Stress, Anxiety, and Sleep among College and University Students during the COVID-19 Pandemic

Angela K Ulrich[1,2], **Kelsie M Full**[3], **Bethany Cheng**[4], **Katie Gravagna**[4], **Dawn Nederhoff**[3], **Nicole E Basta**[4]

[1]Center for Infectious Disease Research and Policy. University of Minnesota. Minneapolis, MN, USA.

[2]Division of Environmental Health Sciences. School of Public Health. University of Minnesota. Minneapolis, MN, USA.

[3]Division of Epidemiology and Community Health. School of Public Health. University of Minnesota. Minneapolis, MN, USA.

[4]Department of Epidemiology, Biostatistics, and Occupational Health. Faculty of Medicine. McGill University. Montreal, QC, Canada.

Abstract

Objective.—We categorized levels of self-reported stress, anxiety, worry, and sleep among US college and university students during the COVID-19 pandemic.

Methods.—We conducted an anonymous online survey between May 7-June 21, 2020.

Results.—Nearly all participants reported worry about the pandemic. Nearly half (95% CI: 43.3–51.3) reported moderate-to-severe anxiety, and 42% (95% CI: 38.0–45.9) reported experiencing poor sleep quality. Those with moderate-to-severe anxiety were more likely (OR: 3.3; 95% CI: 2.4–4.7) to report poor sleep quality than those with less anxiety. Moderate or extreme worry about the pandemic was associated with poor sleep quality (OR: 1.5; 95% CI: 1.1–2.1).

Conclusions.—Our survey found high levels of stress, worry, anxiety, and poor sleep among US college and university students during the early months of the pandemic. Universities should prioritize access to resources for healthy coping to help students manage anxiety and improve sleep quality as the pandemic continues.

Keywords

COVID-19; anxiety; sleep; university students; college students; stress

Introduction

The COVID-19 pandemic caused significant disruptions in daily life in the United States (US) and around the globe. Physical distancing, quarantine, and stay-at-home orders—all

Corresponding Author: Angela K Ulrich; ulric063@umn.edu, 420 Delaware St SE, MMC 263, C315 Mayo, Minneapolis, MN 55455, (612) 626-6770 (Phone); (612) 626-6783 (Fax).

enacted to slow the spread of SARS-CoV-2—can have profound impacts on physical and psychological well-being, particularly when experienced for extended periods of time.[1] The short- and long-term effects of loneliness and isolation due to mitigation measures, in addition to the stress and anxiety of an infectious disease threat, are yet to be fully understood.

In the US, college students have been uniquely impacted by mitigation measures, with many rapidly transitioning to online education and experiencing disruptions in housing in the spring of 2020. Many managed schoolwork, jobs, and pandemic-associated stress, all while isolated from social networks and peer support. Furthermore, COVID-19 is occurring within the context of an already emerging mental health crisis among US college students. A 2019 report from the American College Health Association (ACHA) found among undergraduate students, a majority felt hopeless, very lonely, or overwhelming anxiety, and nearly half felt so depressed that it was difficult to function.[2]

Prior to COVID-19, stress and anxiety were two of the most commonly reported predictors of poor sleep quality (e.g. trouble falling asleep or maintaining sleep) among college students with one study categorizing 60% as poor-quality sleepers.[3] Traumatic events, like the pandemic, can generate a physiologic stress response which can impact sleep quality and lead to the development of sleep disorders.[4] The reverse is also true as poor sleep and sleep deprivation can lead to an increase in anxiety symptoms.

The aims of this paper are to assess self-reported stress, anxiety, worry, and sleep characteristics in a national convenience sample of US college students during the early months of the COVID-19 pandemic.

Methods

Survey

We conducted an anonymous online survey between May 7th and June 21st, 2020. Survey management and data collection were conducted using Research Electronic Data Capture (REDCap).[5]

Eligibility Criteria and Analytic Sample

Potential participants were made aware of the survey through social media posts (i.e., Twitter and Facebook), email, and word-of-mouth. Individuals were eligible to participate in the survey if they were at least 18 years old and were enrolled as a student at an institution for higher education in the US in March 2020. Respondents were included in this analysis if they answered any of the nine survey questions about stress, anxiety, worry, or sleep.

