



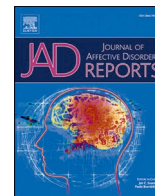
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Research Paper

Limited negative effects of the COVID-19 pandemic on mental health measures of Ghanaian university students

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ABSTRACT

Background: Stress and mental health outcomes are negatively correlated among university students throughout the world. Reports of differences in stress perception by gender exist, but there is limited data on students from sub-Saharan African countries. This study describes the burden of perceived and financial stress; characterizes mood and degree of anxiety symptoms; examines stress coping mechanisms, including resilience and repetitive negative thinking (RNT); and explores how students at a Ghanaian university believed the COVID-19 pandemic affected these measures.

Methods: Students ($n = 129$) were recruited from the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana from October 2020 - January 2021. Validated surveys were used. Participants were asked "Are your answers to the questions affected by the COVID-19 pandemic?"

Results: No differences in mean scores were observed between genders. For female students, financial stress was positively associated with RNT ($p = 0.009$), negative mood ($p = 0.002$), and anxiety ($p < 0.001$). Males were more likely to report decreased stress during the pandemic ($p = 0.002$), but there was no difference in mental health outcomes by perceived stress (PS) change category among males. Effects of the pandemic on mental health outcomes were mixed, but substantial proportions of students reported improvements or no change in financial stress, mood, anxiety, and RNT.

Limitations: Students from one university participated in this cross-sectional survey.

Conclusions: This study adds to the understanding of how higher education students are experiencing stress and are coping with the uncertainties of the COVID-19 pandemic in Ghana.

1. Introduction

High levels of perceived psychological stress and mental health concerns among higher education students are widely reported within individual countries, e.g., (Grøtan et al., 2019; Seedhom et al., 2019) as well as globally (Du et al., 2020), but these studies frequently fail to include the experiences of students in sub-Saharan Africa. In other parts

of the world, high levels of perceived stress are associated with poorer academic (Robotham, 2008; Talib and Zia-ur-Rehman, 2012) and health outcomes (Du et al., 2021b). Whether these relationships extend to students outside of Europe, Asia, and the Americas would benefit from further study.

Studies have identified common stressors among students across multiple countries. In addition to academic stress, financial stress is

Abbreviations: ANOVA, analysis of variance; COVID-19, coronavirus disease 2019; FDR, false discovery rate; GAD-7, Generalized Anxiety Disorder Screener; KNUST, Kwame Nkrumah University of Science and Technology; PANAS, Positive and Negative Affect Schedule; PSS-10, Perceived Stress Scale-10; RNT, repetitive negative thinking; USFSA, University Student Financial Stress Assessment.

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frequently cited (Hyun et al., 2006; Usman and Banu, 2019). While the relationships between financial stress and academic and health outcomes are more variable than those between perceived stress, academics, and health (Jessop et al., 2020; McCloud and Bann, 2019), the reality for many students, regardless of location, is that university attendance is expensive.

Given the previously reported high levels of stress and mental health concerns among higher education students, it is troubling that several studies suggest the COVID-19 pandemic has further increased those concerns for many students (Du et al., 2021b; Husky et al., 2020). However, most of the countries studied were particularly hard hit by the virus in terms of both cases and deaths (World Health Organization, 2021). In contrast, at the time of writing, most sub-Saharan African countries, like Ghana, have reported relatively few COVID-19-related deaths (Roser et al., 2020; Worldometer, 2021). Despite the low reported death toll, there are anecdotal reports from Ghanaians who have tested positive and recovered from COVID-19 that detail social stigmatization and psychological distress (Adom and Adu Mensah, 2020). Understanding how the COVID-19 pandemic has affected Ghanaian students provides a more comprehensive and generalizable understanding of the stresses higher education students face. This understanding can be used to inform responses to future public health emergencies and to develop culturally relevant interventions to improve Ghanaian student outcomes.

