-item, 4-point Likert scale. The Depression subscale (PHQ-2) and Anxiety subscale (GAD-2) each consist of 2 items, with scores ranging from 0-6. A score of 3 or greater on either subscale indicates a positive result for depression or generalized anxiety disorder (GAD). The PHQ-4 has established reliability and validity across diverse populations.<sup>15,16</sup> Impact of Event Scale-6 (IES-6) is a shortened version of the Impact of Event Scale-Revised (IES-R), comprising 6 items rated on a 5-point Likert scale to measure PTSD symptoms. Total scores range from 0 to 24, with higher scores indicating more severe post-traumatic stress reactions. The reliability and validity of the IES-6 have been established across various populations.<sup>17</sup>

**Data Analysis:** Descriptive statistics including Mean (*M*) and Standard Deviations (*SD*) were computed for all variables using the SPSS V.27.0. Chi-Square tests were utilized to assess proportions of depression and anxiety by demographic variables and COVID-19 impact. ANOVA analyses were employed to compare mean PTSD score across demographic variables and COVID-19 impact. The significance level for all statistical analyses was set at 0.05.

## Results

A total of 217 adolescents participated in this study, including 108 males (50.2%), 18% in the younger age group (12 - 14 years old); Asian Americans were the largest ethnic group (*n* = 109, 56.8%), followed by non-Hispanic White (*n* = 52, 27.1%) and Hispanic (*n* = 31, 16.1%) (Table 1). Regarding the COVID-19 impact, about 24.2% (*n* = 52) of the participants have ever had a family member or someone close who had tested positive for COVID-19 or died from it.

Among the types of coping strategies, the use of social media and internet were the most common (*n* = 146, 67.3%), followed by video or computer games, sleeping, eating, and TV watching (*n* = 118, 54.4%), then, indoor activities (*n* = 53, 24.4%), followed by book or magazine reading which was the lowest (*n* = 52, 24.0%).

**COVID-19 Impact:** Chi-Square tests for depression and anxiety and ANOVA analyses for PTSD by demographic variables and COVID-19 impact were applied. Overall prevalence of depression was 25.5% (*n* = 49) and 24.0% (*n* = 46) for anxiety and overall mean scores of PTSD was

8.08 (SD = 5.70) in this study (Table 2). Female participants compared to male participants reported significantly higher prevalence for depression (33.6% vs 17.6%, respectively) and anxiety (34.6% vs. 13%) and significantly higher mean scores for PTSD (9.34 vs. 6.87). However, age and race/ethnicity were not significantly related to participants' depression, anxiety, and PTSD ( $p > .05$ ). Participants who have ever had a family member or someone close with COVID-19 reported significantly higher prevalence for anxiety compared to the counterpart (37% vs 19.0%, respectively) and significantly higher mean scores for PTSD (10.17 vs. 7.39, respectively). The group experiencing COVID-19 did not show a significant difference in depression (35%) compared to those unaffected by COVID-19 (22%) ( $p = 0.55$ ).

## Discussion

The present study examined the association of the COVID-19 pandemic with adolescent depression, anxiety, and PTSD, as well as their coping strategies used. Of the demographic variables, only female gender showed associations with all three mental health issues. This findings consistent with findings from the U.S. and other countries.<sup>6,9,18</sup> While previous studies in China suggested older adolescents reported more mental health problems during the COVID-19 pandemic,<sup>8,9</sup> our study found no significant age related differences in mental health. The impact of COVID-19 on mental health among younger adolescents in the U.S. remains uncertain, warranting further studies. Notably, over half of the participants (56.8%) were Asian Americans, possibly influenced by heightened interest in the COVID-19 study due to prevalent anti-Asian discrimination and violence during the pandemic compared to other racial/ethnic groups.

Given that most studies about COVID-19 and adolescent mental health have been conducted in China,<sup>6,8,9</sup> it is essential to prioritize studies on Asian American adolescents to comprehend their mental health. Although our study did not reveal significant racial/ethnic mental health disparities, we recommend further research in this area.

In this study, 24.2% of the participants reported having a family member or someone close with COVID-19, significantly higher prevalence of both anxiety and PTSD. However, while the impact of depression was higher among families affected by COVID-19 compared to those in non-COVID-19 families (35% vs. 22%), the significance level was marginally significant ( $p = 0.55$ ), possibly due to the sample size. This finding is similar to other studies that reported having a family member or friends with COVID-19 was significantly related to higher levels of anxiety.<sup>6</sup>

The depression rate (25.5%) in the current study was double the pre- COVID-19 prevalence of major depressive episodes among U.S. adolescents (13.3%).<sup>19</sup> Similarly, the prevalence of anxiety (24.0%) was comparable to rates (24.9%) reported from China.<sup>8,9</sup> Our participants' mean PTSD scores of 8.08 approached the potential cutoff scores of 10 on the IES-6.<sup>17</sup> However, comparisons with other studies were challenging due to differences in PTSD measurement tools and limited studies during the COVID-19 pandemic among adolescents.<sup>7</sup> Therefore, further studies are needed to examine the prevalence of depression, anxiety, or PTSD that targets the U.S. adolescent population, given the inconsistent findings.