Stress, Anxiety, and Worry

Respondents self-reported their average level of stress in the past two weeks on a scale of 1 (not stressed at all) to 10 (very stressed), and their ability to manage stress in the past two weeks on a scale of 1(ineffective) to 10(very effective). Participants reported on a 5-point Likert scale how worried they were about the COVID-19 pandemic over the past week. They were asked to select items (multiple items allowed) that caused them to be

very worried, defined as constantly on their mind and keeping them awake at night, from a pre-populated list. The list was developed by the study team and included topics ranging from the health of oneself or of family and friends, physical safety and security, academic and future plans, food security, and financial concerns. Participants also selected (multiple items allowed) from a pre-populated list of strategies they used to cope with the pandemic. The list included examples of adaptive coping (e.g. connecting with friends and/or family virtually or in-person) and mal-adaptive coping (e.g. drinking alcohol or using marijuana). Anxiety was measured using the 7-item Generalized Anxiety Disorder Screener (GAD-7); GAD-7 scores of 5–9, 10–14, and 15 were categorized as mild, moderate, and severe anxiety, respectively.[6]

Sleep Latency, Sleep Disturbances, and Sleep Quality

To characterize sleep, respondents were asked a series of three questions adapted from the Pittsburgh Sleep Quality Index (PSQI).[7] Items represent the PSQI components on sleep latency, sleep disturbances, and subjective sleep quality. Respondents were asked to select the answer that applied to the majority of nights in the past two weeks. The sleep latency question asked how often respondents had trouble sleeping because they could not get to sleep within 30 minutes. The sleep disturbances question asked how often they had trouble staying asleep because they woke up in the middle of the night or early in the morning. The subjective sleep quality question asked how participants would rate their sleep quality; we defined sleep quality as "poor" if their response to this question was "very bad" or "fairly bad".

Statistical Analysis

Proportions and 95% confidence intervals (CI) are described for categorical variables and mean and standard deviations (SD) are reported for continuous variables. We describe the distribution of demographic characteristics, the proportion reporting being moderately or extremely worried about the pandemic, the mean level of self-reported stress and ability to manage stress, the prevalence of various coping strategies, the mean anxiety (GAD-7) scores and the proportion of respondents with mild, moderate, and severe anxiety. We also report the prevalence of poor sleep quality and the prevalence and frequency reporting trouble with sleep latency and trouble with sleep disturbances more than once a week.

We used logistic regression to estimate odds ratios (95% CI) and assess the following relationships: GAD-7 10 (moderate or severe anxiety) and reporting moderate-extreme worry about the COVID-19 pandemic; GAD-7 10 and poor sleep quality; and moderate-extreme worry about the COVID-19 pandemic and poor sleep quality. All logistic regression analyses were adjusted for participant's age (in years, continuous), race (white vs all other races), and sex (male vs female). Statistical analysis was performed using Stata 15.[8]

Institutional Review Board

This study was determined to be exempt by the University of Minnesota and McGill University IRB.

Results

Participants

Of the 651 potential participants who opened the the online survey, N=631 participants are included in this analytic sample. Respondents attended schools in at least 34 different states representing all regions of the country. The median age of respondents is 23.9 years (IQR: 20–26)and 79% are female. Sixty-nine percent identify as white and 18% identify as Hispanic. Forty-three percent are in an undergraduate program, 13% are in an associate's degree program, and 43% are in a graduate or professional degree program. Ninety-one percent reported being a full-time student; 52% attend a public college or university, 28% a private college or university, and 19% a community or junior college.

Stress, Anxiety, and Worry

Nearly all (96%; n=592/616) respondents reported being at least slightly worried about the COVID-19 pandemic with almost half (47%; n=290/616; 95% CI: 0.43–0.51) being either moderately or extremely worried (Table 1). The mean stress level rating was 6.7 (SD: 2.1; range: 1(not at all)-10 (very)). On average, participants reported a score of 5.7 (SD: 2.1; range 1(ineffective)-10(very effective)) in their ability to manage stress.

The most commonly reported factors causing a respondent to be very stressed were worry about future plans (78.7%, 95% CI: 75.3–81.9), academic progress (71.6%, 95% CI:67.9–75.1), and family members or friends (53.1%, 95% CI: 49.1–57.1). The most commonly reported strategies used to cope with the COVID-19 pandemic were text messaging with family and/or friends (77.2%, 95% CI: 73.8–80.5), watching TV, online streaming, video games or movies (75.8%, 95% CI: 72.2–79.1), phone or video calls with family and/or friends (75.5%, 95% CI: 71.9–78.8), and going outside (69.6%, 95% CI: 65.8–73.2). Participants also reported drinking alcohol (27.4%, 95% CI: 23.9–31.1) and using marijuana of any form (15.3%, 95% CI: 12.5–18.3) to cope with the COVID-19 pandemic.

