Gender differences and post-pandemic mental health impacts: a mediation study on Vietnamese adolescents

Thanh Long Nguyen,[1] Victor Storm,[2] Lam Toi Phung,[3] Cong Thien Le,[1] Thi Thu Ha Le,[1] Thi Hoa Nguyen,[1] Son Tung Vu,[4] Thien Thang Tran,[5] Minh Hanh Vu,[6] Van Tuan Nguyen[1]

[1]Hanoi Medical University, Vietnam; [2]University of Sydney, Camperdown, Australia; [3]University of Medicine and Pharmacy, Vietnam National University, Hanoi, Vietnam; [4]Bach Mai Hospital, Hanoi, Vietnam; [5]Can Tho University of Medicine and Pharmacy, Vietnam; [6]Quang Ninh Mental Health Protection Hospital, Vietnam

Correspondence: Van Tuan Nguyen, Hanoi Medical University, No. 1 Ton That Tung Street, Dong Da District, Hanoi, Vietnam.
Tel.: +84913551842.
E-mail: nguyenvantuan@hmu.edu.vn

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ABSTRACT

This study examines anxiety and depression among 552 Vietnamese adolescents after COVID-19, focusing on gender differences and mental health changes. Using the Reynolds Adolescent Depression Scale and the Screen for Child Anxiety-Related Emotional Disorders, we found that 26.3% of participants experienced anxiety and 13.8% had depression. Separation anxiety was most common (33.0%), followed by social phobia (21.2%) and generalized anxiety disorder (16.3%). Family conflicts [adjusted odds ratio (aOR)=6.8, $p<0.01$] and stigma (aOR=22.0, $p<0.05$) significantly raised depression, while high vaccine uptake reduced anxiety (aOR=0.1, $p<0.05$). Post-pandemic mental health changes increased depression (aOR=4.3, $p<0.001$) and anxiety (aOR=3.8, $p<0.01$). Females were more likely to report depression (aOR=5.7, $p<0.01$), with post-pandemic changes mediating 60.8% of this effect. The study highlights the need for gender-sensitive mental health interventions in the post-pandemic era.

Introduction

Vietnam's response to the COVID-19 pandemic began in January 2020 with strict public health measures, including a nationwide lockdown and mandatory safety protocols, peaking at over 10,000 daily cases by September 2021. By 2022, widespread vaccination efforts enabled the easing of these measures.[1,2] The pandemic's isolation and disruption significantly impacted adolescent mental health, increasing anxiety, depressive disorders, and sleep disturbances due to the loss of stable school routines and heightened stress.[2-4]

A study conducted during the pandemic assessed mental health in seven middle-income Asian countries, including Vietnam, using the Impact of Event Scale-Revised and the Depression, Anxiety, and Stress Scale. Vietnam reported the lowest scores across all measures, with the male gender identified as a protective factor.[5] The rapid socioeconomic and cultural changes in Vietnam add complexity to adolescent mental health research.[6] Previous studies have not used internationally validated tools like the Reynolds Adolescent

Depression Scale (RADS) and the Screen for Child Anxiety-Related Emotional Disorders (SCARED), known for their diagnostic accuracy.[7,8]

Research shows marked gender disparities in mental health, with women being about twice as likely as men to develop depression. Sociocultural factors and specific vulnerabilities, such as during pregnancy or intimate partner violence, increase women's susceptibility to mental health issues.[9] The pandemic intensified these challenges, particularly for female caregivers.[10]

A systematic review found female gender to be a risk factor for higher distress during the pandemic.[11] A multinational study highlighted that female caregivers of children aged 5-18 years experienced significantly higher levels of COVID-related stress and symptoms of distress, anxiety, and post-traumatic stress compared to male caregivers.[12]

In Vietnam, gender-specific norms may complicate the expression and recognition of mental health issues, underscoring the need for gender-focused analysis to design effective interventions.[13-15] Addressing these challenges through tailored mental health strategies is crucial for mitigating gender-based disparities in mental health outcomes.

The primary aim of this study is to determine the prevalence and determinants of anxiety and depression among adolescents in Vietnam, using internationally validated tools (RADS and SCARED), focusing on how post-pandemic changes have influenced these outcomes. By leveraging mediation analysis, this research aims to inform the development of targeted, gender-sensitive mental health interventions.