The purpose of this study was two-fold. First, we sought to characterize the burden of perceived stress and financial stress, to characterize mood and degree of anxiety symptoms, and to examine stress coping mechanisms among higher education students at a Ghanaian university. Previous reports in other countries suggest that males and females experience stress differently; albeit, these differences are inconsistent across studies (Jia and Loo, 2018; Misigo, 2015). Still, we hypothesized that there would be gender differences in terms of stress, mental health, and coping, and that women would report more negative results for stress, mental health, and coping outcomes. Second, we sought to explore how students believed the COVID-19 pandemic affected the outcome measures (increased, decreased, or no effect).

2. Methods

Undergraduate and postgraduate students who were at least 18 years old were recruited for the study. A total of 129 students were recruited from various departments in the five colleges at the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana. Survey data were collected between October 2020 and January 2021. During this period, the university was closed down with online tuition ongoing due to the COVID-19 pandemic. Informed consent was obtained prior to participation, and the study was approved by the Committee of Human Research Publication and Ethics (CHRPE), School of Medical Sciences, KNUST (CHRPE/AP/389/20).

All data were entered into the Qualtrics (Provo, UT, USA) online survey platform. Demographic information, including gender identity was collected. Male or female were the only choices based on cultural practices. A series of validated tools were used to assess outcomes of interest. These instruments are listed below. After each survey, participants were asked if the COVID-19 pandemic had resulted in an increase, decrease, or no change in the variable of interest. For example, students were asked, "Are your answers to the perceived stress questions affected by the COVID-19 pandemic?" Participants could respond, "During the pandemic, I have less perceived stress than usual", "During the pandemic, I have more perceived stress than usual", or "No change during the pandemic". The study was not designed to diagnose or treat mental illness among participants. However, free-text responses were reviewed for evidence of likelihood of self-harm with the intent to refer to mental health resources. No such responses were noted.

2.1. Perceived stress

The Perceived Stress Scale-10 (PSS-10) was used to determine the level of perceived stress experienced during the past month (Cohen et al., 1983). The PSS-10 uses the following cut-off scores: low (0–13), moderate (14–26), and high (27–40) (Cohen et al., 1983).

2.2. Financial stress

Financial stress was examined using the University Student Financial Stress Assessment (USFSA) tool. This tool was developed for use in an American student population (Lim et al., 2014); however, the questions are relevant to the Ghanaian population. These questions include: "1. I feel stressed about my personal finances in general. 2. I worry about being able to pay monthly expenses. 3. I worry about having enough money to pay for school. 4. How much stress does the total amount of money you owe cause you? 5. How much stress does credit card debt cause you? 6. How much stress does student loan debt cause you?" Available responses for the first three questions range from 1 (strongly disagree) to 4 (strongly agree). Available responses for the remaining questions range from 1 (does not apply/no debt) to 6 (extreme amount). Scores can range from 6 to 30, with higher scores reflecting greater stress.

2.3. Mood

Mood was assessed using the Positive and Negative Affect Schedule (PANAS) (Watson et al., 1988). This validated tool comprises 20 questions, with 10 measuring positive mood and 10 measuring negative mood. Each question is rated on a five-point Likert Scale, for example, "Indicate the extent you have felt this way over the past week – Interested?" Possible responses include: 1 (very slightly or not at all), 2 (a little), 3 (moderate), 4 (quite a bit), and 5 (extremely). The questionnaire reports a positive and a negative score, with higher scores representing higher levels of the affect being measured.

2.4. Anxiety

The Generalized Anxiety Disorder Screener (GAD-7) was used to assess anxiety symptoms over the past two weeks (Spitzer et al., 2006). Cutoff scores of 5, 10, and 15 were used to classify participants as experiencing mild, moderate, or severe anxiety (Spitzer et al., 2006).

2.5. Stress coping mechanisms

Two measures designed to assess reactions to stress were selected. Psychological resilience has been defined in many ways, but the essence of resilience is characterized by the ability to recover from stressful situations (Smith et al., 2008); this construct was measured using the validated Brief Resilience Scale (Smith et al., 2008). In contrast, repetitive negative thinking is a maladaptive stress management strategy characterized by repetitive, uncontrollable thoughts often after stressful events (McEvoy et al., 2010). Repetitive negative thinking is commonly observed in multiple mental health disorders, including depression and generalized anxiety disorder (McEvoy et al., 2010). The Repetitive Negative Thinking Questionnaire was used to measure this construct (McEvoy et al., 2010).

