

Research Article

Impact of COVID-19 Pandemic on Food Intake, Dietary Behavior, Mental Health, and Academic Performance of a Ghanaian University Students

Clement Kubreziga Kubuga ¹, Mary Amoako ², and Frank Kibikal W. Nyimagnun ¹

¹Nutritional Sciences Department, University for Development Studies, Tamale, Ghana

²Department of Biochemistry and Biotechnology, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Correspondence should be addressed to Clement Kubreziga Kubuga; kubuga@yahoo.com

Received 8 August 2023; Revised 15 October 2023; Accepted 1 November 2023; Published 23 November 2023

Academic Editor: António Raposo

Copyright © 2023 Clement Kubreziga Kubuga et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Students are one vulnerable subgroup that experience a variety of persistent pressures, high levels of stress, and poor mental health due to academic demands. COVID-19 abruptly moved education away from the classroom and mandated that instruction take place either in a small classroom setting or remotely on digital platforms, it added to the already stressed climate. Though it is established that pandemics pose stress and stress affects food intake and academic performance, little has been explored in relation to COVID-19 pandemic induced stress, diet alteration, mental health, and dietary behaviors among university students in Ghana. This study aimed to investigate the impact of COVID-19 pandemic on diet alteration, dietary behavior, mental health, and academic performance among the students of the University for Development Studies. In this cross-sectional study design ($n = 94$), an online survey was conducted among undergraduate students of the University for Development Studies. Data were analyzed using descriptive statistics and logistic regression models. According to the study's findings, all participants had different levels of stress, poor mental health, and problematic eating behaviors. About six out of every 10 students experienced stress induced by COVID-19 pandemic. Nearly half of the students altered their diets due to the COVID-19 pandemic. Majority of the students were also engaged in problematic eating behaviors. Additionally, academic performance of students was heavily influenced: Students who reported worse academic performance were about eight times more likely to be stressed due to COVID-19 pandemic compared to students who reported no change to their academic performance. Our findings suggest that students of UDS experience variety of pressures which were compounded by COVID-19. There is a need for programs that improve stress levels, mental health, and food intake in the university setting.

1. Introduction

Students in the school setting are one vulnerable subgroup that is more likely to experience high levels of stress and mental health issues [1–3], students in particular connected to academic demands [4]. Some studies have shown that pandemics have an impact on students' mental health; they frequently exhibit signs of stress, anxiety, and depression [5]. When COVID-19 abruptly moved education away from the classroom and mandated that instruction take place either in a small classroom setting or remotely on digital platforms [6, 7], it added to the already stressed climate.

The abrupt departure from the traditional classroom methodology entailed additional responsibility. Past studies have shown that academic stress can affect a person's ability to learn, their motivation, their chance of dropping out of school [4], their food choices, and their eating behaviors [1]. The COVID-19 pandemic posed an additional stressor related to academic demands.

Adding to the web of relationships between food consumption and stress, cognitive factors are also known to be altered by stress [8–11]. The Three-Factor Eating Questionnaire (TFEQ) measures three of these factors: restricted, uncontrolled, and emotional eating [12, 13]. Restrained eating is the act of actively avoiding or reducing the

consumption of certain foods [14–16], typically with the goal of losing weight [17]. Restrained eating on the other hand often leads to binge eating [18] because dieting makes people more prone to disinhibition, which can result in overeating [16]. Uncontrolled eating is characterized as lack of control when consuming specific foods, whereas emotional eating refers to an overconsumption of food when feeling negative emotions [19]. These actions raise the likelihood of consuming unhealthy meals [20, 21]. According to other research, those who consume food items that are not healthy have restricted, uncontrolled, and emotional eating [22–24].

COVID-19 pandemic has had a significant impact on some populations through altered eating behaviors [25]. If not checked, poor nutritional choices sustained over extended periods of time will most likely increase the risk of noncommunicable diseases [25]. In some jurisdictions, the pandemic impacted negatively on mental health in various forms [5]. The impact of pandemics on nutrition outcomes and mental health should not therefore be underestimated. Although COVID-19 no longer constitutes a public health emergency of international concern, it is an ongoing health issue. Additionally, research on COVID-19 is needed in the spirit of the Pandemic and All-Hazards Readiness Act to enhance Ghana's public health readiness and response capacities for emergencies, whether planned, unintended, or natural.