Materials and Methods

Study design

A cross-sectional study was conducted from January to April 2023, involving 552 adolescents in a socioeconomically advanced coastal province of northeastern Vietnam. This period was selected following the lifting of social distancing regulations, enabling the assessment of the adolescents' mental health as they transitioned back to their regular school environments.

Setting

The study was executed across four schools, including two lower and two upper secondary schools. To ensure a representative sample, each educational level featured one school from a rural area and one from an urban area within the province.

Participants

Adolescents aged 10-18 who attended the selected lower and upper secondary schools were recruited. This age range was chosen to encompass a broad spectrum of developmental stages, facilitating a comprehensive analysis of mental health impacts across adolescence.

Sample size

The sample size was calculated to detect a presumed 20% prevalence rate of anxiety and depression among adolescents influenced by COVID-19. Using a 5% margin of error, a 95% confidence level, and a design effect of 2, the minimal required sample size was determined to be 492. Accounting for a potential 10% non-response rate, the sample size was adjusted to 542, with the final participant count reaching 552 to ensure robust statistical power.

Sampling procedure

A stratified random sampling method was utilized. One district in a rural area and one city in an urban area were selected within the province. One lower secondary school and one upper secondary school were randomly chosen from each. Within each selected school, one class was randomly picked, and all students in that class were invited to participate.

Data collection

Data collection began after securing approvals from local educational authorities and participating schools. Research objectives and procedures were communicated to all stakeholders, and written informed consent was obtained from the schools and distributed to students' families. Collaborations were established with local child mental health care facilities to support training, medical examinations, and the diagnosis of mental health conditions among participants.

Assessment tools

Depression and anxiety were evaluated using two established instruments. RADS is a self-report tool designed to measure depression levels in adolescents aged 11-20, consisting of 30 items rated on a scale from 1 (almost never) to 4 (almost always). Higher total scores indicate more severe depressive symptoms.[7,16] SCARED, comprising 41 items rated from 0 (never) to 2 (often), assesses various forms of anxiety, including social anxiety, separation anxiety, panic disorder, generalized anxiety, and school avoidance. It is validated for children and adolescents aged 8-18 years.[17]

Statistical analysis

Data were presented as frequencies, percentages, means, and medians as appropriate. The distribution of RADS and SCARED scores was visualized using bar charts in R version 4.3.2. Logistic regression models identified factors related to anxiety and depression. Mediation analysis examined the effects of gender and self-assessed mental health changes post-COVID-19 on depression levels,[18] utilizing the PROCESS Macro in R for initial analyses of direct and indirect effects.[19] To enhance findings, Stata 17 was also used, ensuring a comprehensive analysis through a dual-software approach. All statistical analyses followed a significance threshold of $p<0.05$.

Ethical considerations

The study was conducted in accordance with the ethical guidelines of the Helsinki Declaration and received approval from the Ethics Review Board. Informed consent was obtained from all participants, who were fully informed of their rights, including the ability to withdraw from the study at any time without repercussions. All personal data were anonymized to uphold confidentiality.

Results

Demographic and baseline characteristics

This study assessed 552 adolescents, with 48.01% males and 51.99% females. The majority (84.06%) lived with both parents, 14.31% resided with a single parent, and a smaller fraction (1.63%) had grandparents or other caretakers. Parental relationships were mostly harmonious (82.61%), though some reported conflict (4.53%) or came from separated or bereaved families (12.86%) (*Supplementary Table 1*).

A minimal percentage (2.17%) reported a family history of mental disorders. Substance use was relatively low, with 5.43% engaging in alcohol consumption and 2.36% in smoking. Digital engagement was high, with 72.46% reporting regular internet usage, reflecting the integration of digital interaction in their daily lives. Socioeconomically, 70.83% described their income as average, 26.99% as low, and a minority (2.17%) as high. Over half (54.35%) were dissatisfied with their income level (*Supplementary Table 1*).

COVID-19-related characteristics

Regarding COVID-19 exposure, 35.69% of participants reported that they had never contracted the virus, while the majority had experienced infection at least once (60.33%), and a smaller group twice (22%). Vaccine uptake was substantial, with 71.01% having received three doses. The severity of symptoms during the first COVID-19 infection varied, with 35.69% reporting mild symptoms, 21.20% moderate, and only 0.54% severe, while 42.57% did not specify the severity.