2.6. Data analysis

Data analyses were conducted using IBM SPSS Statistics v. 26 (IBM Corporation, Armonk, NY, USA). Descriptive statistics were used to characterize the study population. Differences between males and females were explored using Independent t-tests for continuous variables. Chi-square tests were used to assess if categorical variable outcomes were associated with gender. When a gender association was identified,

data were presented by gender; otherwise, data were not separated. Pearson product-moment correlations were used to determine if relationships existed between perceived stress scores or financial stress scores and other mental health outcomes. One-way analysis of variance (ANOVA) with Bonferroni corrections was used to determine if mental health outcomes differed based on whether perceived stress or financial stress increased, decreased, or remained the same compared to before COVID-19. Significant results were determined by p-values < 0.05. A false discovery rate (FDR) set at 0.05 was used to correct for multiple comparisons. Data are presented as means ± standard deviations.

3. Results

3.1. Descriptive data

A total of 141 individuals started the survey, and 129 completed responses (55.8% male, 44.2% female) were collected (91.4% response rate). Students spent an average of 48 min completing the survey. The average age was 21.3 ± 2.4 years. More students (n = 41, 31.8%) were third-year students compared to students in other years, and only 15 participants (11.6%) were graduate students. Table 1 lists the stress, mental health, and coping mechanism scores for the total group as well as by gender. There were no differences in scores between males and females after adjustment for FDR. Based on mean scores, both perceived stress and anxiety levels were classified as moderate.

The distribution of perceived stress and anxiety scores were further analyzed based on cut-off scores provided by each tool. The distribution of scores was not associated with gender (p = 0.196 and 0.192, respectively). In terms of perceived stress, the majority of students (n = 90, 69.8%) reported moderate stress levels. Fewer students reported low levels of stress (n = 20, 15.5%) or high levels (n = 19, 14.7%). Most students (n = 100, 77.5%) reported mild anxiety compared to moderate (n = 15, 11.6%) or severe anxiety (n = 14, 10.9%).

3.2. Correlations between stress and mental health by gender

For male participants, perceived stress scores were negatively correlated with resilience scores (r = -0.379, p = 0.001) and positive mood scores (-0.416, p < 0.001), while perceived stress scores were positively correlated with negative mood scores (p = 0.374, p = 0.001), repetitive negative thinking (RNT) scores (r = 0.454, p < 0.001), and general anxiety scores (r = 0.445, p < 0.001). Perceived stress was not associated with financial stress (p = 0.137). Financial stress was not associated with any of the mental health measures (p > 0.05 for all).

For female participants, in terms of perceived stress, the same relationships were significant, but the correlations were stronger. Perceived stress scores were negatively correlated with resilience (r = -0.587, p < 0.001) and positive mood scores (-0.466, p < 0.001), while

Table 1
Stress, mental health, and coping mechanism scores by gender.

Outcome Measured	All(N = 129)	Males(N = 72)	Females(N = 57)	P-value
Perceived Stress	19.8 ± 6.1	19.1 ± 5.7	20.6 ± 6.4	0.155
Financial stress	15.6 ± 4.9	16.3 ± 4.7	14.6 ± 5.0	0.048 [#]
Positive mood	33.5 ± 7.7	34.5 ± 7.3	32.2 ± 8.0	0.094
Negative mood	24.9 ± 8.3	23.5 ± 7.3	26.6 ± 9.2	0.037 [#]
Anxiety	6.7 ± 5.6	6.0 ± 4.8	7.7 ± 6.4	0.102
Coping Mechanism				
Resilience	3.2 ± 0.7	3.3 ± 0.7	3.1 ± 0.8	0.061
Repetitive Negative Thinking	86.9 ± 24.4	83.4 ± 22.3	91.4 ± 26.3	0.064

Mean ± standard deviation (SD) for mental health measures. The p-values are not adjusted for FDR. ([#])Indicates that the p-value was no longer significant after adjusting for FDR.

perceived stress was positively correlated with negative mood (p = 0.587, p < 0.001), RNT (r = 0.558, p < 0.001), and general anxiety scores (r = 0.554, p < 0.001). Perceived stress was not associated with financial stress (p = 0.135); however, financial stress was positively correlated with scores for negative mood (r = 0.401, p = 0.002), RNT (r = 0.343, p = 0.009), and anxiety scores (r = 0.461, p < 0.001).