As coping strategies to overcome stress during the pandemic, most participants in this study used social media and/or the internet, playing video or computer games, while fewer than half engaged in outdoor or indoor physical activities. This aligns with an Australian study where adolescents increased inactivity and social media and internet use during the COVID-19 pandemic, linked to reduced happiness.<sup>11</sup> It is evident that pandemic prevention orders - physical distancing, stay-at-home orders, and school closures - have led to increase screen time and internet, smartphone use, and decreased physical activity among school-age children and adolescents which can lead to a lack of interpersonal relationship and social support. To address this, promoting healthier coping strategies should be guided and encouraged to promote social interaction despite physical distancing is crucial. Examples of healthy coping strategies include 1) socially interactive networking to help



them to stay connected with each other in their community,<sup>13,20,21</sup> 2) physically active indoor activities through virtual networking,<sup>13</sup> and 3) healthy sleep management.<sup>14</sup>

**Limitations:** Convenience sampling and reliance on online surveys and self-reported questionnaires may limit the generalizability of our findings and lead to underreporting of mental health issues due to stigma. Nonetheless, this pioneering study offers valuable insights into the mental health of U.S. adolescents during the COVID-19 pandemic, including a significant representation of Asian American adolescents.

**Relevance for Clinical Practice:** Given the increased prevalence of depression, anxiety, and PTSD in adolescents identified in this study, it is essential to develop, implement, and expand prevention programs focusing on mental health. This includes routine screening and early detection in primary care and psychiatric/mental health care settings for both adolescents and their families. School nurses need to be aware of the impact of the COVID-19 pandemic on adolescents' mental health. School-based programs that augment and/or complement adolescents' use of online devices with more interactive and creative activities should be developed and implemented in collaboration with adolescents and their families. Collaboration and cooperation between health care settings, schools, families, and students should be encouraged to help identify students at risk.

## Conclusion

This study revealed that approximately 25% of participants had a family member or someone close to them with COVID-19, significantly associated with anxiety and PTSD. Participants in this study heavily relied on social media and the internet a lot more than any other coping strategies, and also experienced increased rates of anxiety and PTSD during the pandemic. Implementing prevention programs with routine screening, early detection, and referrals for mental health support is crucial. Additionally, school and home-based activities to enhance social interaction and healthy coping strategies among adolescents and their families should be both developed and encouraged.

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## Conflict of interest

The authors declare that they had no conflicts of interest.

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**Table 1***Demographic Characteristics and COVID-19 Impact of Participants (N = 217)*

Variable	n (%)
Gender	
Male	108 (50.2)
Female	107 (49.8)
Age	
Younger (12-14 years old)	39 (18.0)
Older (15-17 years old)	178 (72.0)
Race/Ethnicity	
Non-Hispanic White	52 (27.1)
Asian	109 (56.8)
Hispanic	31 (16.1)
COVID-19 impact	
Family or someone close with COVID-19	
Yes	52 (24.2)
No	163(75.8)

*Note.* Valid case only

**Table 2**  
*Differences in Depression, Anxiety, and PTSD by Demographic Characteristics and COVID-19 Impact (N = 217)*

Variable	Depression (PHQ-2 >=3)		Anxiety (GAD-2 >=3)		PTSD (IES-6)	
	n (%)	χ <sup>2</sup> (p)	n (%)	χ <sup>2</sup> (p)	M (SD)	F (p)
Gender						
Male	19 (17.6)	7.28 (<.05)	14 (13.0)	13.88 (<.001)	6.87 (5.10)	10.60 (<.01)
Female	36 (33.6)		37 (34.6)		9.34 (6.01)	
Age						
Younger (12-14 years old)	13 (31.0)	.52 (.47)	11 (26.2)	0.06 (.82)	8.35 (5.78)	.11 (.74)
Older (15-17 years old)	48 (25.5)		46 (24.5)		8.02 (5.70)	
Race/Ethnicity						
Non-Hispanic White	16 (30.8)	1.41 (.50)	14 (26.9)	.61 (.74)	7.94 (5.41)	.04 (.96)
Asian	27 (24.8)		26 (23.9)		8.12 (5.74)	
Hispanic	6 (19.4)		6 (19.4)		8.29 (5.74)	
COVID-19 impact						
Family/someone close with COVID-19						
Yes	19 (35.2)	3.68 (.055)	20 (37.0)	7.33 (<.01)	10.17 (6.31)	9.99 (<.01)
No	36 (22.1)		31 (19.0)		7.39 (5.33)	
Total	49 (25.5)		46 (24.0)		8.08 (5.70)	

*Note.* Valid case only