The mental health state post-COVID-19 showed that 47.10% of adolescents perceived no change from their pre-infection state, 13.41% reported a change, and 39.49% did not specify any particular shift.

Distribution of mental health scores

Figure 1 depicts the distribution of total scores for RADS and SCARED. RADS scores have a mean of 23.80 and a standard deviation (SD) of 13.20, ranging from 0 to 90. Meanwhile, the SCARED scores have a mean of 17.80 and an SD of 13.76, ranging from 0 to 72.

Prevalence of specific anxiety and depression subtypes

The study's results indicated that 26.3% of the participants exhibited symptoms of anxiety, while 13.8% met the diagnostic criteria for depression (*Supplementary Table 2*). Analysis of anxiety subtypes showed that separation anxiety was the most common, affecting 33.0% of those diagnosed with an anxiety disorder. Social phobia was identified in 21.2% of the participants, followed by specific phobia or panic disorder at 18.5%, generalized anxiety disorder at 16.3%, and school avoidance at 14.0% (*Supplementary Table 2*).

Analysis of factors associated with anxiety and depression

Factors correlating with depression prevalence

Females exhibited significantly higher odds of depression with a crude odds ratio (cOR) of 3.0 [95% confidence interval (CI): 1.7-5.1, p<0.001] and an adjusted odds ratio (aOR) of

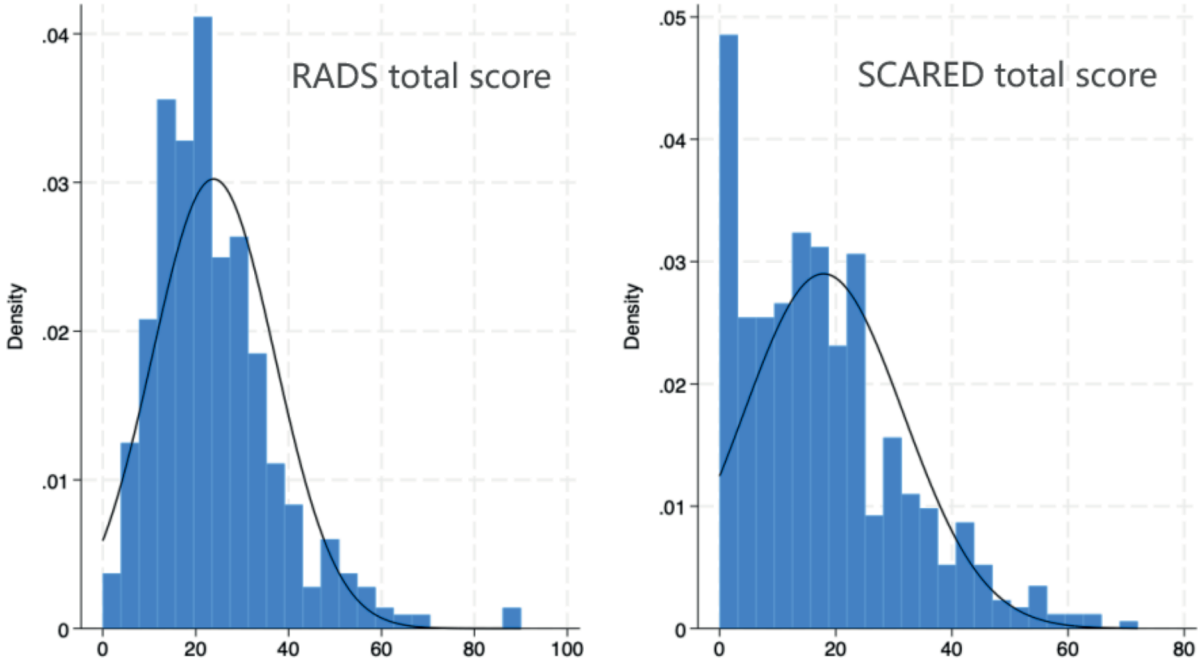

Figure 1. Distribution of total scores on the Reynolds Adolescent Depression Scale (RADS) and the Screen for Child Anxiety Related Emotional Disorders (SCARED).