3.3. Effects of the COVID-19 pandemic on perceived stress, financial stress, resilience, repetitive negative thinking, mood, and anxiety

Based on the male and female participants' responses to how their perceived stress changed during the COVID-19 pandemic, perceived stress change during the pandemic was associated with gender (p = 0.002). Males were more likely to report decreased stress during the pandemic. See Fig. 1A.

Changes in financial stress, mood, anxiety, resilience, and repetitive negative thinking due to the COVID-19 pandemic were not associated with gender. Fewer than 20% of participants reported increased financial stress, anxiety, or RNT as a result of the pandemic (Fig. 1B, D, and F) while more students – nearly one-third – reported decreased financial stress, anxiety, or RNT. The largest proportion of students reported no change in these measures due to the pandemic. Nearly 40% of students reported worsened mood due to the pandemic and nearly 43% reported decreased resilience (Fig. 1C and E). Mood improved for 36% of students and resilience increased for 23%.

3.4. Differences in mental health outcomes according to increased, decreased, or no change in perceived stress due to the pandemic

One-way ANOVA was used to assess whether differences in mental health outcomes were present when students were grouped by perceived stress change category during the pandemic. There was no difference in mental health outcomes by perceived stress change category among males. Among females, students experiencing more perceived stress had higher PSS-10 scores (22.6 ± 6.2) compared to those experiencing lower perceived stress (17.1 ± 4.5; p = 0.017) or no change (14.8 ± 5.3; p = 0.010). There was no difference in PSS-10 scores between those who experienced no change and those who experienced less (p = 0.999). Resilience scores were significantly lower between female students who reported increased perceived stress (2.9 ± 0.8) during the pandemic and those who reported no change (4.0 ± 0.6, p = 0.005), but not between students who reported less perceived stress (3.3 ± 0.3, p = 0.232), and no differences were observed between students who experienced less or no change (p = 0.262). For negative mood scores, female students experiencing more perceived stress had higher scores (29.3 ± 9.1) compared to those experiencing lower stress (21.3 ± 6.4, p = 0.015) or no change (19.2 ± 5.8, p = 0.023), and no differences were observed between students who experienced less or no change (p = 0.999).

3.5. Differences in mental health outcomes according to increased, decreased, or no change in financial stress due to the pandemic

For both males and females, the effect of COVID-19 on financial stress did not lead to differences in mental health outcomes – only differences in financial stress. For males, those who experienced more financial stress had higher financial stress scores than both those who experienced no change (p = 0.011) and those who had less (p < 0.001). There was no difference in scores between those who experienced no change and those who had less (p > 0.999). For females, those who experienced more financial stress had higher financial stress scores than both those who experienced no change (p = 0.002) and those who had less (p = 0.011). There was no difference in scores between those who experienced no change and those who had less (p > 0.999).