Taken together, pandemics pose stress, stress affects food choices and academic performance as reported in other jurisdictions. Yet, little has been explored in relation to COVID-19 pandemic induced stress, food intake, mental health, and dietary behaviors among university students in Ghana. The aim of this study was to investigate the impact of COVID-19 pandemic on food intake (diet alteration), dietary behavior, mental health, and academic performance among the students of the University for Development Studies.

2. Materials and Methods

This research employed a cross-sectional study design among undergraduate students of the University for Development Studies. A total of 94 students responded to an online survey during the lockdown in Ghana. GPower software (version 3.1) was used to calculate the minimal adequate sample size of 75 students with a desired level of power (80%); significance level of 5% (95% CI); desired detectable effect size of 0.3 of COVID-19 relate stress on food intake, dietary behavior, mental health, and academic performance. Key variables were perceived stress, dietary behavior, food intake/diet alteration, academic performance, generalized anxiety disorder (GAD), and demographic variables. Demographics variables (age, gender, year of study, weight, height, and gender) were all self-reported. Weight and height were used to calculate body mass index (BMI) [26]. Perceived stress was assessed by using the Perceived Stress Scale-10 (PSS-10) [27]. Dietary behaviors were examined via the use of the Three-Factor Eating Questionnaire-R18 (TFEQ-R18). The instrument has been previously validated [28, 29].

The questionnaire assesses three elements of eating behaviors: restricted eating (six items), uncontrolled eating (nine

items), and emotional eating (three items) [13, 30]. Restricted eating refers to the purposeful restriction of food intake in order to regulate body weight or to promote weight reduction. Emotional eating is the inability to resist emotional signals, whereas uncontrolled eating is the inclination to eat more than normal due to a loss of control over intake. All questions are answered on a 4-point scale (certainly true, mostly true, largely false, and definitely false), which is then converted to a 0–100 scale by adding together the scale scores for emotional eating, uncontrolled eating, and restricted eating [30].

Diet alteration was self-reported. Students were asked to retrospectively provide information on their food intake. One example question is, “Have you made changes to your diet during the COVID-19 pandemic compared to before the pandemic?” The possible answers include: Yes, healthier than before; yes, less healthy than before; and no, my diet did not change. Another example was, “How have your eating habits changed as a result of the COVID-19 pandemic?”.

Academic performance was also self-reported. A sample question is, “Is your academic performance influenced by the COVID-19 pandemic?” The possible answers include: Yes, my academic performance is worse; Yes, my academic performance is better; No, not really; and I am not sure (indifferent).

Anxiety was the key measure for mental health. In order to evaluate anxiety symptoms during the previous 2 weeks, the Generalized Anxiety Disorder Screener (GAD-7) was utilized [31]. Participants' anxiety levels were classified as low, moderate, or severe using cutoff values of 5, 10, and 15 [31]. For the impact of COVID-19 to be assessed, participants were specifically asked if their answers to the set of questions for each of the respective variables (perceived stress, diet alteration, dietary behavior, mental health, and academic performance) were affected by the COVID-19 pandemic. The research was carried out online. Researchers sent a survey link to students' platforms for recruitment on August 11, 2021 and was closed by October 25, 2021. Before completing an online questionnaire, each participant provided a written consent (via the online questionnaire) to be part of the study. This current work is part of an earlier work which contributed scientific knowledge on COVID-19 related stress and eating behavior among Ghanaian Students during the peak of the COVID-19 pandemic. Because pandemics are unexpected and always a possibility, it is important to constantly be ready for them. This current work is a continuation of our earlier works (from same dataset) aiming to contribute scientific information in the spirit of the Pandemic and All-Hazards Readiness Act to strengthen Ghana's public health preparedness and response capabilities for emergencies, whether planned, unforeseen, or natural. Ethical approval for this study was granted by the Committee on Human Research Publication and Ethics of Kwame Nkrumah University of Science and Technology in Ghana.