5.7 (95% CI: 1.9-17.1, p<0.01). Family conflicts were strongly associated with increased depression, with a cOR of 5.1 (95% CI: 2.9-9.0, p<0.001) and an aOR of 6.8 (95% CI: 1.9-24.5, p<0.01).

Experienced stigma also correlated with a higher likelihood of depression, showing a cOR of 10.5 (95% CI: 3.6-30.5, p<0.001) and an aOR of 22.0 (95% CI: 1.1-450.4, p<0.05). Urban residency demonstrated a moderate relationship with depression, with a cOR of 1.9 (95% CI: 1.1-3.2, p<0.05) and an aOR of 2.3 (95% CI: 0.9-5.8, not statistically significant).

Among the COVID-19-related factors analyzed, several showed significant correlations with depression levels in adolescents. Notably, individuals who reported changes in their mental state post- *vs.* pre-COVID-19 infection displayed a markedly higher likelihood of experiencing depression, with a cOR of 4.9 (95% CI: 2.6-9.1, p<0.001) and an aOR of 4.3 (95% CI: 1.6-11.6, p<0.01). Additionally, the number of COVID-19 infections showed a significant association with depression levels. Adolescents infected twice with COVID-19 exhibited a higher propensity for depression, with a cOR of 3.5 (95% CI: 1.3-9.6, p<0.05), although this association did not remain significant after adjustment for other factors. The severity of symptoms during the first COVID-19 infection also appeared to influence depression levels, with moderate symptoms associated with an increased likelihood of depression in the unadjusted model (cOR=2.2, 95% CI: 1.2-4.0, p<0.05). However, this did not maintain significance in the adjusted analysis (*Supplementary Table 3*).

Factors correlating with anxiety prevalence

Gender showed a significant impact, with females experiencing a higher prevalence of anxiety (cOR=3.7, 95% CI: 2.4-5.7, p<0.001; aOR=4.3, 95% CI: 2.0-9.0, p<0.01). Family conflict also contributed significantly to anxiety rates (cOR=3.2, 95% CI: 1.9-5.3, p<0.001; aOR=3.8, 95% CI: 1.2-11.9, p<0.05). Furthermore, a history of psychological trauma was associated with higher rates of anxiety (cOR=3.8, 95% CI: 1.7-8.3, p<0.001), although this association did not maintain statistical significance in the adjusted model (aOR=5.5, 95% CI: 0.9-32.9).

Regarding COVID-19-related factors, significant findings included the impact of self-assessed mental state changes post-COVID-19 infection, which were strongly linked to increased anxiety (cOR=4.1, 95% CI: 2.4-7.0, p<0.001; aOR=3.8, 95% CI: 1.7-8.4, p<0.01). Additionally, the number of COVID-19 vaccine doses received was notably associated with anxiety outcomes; specifically, receiving 3-4 doses was linked to a decrease in anxiety in the adjusted analysis (aOR=0.1, 95% CI: 0.01-0.6, p<0.05), suggesting a potential protective effect (*Supplementary Table 3*).

Detailed analysis of anxiety subtypes

For generalized anxiety disorder, family conflict (cOR=2.8, 95% CI: 1.6-4.9, p<0.001), psychological trauma (cOR=3.3, 95% CI: 1.4-7.4, p<0.01), experienced stigma (cOR=4.8, 95% CI: 1.7-13.6, p<0.01), and frequent internet use (cOR=2.3, 95% CI: 1.3-4.2, p<0.01) were significant predictors in crude models. Urban residency (aOR=2.6, 95% CI: 1.1-6.2, p<0.05) and self-assessed changes in mental state post-COVID-19 (aOR=3.7, 95% CI: 1.6-8.7, p<0.01) also showed significant associations in adjusted models (*Supplementary Table 4*).

For separation anxiety disorder, gender significantly influenced the prevalence, with females more likely to suffer from the disorder in both unadjusted and adjusted analyses (aOR=3.6, 95% CI: 1.9-6.8, p<0.001). Changes in mental state post-COVID-19 were associated with an increased likelihood of separation anxiety (aOR=2.2, 95% CI: 1.1-4.4, p<0.05) (*Supplementary Table 4*).