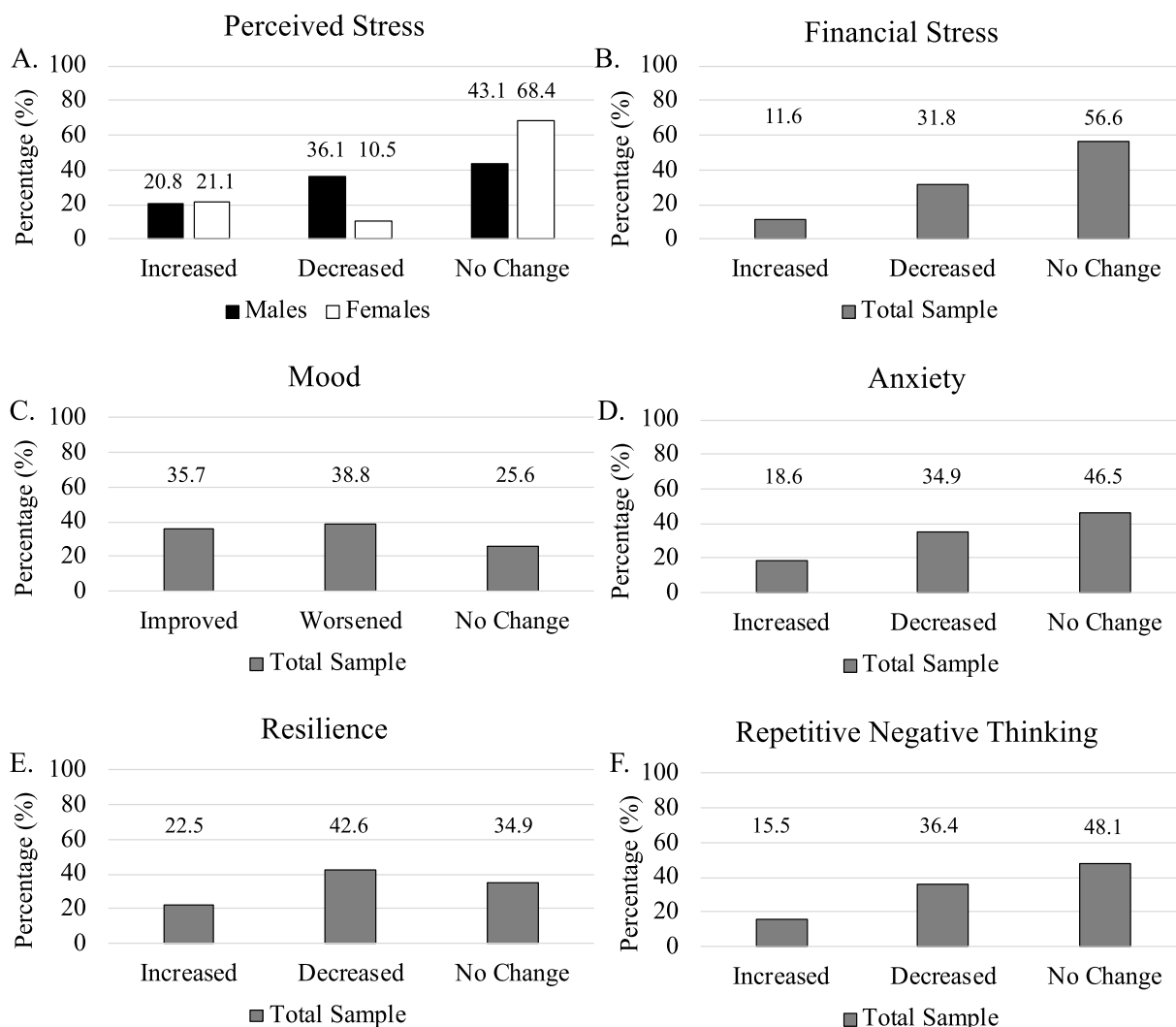


Fig. 1. A-F. Percentage of participants responding to the questions about how the COVID-19 pandemic affected stress, mental health, and coping mechanisms. Only perceived stress was associated with gender.

4. Discussion

The purpose of this study was to describe the burden of perceived and financial stress, to characterize mood and degree of anxiety symptoms, to examine stress coping mechanisms, and to explore how students at a Ghanaian university believed the COVID-19 pandemic affected the outcome measures. Mean values and associations between variables were similar between males and females, which contradicted our hypothesis. However, males were more likely to report decreased stress during the pandemic. While males and females rated financial stress similarly, only among females was financial stress positively associated with repetitive negative thinking, negative mood, and anxiety. Perceived stress was not associated with financial stress for either gender. Most students reported improvements or no change in the measured outcomes as a result of the pandemic. This study adds to the understanding of how higher education students are experiencing stress and are coping with the uncertainties of the COVID-19 pandemic.