3. Statistical Analysis

Data analysis was done with SAS 9.4 software (SAS Institute Inc., Cary, NC, USA). Sociodemographic data, academic performance, diet alteration, eating behavior, perceived stress,

and GAD were all presented using descriptive statistics. Participants were divided into groups based on their scores on the TFEQ's eating behavior subscales using a median split [32, 33]: restricted eating (low RE; high RE), uncontrolled eating (low UE; high UE), and emotional eating (low EE; high EE). Simple logistic regression was used to determine the relationship between eating behaviors, diet alteration, academic performance, mental health, and COVID-19-related stress.

4. Results

The results in Table 1 indicate that majority of the students were less than 25 years old (78%) and had normal BMI (56.6%). All the students had various degrees of stress, most of them experienced moderate stress level (61.0%) and their stress levels were attributed to COVID-19 pandemic (64.9%).

More than half of the students were engaged in high levels of the various eating behaviors: high emotional eating (74.0%), high restricted eating (61.0%), and high uncontrolled eating (64.9%). Nearly half of the students (48.0%) indicated that they changed their diets during the COVID-19 pandemic lockdown as compared to before the lockdown. A good number of the students (33.8%) reported consuming healthier diets during the lockdown while majority (52.0%) of them indicated that they made no changes to their diets. All the students had various degrees of GAD, most of them experienced mild GAD (36.4%), and their GAD levels were attributed to COVID-19 pandemic (57.0%). On academic performance, there was mixed reporting: Majority (44.2%) were indifferent about their performance, relatively good numbers indicated worse (24.7%) and better (16.9%) academic performance, and no change (14.9%) in performance was the lowest category.

In Table 2, we modeled the probability of reporting that experienced stress was due to COVID-19 pandemic across students' dietary behavior, diet alteration, GAD, academic performance, and sociodemographic variables: Students engaged in low uncontrolled eating had 3.59 (95% CI 1.17,11.01) times the odds of being stressed due to COVID-19 pandemic, when compared to students engaged in high uncontrolled eating. Students with mild GAD had 73% lower odds of being stressed due to COVID-19 pandemic when compared to students with severe GAD. Students who reported worse academic performance had 7.56 (95% CI 1.51,37.89) times the odds of being stressed due to COVID-19 pandemic, when compared to students who reported no changes to their academic performance. Diet alteration and sociodemographic variables did not show significant associated risk.

5. Discussion

Our findings showed that every student in the research experienced stress in varying degrees, and that about six out of every 10 students experienced stress induced by COVID-19 pandemic. This finding is similar to earlier studies in China [34–36] and Ghana [37–40]. Collectively, these findings

suggest that COVID-19 pandemic resulted in elevated levels of stress among university students across the globe.

Additionally, the study evaluated the impact of COVID-19 related stress in four dimensions: diet alteration, dietary behavior, mental health, and academic performance among research participants. Nearly half of the students indicated that they altered their diets during the pandemic. Among those who altered their diets, about 70% of them indicated that they consumed healthier diets during the pandemic while the remaining consumed less healthy diets. This finding is in consonance with other studies in Poland [41] and Spain [42] which indicated both positive and negative dietary changes. In this study, the proportion of students who consumed healthier diets far outweighed those that consumed less healthy diets. In the nutrition lens, the temporary impact of the pandemic is positive and if sustained will go a long way to improve the nutritional status of students. It is interesting to note that an earlier study in Ghana [37] reported that COVID-19 pandemic was significantly associated with dietary risk among students which is out of the scope of this paper.