In the case of social phobia, gender was a significant factor (aOR=3.9, 95% CI: 1.9-8.0, p<0.001), while frequent internet use was noted as a risk factor in the unadjusted model (cOR=2.3, 95% CI: 1.3-3.9, p<0.01). Similarly, the number of COVID-19 infections had a significant correlation in crude analysis for those infected once (cOR=1.7, 95% CI: 1.1-2.6, p<0.05) (*Supplementary Table 4*).

Lastly, school avoidance disorder was prominently affected by age and psychological trauma in both models, with older adolescents and those with a history of trauma showing higher odds of this condition (aOR=7.5, 95% CI: 1.1-52.3, p<0.05). Additionally, self-assessed changes in mental state post-COVID-19 were significantly associated with increased odds of school avoidance (aOR=5.4, 95% CI: 2.1-14.2, p<0.01) (*Supplementary Table 4*).

Mediation analysis

The mediation analysis explored the influence of gender and self-assessed changes in mental health following COVID-19 on depression levels among adolescents using RADS. Participants self-reported any perceived changes in their mental health since the onset of the pandemic, which was used to assess mediation effects (*Supplementary Table 5*).

The direct effect indicates that gender significantly affects depression scores, with females reporting higher levels. The indirect effect of self-assessed mental health changes following COVID-19 also shows a significant impact, enhancing the gender effect on depression. The total effect combines both direct and mediated impacts, demonstrating a significant influence on the depression outcomes of the adolescents studied. Additionally, self-assessed changes in mental health post-COVID-19 were found to mediate 60.8% (95% CI: 37.9 to 83.6) of the total gender effect on depression outcomes.

Discussion

Interpreting the findings: gender disparities in mental health

Our study underscores significant gender disparities in the mental health of Vietnamese adolescents, revealing notably higher rates of anxiety (aOR=4.3, 95% CI: 2.0-9.0, p<0.01) and depression (aOR=5.7, 95% CI: 1.9-17.1, p<0.01) among females compared to males. This observation aligns with a study conducted on Vietnamese university students, although there are important distinctions in the demographic scope of the studies.[20] The university study included older adolescents and reported varying patterns of stress and coping, which were influenced by the unique environmental and developmental challenges faced by this age group. Female university students were found to be more

stressed about online learning [p=0.01, odds ratio (OR)=0.96, 95% CI: 0.93-0.99] and faced more comprehension problems with family (p=0.01, OR=0.94, 95% CI: 0.90-0.98) than their male counterparts.[21] Conversely, male students were more likely to experience verbal or physical abuse/violence/harassment (p<0.01, OR=1.40, 95% CI: 1.27-1.54) and reported more discrimination due to gender (p=0.01, OR=1.15, 95% CI: 1.06-1.26).[20]

Our study specifically targeted adolescents under the age of 18, intentionally excluding older adolescents, such as those aged 18-19 years, who likely experience different mental health challenges due to living arrangements and other developmental factors. This methodological distinction, important for the applicability of diagnostic tools designed for younger adolescents, was highlighted by Erskine *et al*. and might explain some variability in findings between studies focusing on different segments within the adolescent population.[21] Additionally, another study during the COVID outbreak on Vietnamese adolescents, though not using the SCARED and RADS tools as in our study, further confirmed gender as a significant factor influencing negative Social-Emotional Health, with females displaying greater odds of adverse outcomes than males (p=0.03, OR=1.132).[13] These findings underscore the necessity for gender-sensitive mental health interventions tailored to the specific needs of female adolescents. Furthermore, the critical role of age in adolescent mental health studies was emphasized in a rapid review by Roshni Chakraborty and Fiona Samuels (January 2021) on the impact of COVID-19 on adolescent mental health in Vietnam and Tanzania. They highlighted that stress related to examinations and uncertainties about future careers and job opportunities were particularly pronounced among older adolescents (*i.e*., those in or who have just graduated from senior secondary school), significantly contributing to mental ill-being.[2]

Mediation effects of post-pandemic changes on mental health

Our mediation analysis reveals that post-pandemic changes accounted for 60.8% of the impact of gender on depression outcomes (95% CI: 37.9-83.6), highlighting the profound influence of pandemic-induced lifestyle alterations on gender disparities in mental health. This finding underscores an urgent need for targeted interventions that address these factors.