Nearly half (47.3%; 95% CI: 43.3–51.3) reported moderate-severe anxiety. Respondents with moderate-severe anxiety were more likely to report being moderately or extremely worried about the COVID-19 pandemic (OR: 3.3; 95% CI: 2.4–4.7) compared to those with no or mild anxiety (GAD-7<10), adjusted for age, sex, and race.

Sleep Latency, Sleep Disturbances, and Sleep Quality

Sixty percent (95% CI: 55.5–64.4) of respondents reported trouble with sleep latency because they couldn't get to sleep within 30 minutes more than once a week, with over half of those reporting this issue three or more times a week. Nearly half (48.2%, 95% CI:44.2–52.2) reported sleep disturbances or having trouble staying asleep because they woke up in the middle of the night or early morning more than once a week; half of those reported this issue three or more times a week. Forty-two percent (95% CI: 38.0–45.9) of respondents reported poor overall sleep quality.

Respondents with moderate-severe anxiety (GAD 10) were more likely to report poor sleep quality compared to those with GAD-7<10 (OR: 3.3; 95% CI: 2.4–4.7), after adjusting for

age, sex, and race. Respondents who reported being moderately or extremely worried about the COVID-19 pandemic were more likely to report poor sleep quality compared to those who were only somewhat worried, slightly worried, or not worried at all (OR: 1.5; 95% CI: 1.1–2.1), adjusted for age, sex, and race.

Discussion

The COVID-19 pandemic and mitigation measures have significantly impacted the lives of college students. Although both mental health issues and sleep disorders were on the rise in this population,[9] the pandemic experience may exacerbate these issues. We observed nearly all respondents experienced some level of worry about the COVID-19 pandemic and those with moderate-severe anxiety were more likely than those without to report poor sleep quality during the pandemic. A similar theme is emerging from multiple studies conducted among college students regarding increased stress and poor sleep health during the COVID-19 pandemic.[10,11]

Similar to other studies of college students during the early stages of the pandemic, we found high levels of stress and anxiety.[12–14] Those with moderate-severe anxiety were more likely to report being moderately or extremely worried about the COVID-19 pandemic. Self-medication (e.g. alcohol and marijuana) was used by approximately 30% of participants to cope with pandemic-related stress, a finding much higher than reported in other studies conducted around the same time.[13]

While poor sleep quality, sleep disturbances, and anxiety commonly co-occur among college students, our findings suggest worry over the pandemic may add to the already complex relationship between sleep and anxiety in this population. College students in our sample experienced sleep problems, including poor sleep quality, with approximately 60% reporting at least one sleep problem. The prevalence of reported sleep latency, sleep disturbances, and poor sleep quality were slightly higher in our sample compared to studies conducted pre-pandemic.[3,16] Our results tend to agree with other studies reporting a high prevalence of sleep problems during the pandemic.[10,15] However, sleep issues were already common among college students with one study reporting the majority (70%) of college students had chronic sleep deprivation and 40% reported poor sleep quality.[3]

This study is timely given the emerging nature of COVID-19 and the unknown impacts of mitigation strategies on mental health and sleep. One advantage of our study is we drew a sample of students from across various regions of the US, unlike many other studies of US college students conducted during the same time period in a single site.[10,12,13,15] The study is limited by the cross-sectional design, convenience sampling, and the lack of a comparison to pre-pandemic trends among the same participants. Thus, generalizability of our findings and our ability to infer causality between the factors assessed are limited. Limitations also include using one measure of stress and only three of seven items from the PHQI to represent sleep quality, sleep latency, and sleep disturbances, a decision designed to minimize participant burden during the pandemic.

In conclusion, combined with other research findings, our results support the need for colleges to prioritize access to resources for healthy coping to help students manage stress and anxiety as the pandemic continues. One potential strategy would be to deliver internet-based virtual interventions targeting stress reduction shown to be effective in this population,[17] consistent with physical distancing recommendations. Given trends prior to the pandemic, it is likely anxiety and sleep problems have been amplified by the pandemic and will persist well into the future. Thus, future research should consider strategies to best measure short- and long-term impacts of the pandemic and design mitigation interventions to improve mental health and well-being among college students throughout the pandemic and beyond.