More than half of the students were engaged in high levels of various problematic eating behaviors: emotional, restricted, and uncontrolled eating. This finding is in agreement with a similar study conducted in Normande, France, which indicated sharp rise in problematic eating behaviors among undergraduate students [43]. There was no significant relationship between COVID-19-related stress and eating behaviors except for uncontrolled eating. Unexpectedly, significantly negative relationship was observed in uncontrolled eating: Students engaged in low controlled eating had higher odds of being stressed due to COVID-19 pandemic, when compared to students engaged in high uncontrolled eating. This finding may be due to the higher proportion of the participants (61.0%) who experienced moderate level of stress. Though unexpected, our finding is similar to an Egyptian study [44]. It further suggested that stress could be associated with both, eating less and/or eating more depending on the stressor and other several factors. Contrary to our findings, a study in France among university students indicated significant positive relationship between problematic eating behaviors (binge eating and dietary restriction) and stress during the pandemic [45].

Similar to the findings in stress, every student in the research experienced ill mental health in varying degrees, most of them experienced mild GAD, and their GAD levels were attributed to COVID-19 pandemic. These findings are similar to an earlier study in USA [35] and Ghana [40] which reported mild influence of COVID-19 on mental health. Expectedly, there was a significant relationship between COVID-19-related stress and GAD. Students with mild GAD had 73% lower odds of being stressed due to COVID-19 pandemic when compared to students with severe GAD. Our finding is further buttressed by an earlier study which suggested that higher GAD levels among students were due to the inability to cope well with the challenges that came with COVID-19 [46]. Additionally, another study indicated that COVID-19 pandemic made a significant

TABLE 1: Sociodemographic characteristics, perceived stress, mental health, food intake, and dietary behaviors of Ghanaian university students.

Variable	<i>n</i> (%)
Age	<25
	74 (78.7)
	≥25
	20 (21.3)
Sex	Male
	38 (49.4)
	Female
	39 (50.6)
BMI	Underweight
	13 (17.1)
	Normal
	43 (56.6)
	Overweight
	11 (14.5)
	Obese
	9 (11.8)
Year of study	First
	22 (28.5)
	second
	11 (14.3)
	Third
	18 (23.4)
	Fourth
	16 (20.8)
	Fifth–seventh
	10 (13.0)
Stress level	Low
	1 (1.3)
	Moderate
	47 (61.0)
	High
	29 (37.7)
Stress attributed to COVID-19	Yes
	50 (64.9)
	No
	27 (35.1)
Self-reported stress classification during pandemic	Low
	15 (19.5)
	High
	35 (45.5)
	No change
	27 (35.0)
Eating behaviors	Low emotional eating
	20 (26.0)
	High emotional eating
	57 (74.0)
	Low restricted eating
	30 (39.0)
	High restricted eating
	47 (61.0)
	Low uncontrolled eating
	27 (35.1)
	High uncontrolled eating
	50 (64.9)
GAD	Mild
	28 (36.4)
	Moderate
	25 (32.5)
	Severe
	24 (31.1)
COVID-19 influence on academic performance	Worse
	19 (24.7)
	Better
	13 (16.9)
	Indifferent
	34 (44.2)
	No change
	11 (14.3)
Diet alterations during COVID-19	Healthier
	26 (33.8)
	Less healthier
	11 (14.3)
	No change
	40 (52.0)
Diet alteration due to COVID-19	Altered diet
	37 (48.0)
	No change
	40 (52.0)
GAD attributed to COVID-19	Yes
	44 (57.0)
	No
	33 (43.0)
COVID-19 influenced GAD classification	Less anxiety
	12 (16.0)
	More anxiety
	32 (42.0)
	No change
	33 (43.0)

TABLE 2: Risk of COVID-19 induced stress and its impact on mental health, food intake, and dietary behaviors of Ghanaian university students.

Variable	OR (CI)	P value
Age	<25	1.59 (0.52, 4.90)
	≥25	0.4155
Sex	Male	0.52 (0.20, 1.34)
	Female	0.1734
BMI	Underweight	0.86 (0.24, 3.09)
	Overweight	1.43 (0.33, 6.20)
	Obese	0.67 (0.15, 2.87)
	Normal	0.527
Eating behaviors	Low emotional eating	1.40 (0.47, 4.20)
	High emotional eating	
	Low restricted eating	0.45 (0.17, 1.18)
	High restricted eating	
	Low uncontrolled eating	3.59 (1.17, 11.01)
	High uncontrolled eating	0.0258
GAD	Mild	0.27 (0.08, 0.88)
	Moderate	1.06 (0.29, 3.88)
	Severe	0.0082
Diet alteration due to COVID-19	Healthier	2.01 (0.69, 5.85)
	Less healthier	1.97 (0.45, 8.55)
	No change	0.5379
COVID-19 influence on academic performance	Worse	7.56 (1.51, 37.89)
	Better	2.96 (0.69, 12.70)
	Indifferent	0.74 (0.19, 2.90)
	No change	0.0304
		0.4896
		0.0563

negative impact on mental health among university students [39, 40, 47].