Mediation studies focusing on adolescent mental health are notably sparse. A review in June 2020 surveyed decades of literature and identified only one study that included mediation analysis. This study examined belongingness as a protective factor against the psychological impacts of peer rejection and loneliness among adolescents. Data were gathered from 294 eighth-grade students from a culturally and ethnically diverse school, using peer assessments for peer acceptance and self-reports for other variables. The findings demonstrated that belongingness significantly moderated the effects of peer acceptance on loneliness and, subsequently, on depression, suggesting it is a crucial buffer against these negative impacts. These results are particularly relevant for counseling psychologists working with ethnically diverse populations, indicating that fostering a sense of belonging could mitigate some of the adverse effects of social isolation among adolescents.[22]

Digital engagement and its implications

A rapid review by Roshni Chakraborty and Fiona Samuels (2021) explored the impact of COVID-19 on adolescent mental health in Vietnam and Tanzania.[2] The review highlighted how governments and non-governmental organizations adapted to restrictions by introducing digital interventions, including telehealth, online education, and digital storytelling, which engaged millions of adolescents worldwide.[2] While these interventions offered valuable insights for future strategies, the study also noted a rise in abusive household conditions and online child abuse material in Vietnam, underscoring the need for enhanced services to tackle domestic and online violence.

In our study, with 72.46% of Vietnamese adolescents reporting regular internet use, we observed a complex relationship between digital engagement and mental health. Frequent internet use was associated with higher rates of several anxiety disorders: generalized anxiety disorder (cOR=2.3, 95% CI: 1.3-4.2, p<0.01), social phobia (cOR=2.3, 95% CI: 1.3-3.9, p<0.01), and school avoidance disorder (cOR=2.3, 95% CI: 1.2-4.3, p<0.05). This finding underscores the potential mental health risks associated with high levels of digital consumption among adolescents in Vietnam.

Large-scale studies indicate that light users (<1 hour a day) of digital media report better psychological well-being than heavy users (>5 hours), who experience more negative outcomes like unhappiness and suicidal tendencies.[23] Most existing research is correlational and focuses on adults, leading to mixed findings.[24] Our study aligns with global trends but also reveals unique aspects of the Vietnamese context, where rapid socioeconomic changes may intensify the effects of digital engagement on adolescent mental health. This calls for urgent strategies to balance the benefits and risks of digital usage, ensuring that interventions are culturally appropriate for Vietnamese adolescents in the digital post-pandemic era.

Future directions: enhancing mediation analysis and intervention strategies

Our discussion highlights the urgent need to refine mediation analysis and intervention strategies for adolescent mental health in Vietnam. The findings on gender disparities and the impact of post-pandemic changes call for further investigation into the factors influencing these outcomes. Future research should expand mediation analysis to better understand how gender and other demographic variables affect mental health outcomes after the pandemic.

Our findings illustrate the intricate relationship between digital engagement and mental health, indicating that future research should explore the effects of digital media use on various mental health disorders. In particular, it is essential to investigate the long-term consequences of increased screen time, as our study associates it with elevated anxiety and depression rates among Vietnamese adolescents. Furthermore, research should focus on identifying protective factors that can alleviate these negative impacts and developing targeted digital wellness programs.

Considering Vietnam's distinct socio-cultural context, future studies need to incorporate culturally specific factors, especially regarding how local norms and values influence the effectiveness of digital interventions and mental health services.

Additionally, developing gender-sensitive interventions tailored for adolescents is essential. These interventions should directly address mental health determinants while considering the pathways our study identified. By taking these factors into account, we can create effective mental health support systems suitable for Vietnam's post-pandemic environment and similar contexts globally.

Conclusions

This research identifies significant gender disparities in the mental health effects of the COVID-19 pandemic on Vietnamese adolescents. Changes in mental health after the pandemic accounted for 60.8% of the gender differences in depression. The role of heightened digital engagement, as well as family conflicts and stigma impacting anxiety, underscores the complex interplay of various factors. These findings emphasize the need for tailored mental health interventions to support adolescents during the post-pandemic recovery period effectively.

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