The topic of stress among higher education students has been well documented. Our previous work surveyed students in China, Ireland, Malaysia, South Korea, Taiwan, the Netherlands, and the United States in April 2020 at the start of the pandemic and also used the PSS-10 to measure perceived stress (Du et al., 2020). Findings from that study and the current study indicate comparable proportions of students experiencing moderate stress (63.2% in the previous study vs. 69.8% in the

current study). Other studies of Ghanaian undergraduate students that used the PSS-10 reported that 70% of first-year educational psychology students (Amponsah and Owolabi, 2011), 93% of undergraduate students were moderately stressed (Edjah et al., 2020), and 59% of nursing students were moderately or highly stressed (Bam et al., 2014). While stress levels appear to vary somewhat based on the student population's course of study, these findings suggest that, for many higher education students across the world, including Ghana, university life is at least moderately stressful.

Ghanaian students' financial stress scores were also similar to students outside of Ghana. Ghanaian students reported financial stress scores of 15.6 ± 4.9 . A recent study of higher education students in the United States during the COVID-19 pandemic reported financial stress scores of 17.4 ± 5.9 (Du et al., 2021a), or roughly 10% higher. A previous study that conducted focus group discussions about academic stress with Ghanaian undergraduate students noted that many reported financial concerns were a significant source of stress (Adom and Adu Mensah, 2020).

While perceived and financial stress levels reported by students in other countries and Ghanaian students were similar, differences in the effects of the pandemic on stress are apparent. Our previous study (Du et al., 2020) reported that 60.2% of students reported increased perceived stress compared to before the pandemic while approximately 20% of Ghanaian students experienced these increases. Nearly 42% of

students in the previous study (Du et al., 2020) indicated that financial stress had increased; by comparison, only 11.6% of Ghanaian students stated that financial stress increased. Despite the fact that Ghanaian students were engaged in remote learning like their global peers, which has been linked to increased frustration and worry about the future (Özkan et al., 2021; Peloso et al., 2020), there are several differences that could contribute to these pandemic-related disparities. First, the countries previously surveyed were surveyed early on during the pandemic when cases and deaths were high. In contrast, Ghana had reported far fewer deaths than countries like the United States during the time of the survey, e.g. approximately 430,000 vs. 350 (Worldometer, 2021). Second, the cost of higher education in the locations surveyed in the previous study are, in many cases, high enough that students must often go into debt to afford their education (Doan, 2017; Students from Average-Income Households Hit Hardest by Loan System, 2020). In Ghana the situation is different. For students attending public universities, students are expected to pay their Academic Facility User Fee (AFUF), which is a small fraction of the actual fees; hence, most students self-finance their fees with the help of family relations, and most students do not have to go into debt to pay their fees. In summary, the vast majority of Ghanaian students surveyed in this study appear to have experienced no change or improvements in financial stress during the COVID-19 pandemic.

Perceived stress was not associated with financial stress; however, financial stress was positively correlated with scores for negative mood, RNT, and anxiety. The lack of association between perceived and financial stress is likely due to the fact that the PSS-10 does not specifically ask about financial stress. Questions refer to “personal problems”, which could be interpreted to include financial stress but could easily be interpreted as focused on social stressors. The lack of detail makes it difficult to conclude that financial problems would be included by a participant when weighing a response. The associations observed between financial stress and some, but not all, mental health outcomes in this study are consistent with a recent meta-analysis of studies that examined whether there was a relationship between financial stress and mental health among higher education students in the United Kingdom (McCloud and Bann, 2019). In that study, differing indicators of financial stress produced different results. For example, the amount of debt was a less reliable indicator of mental health problems than experiencing financial difficulties, like problems paying bills, or stress surrounding debt issues. Further study on the financial situation of Ghanaian students and how financial stress affects both health and academic outcomes is warranted.

Resilience scores were lower and negative mood scores higher among female students who reported experiencing increased stress during the pandemic. This agrees with previous work indicating that reduced resilience is associated with a decreased ability to manage stress (Luthar et al., 2000). Findings regarding gender differences in resilience are mixed (Iimura and Taku, 2018; Naseem and Munaf, 2020). Discrepancies have been attributed to the age of the participants studied (Naseem and Munaf, 2020). For example, males have been reported to be more resilient during adolescence and early adulthood than females, but differences disappear in older adulthood (Naseem and Munaf, 2020). While others report that stress negatively impacts mood (van Eck et al., 1998), it is also the case that negative affect is an important moderator in one’s response to stress (Bolger and Zuckerman, 1995). Taken together, the findings from this study are largely consistent with previous reports.