COVID-19 changed education dramatically in Ghana and across the globe, whereby teaching is undertaken either in restricted classroom environment or remotely on digital platforms [6, 7]. Though previous research works indicate that academic-related stress can reduce academic achievement, COVID-19 posed an additional stressor related to academic demands. Yet little is known about its impact on academic performance in Ghana especially in the northern belt of Ghana. In this study, reports on academic performance were mixed with a good number indicating that their performance was negatively influenced by COVID-19. There was a significant relationship between COVID-19-related stress and academic performance. Students who reported worse academic performance had higher odds of being stressed due to COVID-19 pandemic compared to students who reported no change to their academic performance. Our findings are similar to an earlier study which indicated mixed findings and higher odds for decrease academic performance due to the impact of COVID-19 pandemic among university students [48]. Our findings suggest that COVID-19 did not only affect mental health, diet alterations, and eating behaviors but also affect students' academic performances.

This study is not without weaknesses and merits. The strengths of this study include its methodological approach

which measured exposure and outcome variables simultaneously. To the best of the authors' knowledge, this is among the few studies to specifically investigate the impact of COVID-19 pandemic on students' diet alteration, dietary behavior, mental health, and academic performance in Ghana. The study was carried out during the COVID-19 pandemic, a period of increased stress, which provides a distinctive viewpoint. We acknowledge some weaknesses in this study. The study was carried out at one public institution in Ghana using a convenience sample, and given the small sample size, it is possible that it does not accurately reflect the whole student population in Ghana. The scope of this study did not cater for participants who had or experienced COVID-19 infections, though the impact of COVID-19 might have been different for infected students as compared to students who only experienced the stress associated with the pandemic. Additionally, though the age brackets of participants are typical for undergraduate students in the university, the students' age bracket is narrow. As such, the study's findings may not accurately reflect the Ghanaian student population.

6. Conclusion

All the students in this study had various degrees of stress, ill mental health, and problematic eating behaviors. About six

out of every 10 students experienced stress induced by the COVID-19 pandemic. COVID-19 made students to alter their diets, nearly half of the students altered their diets. Majority of the students were also engaged in problematic eating behaviors. Additionally, academic performance of students was heavily influenced: students who reported worse academic performance were about eight times more likely to be stressed due to the COVID-19 pandemic compared to students who reported no change to their academic performance. Our findings suggest that students of UDS experience variety of pressures which were compounded by COVID-19 pandemic. There is a need for programs that improve stress levels, mental health, and food intake in the university setting. Further studies in relation to pandemics and stress levels among university students in Ghana should be conducted in a much larger population for generalization.

Abbreviations

GAD:	Generalized anxiety disorder
TFEQ-R18:	Three-Factor Eating Questionnaire-R18
RE:	Restricted eating
EM:	Emotional eating
UE:	Uncontrolled eating
PSS:	Perceived Stress Scale
COVID-19:	Coronavirus disease 2019.

Data Availability

The datasets used during the current study are available from the corresponding author upon reasonable request.

Ethical Approval

The Committee on Human Research Publication and Ethics of Kwame Nkrumah University of Science and Technology granted research ethics permission (CHRPE/AP/389/20).

Consent

Before completing an online questionnaire, each participant provided a written consent (via the online questionnaire) to be part of the study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

C.K.K. contributed to conceptualization, methodology, formal analysis, writing—review and editing, and supervision. M.A. contributed to writing—review and editing and data collection. F.K.W.N. contributed to writing—draft manuscript and data collection. All authors have read and agreed to the published version of the manuscript.