Acknowledgments

REFERENCES

1. Kämpfen F, Kohler IV, Ciancio A, de Bruin WB, Maurer J, Kohler H-P Predictors of mental health during the Covid-19 pandemic in the US: Role of economic concerns, health worries and social distancing. PLOS ONE 2020; 15: e0241895.

2. American College Health Association. American College Health Association-National College Health Assessment II: Reference Group Executive Summary Spring 2019. 2019.

3. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep Patterns and Predictors of Disturbed Sleep in a Large Population of College Students. Journal of Adolescent Health 2010; 46: 124–32.

4. Pires GN, Bezerra AG, Tufik S, Andersen ML. Effects of acute sleep deprivation on state anxiety levels: a systematic review and meta-analysis. Sleep Med 2016; 24: 109–18. [PubMed: 27810176]

5. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009; 42: 377–81. [PubMed: 18929686]

6. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med 2006; 166: 1092–7. [PubMed: 16717171]

7. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989; 28: 193–213. [PubMed: 2748771]

8. StataCorp. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC, 2017.

9. ACHA. National College Health Assessment. https://www.acha.org/NCHA/ACHA-NCHA_Data/Publications_and_Reports/NCHA/Data/Reports_ACHA-NCHAIIc.aspx (accessed March 12, 2021).

10. Stress Benham G. and sleep in college students prior to and during the COVID-19 pandemic. Stress Health 2020; published online Dec 14. DOI:10.1002/smi.3016.

11. Zimmermann M, Bledsoe C, Papa A. The Impact of the COVID-19 Pandemic on College Student Mental Health: A Longitudinal Examination of Risk and Protective Factors. 2020; published online June 17. DOI:10.31234/osf.io/2y7hu.

12. Copeland WE, McGinnis E, Bai Y, et al. Impact of COVID-19 Pandemic on College Student Mental Health and Wellness. J Am Acad Child Adolesc Psychiatry 2021; 60: 134–141.e2. [PubMed: 33091568]

13. Wang X, Hegde S, Son C, Keller B, Smith A, Sasangohar F. Investigating Mental Health of US College Students During the COVID-19 Pandemic: Cross-Sectional Survey Study. J Med Internet Res 2020; 22. DOI:10.2196/22817.

14. Browning MHEM, Larson LR, Sharaievska I, et al. Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States. PLOS ONE 2021; 16: e0245327.

15. Wright KP, Linton SK, Withrow D, et al. Sleep in university students prior to and during COVID-19 Stay-at-Home orders. Curr Biol 2020; 30: R797–8. [PubMed: 32693068]

16. Nguyen-Feng VN, Greer CS, Frazier P. Using online interventions to deliver college student mental health resources: Evidence from randomized clinical trials. Psychological Services 2017; 14: 481–9. [PubMed: 29120206]

Table 1.

Prevalence and 95% confidence intervals of anxiety, worry, and sleep quality measures.

	N	Proportion	95% CI
Generalized Anxiety Disorder Screening Score	**622**	**100.0**	
Minimal (GAD-7 = 0–4)	117	18.8%	15.8–22.1
Mild (GAD-7 = 5–9)	211	33.9	30.2–37.8
Moderate (GAD-7 = 10–14)	172	27.7	24.2–31.4
Severe (GAD-7 = 15)	122	19.6	16.6–23.0
Level of worry about the COVID-19 pandemic	**616**	**100.0**	
Not at all worried	24	3.9	2.5–5.7
Slightly worried	103	16.7	13.9–19.9
Somewhat worried	199	32.3	28.6–36.2
Moderately worried	222	36.0	32.2–40.0
Extremely worried	68	11.0	8.7–13.8
Overall sleep quality	**618**	**100.0**	
Very good	44	7.1	5.2–9.4
Fairly good	315	51.0	47.0–55.0
Fairly bad	217	35.1	31.3–39.0
Very bad	42	6.8	4.9–9.1
Trouble sleeping because you cannot get to sleep within 30 minutes	**618**	**100.0**	
Not during the past 2 weeks	144	23.3	20.0–26.8
Less than once a week	100	16.2	13.4–19.3
Once or twice a week	171	27.7	24.2–31.4
Three or more times a week	203	32.9	29.2–36.7
Trouble sleeping because you wake up in the middle of the night or early morning	**618**	**100.0**	
Not during the past 2 weeks	195	31.6	27.9–35.4
Less than once a week	125	20.2	17.1–23.6
Once or twice a week	154	24.9	21.6–28.5
Three or more times a week	144	23.3	20.0–26.8