While we maintain that most studies exploring university student stress and health outcomes fail to include sub-Saharan African students, there are notable exceptions (Amponsah and Owolabi, 2011; Auerbach et al., 2016; Bam et al., 2014; Edjah et al., 2020; Kamulegeya et al., 2020; Misigo, 2015) where information that included Kenyan, Nigerian, Ugandan, and Ghanaian students has been published. Studies referring to Ghanaian students have been cited throughout this discussion section, but in terms of non-Ghanaian studies, in Kenya, female students

reported higher stress, but a different survey instrument was used (Misigo, 2015). One study surveyed Nigerian students (Auerbach et al., 2016); however, results by country were not listed. In Uganda, of the 1000 students surveyed, 30.5% reported the presence of depression symptoms and 40.8% indicated high levels of academic stress (Kamulegeya et al., 2020). Unfortunately, the tools used to survey the Ugandan students differed from the current study, so direct comparisons are difficult to make. These limited examples demonstrate the need for more studies that recruit students from sub-Saharan African countries.

Characterizing student mental health concerns is an important first step to addressing those concerns. While a relatively small proportion of students reported high levels of stress or anxiety and many did not experience negative changes as a result of the pandemic, for those students who do experience high levels of distress, interventions are warranted. Perceived and financial stress management programs for higher education students have been shown to be effective in managing stress in other countries (Fernandes et al., 2014; Regehr et al., 2013). The development and testing of culturally relevant programs for students in Ghana is an area worthy of future effort. Additionally, students experiencing mental health concerns has increased in many areas of the world during the COVID-19 pandemic (Du et al., 2020; Patsali et al., 2020), straining already meager resources (Prince, 2015; Xiao et al., 2017). Fortunately, experts suggest that strengthening social support systems, for example routine calls or check-ins, can address loneliness and isolation that can contribute to poor mental health (Ng et al., 2020). These types of interventions, that do not necessarily rely on trained practitioners, should be studied in the Ghanaian student population.

This study expands our understanding of stress and mental health measures among Ghanaian university students; however, there are several notable limitations. First, the study was conducted using a convenience sample at one public university in Ghana and, furthermore, given the small sample size may not be representative of the larger Ghanaian student population, so results should be interpreted with caution. Second, this cross-sectional survey was conducted during the COVID-19 pandemic, and while few students reported negative changes resulting from the pandemic, it is possible the responses do not reflect experiences outside of the pandemic. Third, the surveys used were not validated for the Ghanaian student population; however, the PSS-10 is widely used to survey respondents in many countries, e.g., (Adamson et al., 2020) and has been used in Ghanaian higher education students previously (Amponsah and Owolabi, 2011). Finally, the University Student Financial Stress Assessment (Lim et al., 2014) was developed for use in an American student population; however, questions about feeling stressed about finances and worries about being able to pay monthly expenses and school fees are relevant to students worldwide.

5. Conclusions

Somewhat contrary to the findings of other studies of higher education students during the COVID-19 pandemic, substantial proportions of students reported improvements or no change in financial stress, mood, anxiety, and RNT. While overall outcome scores were similar between males and females, small but important differences in the effects of the COVID-19 pandemic were observed. Students in other countries have benefitted from interventions designed to reduce perceived and financial stress (Fernandes et al., 2014; Regehr et al., 2013). An exploration of whether these interventions also work in a Ghanaian student population should be conducted.

CRedit authorship contribution statement

Mary Adjepong: Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision, Project administration. **Felicity Amoah-Agyei:** Conceptualization, Methodology, Investigation, Writing – review & editing. **Chen Du:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – review & editing. **Wenyan Wang:**

Writing – original draft, Writing – review & editing. **Jenifer I. Fenton:** Conceptualization, Methodology, Writing – review & editing. **Robin M. Tucker:** Conceptualization, Methodology, Validation, Formal analysis, Resources, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

All authors declare they have no conflicts of interest.

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Data availability statement

Data are still being analyzed by the research team and are not publicly available at present. Please contact the corresponding author for data requests and more information.

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