Acknowledgments

Dr. Robin Tucker's assistance and hosting of the research data are greatly appreciated. The authors also acknowledge Dr. Jenifer Fenton's invaluable assistance. This study received funding from the University for Development Studies, Tamale, Ghana

References

- [1] W. Shen, L. M. Long, C.-H. Shih, and M.-J. Ludy, "A humanities-based explanation for the effects of emotional eating and perceived stress on food choice motives during the COVID-19 pandemic," *Nutrients*, vol. 12, no. 9, Article ID 2712, 2020.
- [2] V. L. Errisuriz, K. E. Pasch, and C. L. Perry, "Perceived stress and dietary choices: the moderating role of stress management," *Eating Behaviors*, vol. 22, pp. 211–216, 2016.
- [3] J. Hunt and D. Eisenberg, "Mental health problems and help-seeking behavior among college students," *Journal of Adolescent Health*, vol. 46, no. 1, pp. 3–10, 2010.
- [4] M. C. Pascoe, S. E. Hetrick, and A. G. Parker, "The impact of stress on students in secondary school and higher education," *International Journal of Adolescence and Youth*, vol. 25, no. 1, pp. 104–112, 2020.
- [5] O. Chandasiri, "The COVID-19: impact on education," *Journal of Asian and African Social Science and Humanities*, vol. 6, no. 2, pp. 37–42, 2020.
- [6] C. Y. Y. Pung, S. T. Tan, S. S. Tan, and C. X. Tan, "Eating behaviors among online learning undergraduates during the COVID-19 pandemic," *International Journal of Environmental Research and Public Health*, vol. 18, no. 23, Article ID 12820, 2021.
- [7] C. Li and F. Lalani, "The COVID-19 pandemic has changed education forever. This is how," 2020, The World Economic Forum COVID Action Platform, <https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/>.
- [8] A. Diggins, C. Woods-Giscombe, and S. Waters, "The association of perceived stress, contextualized stress, and emotional eating with body mass index in college-aged Black women," *Eating Behaviors*, vol. 19, pp. 188–192, 2015.
- [9] C. C. Tan and C. M. Chow, "Stress and emotional eating: the mediating role of eating dysregulation," *Personality and Individual Differences*, vol. 66, pp. 1–4, 2014.
- [10] S. N. Katterman, B. M. Kleinman, M. M. Hood, L. M. Nackers, and J. A. Corsica, "Mindfulness meditation as an intervention for binge eating, emotional eating, and weight loss: a systematic review," *Eating Behaviors*, vol. 15, no. 2, pp. 197–204, 2014.
- [11] Y. H. Yau and M. N. Potenza, "Stress and eating behaviors," *Minerva Endocrinologica*, vol. 38, no. 3, pp. 255–267, 2013.
- [12] S. Anglé, J. Engblom, T. Eriksson et al., "Three factor eating questionnaire-R18 as a measure of cognitive restraint, uncontrolled eating and emotional eating in a sample of young Finnish females," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 6, Article ID 41, 2009.
- [13] B. de Lauzon, R. Monique, D. Valérie et al., "The three-factor eating questionnaire-R18 is able to distinguish among different eating patterns in a general population," *The Journal of Nutrition*, vol. 134, no. 9, pp. 2372–2380, 2004.
- [14] J. Polivy, C. P. Herman, and J. S. Mills, "What is restrained eating and how do we identify it?" *Appetite*, vol. 155, Article ID 104820, 2020.

- [15] C. P. Herman, J. Polivy, C. N. Lank, and T. F. Heatherton, "Anxiety, hunger, and eating behavior," *Journal of Abnormal Psychology*, vol. 96, no. 3, pp. 264–269, 1987.
- [16] J. Polivy and C. P. Herman, "Dieting and bingeing: a causal analysis," *American Psychologist*, vol. 40, no. 2, pp. 193–201, 1985.
- [17] M. R. Lowe and E. I. Kleifield, "Cognitive restraint, weight suppression, and the regulation of eating," *Appetite*, vol. 10, no. 3, pp. 159–168, 1988.
- [18] A. Jansen, C. Nederkoorn, L. van Baak, C. Keirse, R. Guerrieri, and R. Havermans, "High-restrained eaters only overeat when they are also impulsive," *Behaviour Research and Therapy*, vol. 47, no. 2, pp. 105–110, 2009.
- [19] T. Van Strien and M. A. Ouwens, "Effects of distress, alexithymia and impulsivity on eating," *Eating Behaviors*, vol. 8, no. 2, pp. 251–257, 2007.
- [20] C. Keller, C. Hartmann, and M. Siegrist, "The association between dispositional self-control and longitudinal changes in eating behaviors, diet quality, and BMI," *Psychology & Health*, vol. 31, no. 11, pp. 1311–1327, 2016.
- [21] B. de Lauzon-Guillain, A. Basdevant, M. Romon, J. Karlsson, J.-M. Borys, and M. A. Charles, "Is restrained eating a risk factor for weight gain in a general population?" *The American Journal of Clinical Nutrition*, vol. 83, no. 1, pp. 132–138, 2006.
- [22] M. A. Beydoun, "The interplay of gender, mood, and stress hormones in the association between emotional eating and dietary behavior," *The Journal of Nutrition*, vol. 144, no. 8, pp. 1139–1141, 2014.
- [23] N. Michels, I. Sioen, C. Braet et al., "Stress, emotional eating behaviour and dietary patterns in children," *Appetite*, vol. 59, no. 3, pp. 762–769, 2012.
- [24] S. T. Nguyen-Michel, J. B. Unger, and D. Spruijt-Metz, "Dietary correlates of emotional eating in adolescence," *Appetite*, vol. 49, no. 2, pp. 494–499, 2007.
- [25] D. Rodriguez-Leyva and G. N. Pierce, "The impact of nutrition on the COVID-19 pandemic and the impact of the COVID-19 pandemic on nutrition," *Nutrients*, vol. 13, no. 6, Article ID 1752, 2021.
- [26] Centers for Disease Control and Prevention, *National Health and Nutrition Examination Survey (NHANES): Anthropometry Procedures Manual*, pp. 15–16, Centers for Disease Control and Prevention, Atlanta, GA, 2007.
- [27] S. Cohen, T. Kamarck, and R. Mermelstein, "A global measure of perceived stress," *Journal of Health and Social Behavior*, vol. 24, no. 4, pp. 385–396, 1983.
- [28] S.-A. Mostafavi, S. Akhondzadeh, M. R. Mohammadi et al., "The reliability and validity of the persian version of three-factor eating questionnaire-R18 (TFEQ-R18) in overweight and obese females," *Iranian Journal of Psychiatry*, vol. 12, no. 2, pp. 100–108, 2017.
- [29] I. Jáuregui-Lobera, P. García-Cruz, R. Carbonero-Carreño, A. Magallares, and I. Ruiz-Prieto, "Psychometric properties of Spanish version of the three-factor eating questionnaire-R18 (Tfeq-Sp) and its relationship with some eating-and body image-related variables," *Nutrients*, vol. 6, no. 12, pp. 5619–5635, 2014.
- [30] J. Karlsson, L.-O. Persson, L. Sjöström, and M. Sullivan, "Psychometric properties and factor structure of the three-factor eating questionnaire (TFEQ) in obese men and women. Results from the swedish obese subjects (SOS) study," *International Journal of Obesity*, vol. 24, no. 12, pp. 1715–1725, 2000.
- [31] R. L. Spitzer, K. Kroenke, J. B. W. Williams, and B. Löwe, "A brief measure for assessing generalized anxiety disorder: the GAD-7," *Archives of Internal Medicine*, vol. 166, no. 10, pp. 1092–1097, 2006.
- [32] J. Suwalska, K. Kolasiniska, D. Łojko, and P. Bogdański, "Eating behaviors, depressive symptoms and lifestyle in university students in Poland," *Nutrients*, vol. 14, no. 5, Article ID 1106, 2022.
- [33] J. DeCoster, M. Gallucci, and A.-M. R. Iselin, "Best practices for using median splits, artificial categorization, and their continuous alternatives," *Journal of Experimental Psychopathology*, vol. 2, no. 2, pp. 197–209, 2011.
- [34] C. Wang and H. Zhao, "The impact of COVID-19 on anxiety in Chinese university students," *Frontiers in Psychology*, vol. 11, Article ID 1168, 2020.
- [35] C. Son, S. Hegde, A. Smith, X. Wang, and F. Sasangohar, "Effects of COVID-19 on college students' mental health in the United States: interview survey study," *Journal of Medical Internet Research*, vol. 22, no. 9, Article ID e21279, 2020.
- [36] S. Deng, W. Wang, P. Xie, Y. Chao, and J. Zhu, "Perceived severity of COVID-19 and post-pandemic consumption willingness: the roles of boredom and sensation-seeking," *Frontiers in Psychology*, vol. 11, Article ID 567784, 2020.
- [37] M. Amoako, F. Amoah-Agyei, C. Du, J. I. Fenton, and R. M. Tucker, "Emotional eating among Ghanaian university students: associations with physical and mental health measures," *Nutrients*, vol. 15, no. 6, Article ID 1526, 2023.
- [38] C. Du, M. Adjepong, M. C. H. Zan et al., "Gender differences in the relationships between perceived stress, eating behaviors, sleep, dietary risk, and body mass index," *Nutrients*, vol. 14, no. 5, Article ID 1045, 2022.
- [39] M. Amoako, F. Amoah-Agyei, G. O. Mensah et al., "Effects of the COVID-19 pandemic on health behaviors of higher education students in Ghana: a cross-sectional study," *International Journal of Environmental Research and Public Health*, vol. 19, no. 24, Article ID 16442, 2022.
- [40] M. Adjepong, F. Amoah-Agyei, C. Du, W. Wang, J. I. Fenton, and R. M. Tucker, "Limited negative effects of the COVID-19 pandemic on mental health measures of Ghanaian university students," *Journal of Affective Disorders Reports*, vol. 7, Article ID 100306, 2022.
- [41] A. Sidor and P. Rzymiski, "Dietary choices and habits during COVID-19 lockdown: experience from Poland," *Nutrients*, vol. 12, no. 6, Article ID 1657, 2020.
- [42] C. Rodríguez-Pérez, E. Molina-Montes, V. Verardo et al., "Changes in dietary behaviours during the COVID-19 outbreak confinement in the Spanish COVIDiet study," *Nutrients*, vol. 12, no. 6, Article ID 1730, 2020.
- [43] M.-P. Tavoracci, J. Ladner, and P. Déchelotte, "Sharp increase in eating disorders among university students since the COVID-19 pandemic," *Nutrients*, vol. 13, no. 10, Article ID 3415, 2021.
- [44] W. El Ansari and G. Berg-Beckhoff, "Nutritional correlates of perceived stress among university students in Egypt," *International Journal of Environmental Research and Public Health*, vol. 12, no. 11, pp. 14164–14176, 2015.
- [45] V. Flaudias, S. Iceta, O. Zerhouni et al., "COVID-19 pandemic lockdown and problematic eating behaviors in a student population," *Journal of Behavioral Addictions*, vol. 9, no. 3, pp. 826–835, 2020.
- [46] I. Chrikov, K. M. Soria, B. Horgos, and D. Jones-White, *Undergraduate and Graduate Students' Mental Health During the COVID-19 Pandemic*, SERU Consortium, University of California - Berkeley and University of Minnesota, <https://cshe.berkeley.edu/seru-covid-survey-reports>, 2020.

- [47] A. Kecojevic, C. H. Basch, M. Sullivan, and N. K. Davi, "The impact of the COVID-19 epidemic on mental health of undergraduate students in New Jersey, cross-sectional study," *PLOS ONE*, vol. 15, no. 9, Article ID e0239696, 2020.
- [48] L. J. Kimaru, M. A. Habila, N. M. Mantina, D. N. Lopez, and F. Melton, "The impact of COVID-19 on academic performance among college-level students," *Journal of American College Health*, pp. 1–7, 2022.