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Effect of coronavirus on students' food security status: A case of University of Cape Coast, Ghana

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Coronavirus is a novel virus that hit the world starting from developed countries to under-developed countries. Ghana is amongst the countries in Africa that observed some level of confinement by their government leading to the shutdown of various institutions including schools. The resulting impact of the policy saw students being more vulnerable to food insecurity and related issues. This paper examines the effect of Coronavirus on students' food insecurity status at the University of Cape Coast. The research design adopted for this study was the cross-sectional survey design with the University of Cape Coast, Ghana being the study area. A total of 291 students were randomly selected to participate in the study. Structured questionnaire was used for data collection. The findings of the study show that socioeconomic characteristics of students and food insecurity status showed no association. Students rated the extent of the effect of the pandemic as moderate and the major area of academic life affected was the change in the academic calendar. Class attendance was the most perceived effect of the pandemic. Students also reported that they were rarely food insecure. The study further found out that the best predictors of students' food insecurity were age, current level, insurance and employment status. The major challenge faced by students during Coronavirus was difficulties in their academics. This led students to adopt mitigation strategies such as online studies, paying heel to Coronavirus protocols, and self-support to mitigate the pandemic's impact. The study concluded that the academic activities of students of the University of Cape Coast were affected moderately by the pandemic and therefore recommends that the University of Cape Coast should improve its information and communication technology infrastructure to make online classes easier and the school should increase funding opportunity to less privilege students.

Key words: Coronavirus, food security, students, University of Cape Coast, Ghana.

INTRODUCTION

The 1996 World Food Summit defined food security as "a situation that exists when all people, at all times, have

physical, social and economic access to sufficient, safe and nutritious foods that meet their dietary needs and food preferences for a healthy life" (Faridi and Sulphey, 2019). This concept encompasses multiple requirements, including access to food, food availability, and culturally suitable food. Food security is exacerbated by several problems in today's global climate. Despite more food being grown and produced than ever before in this age, enough to feed the entire world's population, its distribution continues to be a challenge, and not all food is culturally appropriate everywhere. Local food availability varies greatly, with the greatest disparity between developed and underdeveloped countries. The main cause of this disparity is the disparity in wealth between these groups (Béné, 2020). However, it must be mentioned that hunger exists in every country, and it frequently occurs along economic and social lines. Individuals and countries who are less fortunate often have less.

On January 20, 2020, coronavirus (COVID-19) disease was declared a public health emergency of international concern by the World Health Organization (Mbugua et al., 2021). COVID-19 appeared in the West African region around March 2020, causing internal and external movement restrictions, which disrupted national and regional food systems leading to a serious impact on the labour market as well as food availability (Reardon et al., 2020). The COVID-19 pandemic is a public health and humanitarian crisis that has jeopardized the food security and nutrition needs of millions of people worldwide. Hundreds of millions of people were already suffering from hunger and malnutrition before the virus, and unless immediate action is taken, we may witness a global food emergency (Bk and Bhandari, 2021). In the long term, if large-scale coordinated action is not taken, the combined effects of COVID-19, as well as corresponding mitigation measures, and the emerging global recession may disrupt the functioning of food systems. Such upheaval has the potential to have far-reaching consequences for health and nutrition on a scale not seen in more than a half-century (Rwigema, 2021). Since April 2020, the Nutrition Department of the Ghana Health Service (GHS) and the Ministry of Food and Agriculture (MoFA) through the Statistics, Research and Information Directorate (SRID) have been working with UNICEF and United Nations World Food Programme (WFP) to improve the countries capacity to monitor food and nutrition security at the household level, as well as food commodity prices, in 32 districts in 16 regions (Okyere and Ahene-Codjoe, 2021). This is being done to assess the impact of the COVID-19 pandemic on food prices.

Studies done in the USA for example Wolfson and Leung (2020) study on food insecurity and COVID-19 disparities in early effects for US adults revealed that the food insecurity of low-income households increased by 44% during the period of the pandemic. Ahn and Norwood (2021) added that the deterioration in the financial status of households likely has increased food insecurity. They revealed that during the early stages of the pandemic, food insecurity in households with children increased by 3%. The translating effect was a 50% increase in food pantry services rendered to poor households. During the COVID-19 period, Australia, one of the world's most food secure countries, experienced unprecedented levels of food shortage (Rasul, 2021). Similar shortage has been reported by International food agencies like FAO during the period. These shortages have led to the destabilization of food supply, availability, and a general rise in prices of basic food commodities. The effect according to O'Kane (2020), saw a 4 to 10% increase in food insecurity and a more than 83% increase for disadvantaged populations. In his report, food insecurity hikes were blamed on unemployment, poverty, social isolation, low educational levels, food literacy, and time. In Mexico, Gaitán-Rossi et al. (2021) reported that the effect of the pandemic led to the worsening of the food security status of households already vulnerable prior to the pandemic. Households with children saw a 52.27% in food insecurity in Mexico during the period. Similarly, studies by Manfrinato et al. (2021) in Brazil on the impact of COVID-19 and food insecurity revealed that between March 27 and June 2020, 39% of households had already skipped a meal, 89% had uncertainty in accessing food, and 47% severely food insecure. This demonstrates that COVID-19 has an impact on food security not only a regional issue but global. For West Africa, works by Zidouemba et al. (2020) and Lynda et al. (2020) in Nigeria and Burkina Faso revealed a worsening food situation in West Africa. The impact of the pandemic has led to food deficits among households. This they attributed to food price hikes, decrease household incomes, and remittances. They concluded that the pandemic's impact on food security could last for the next 10 years.

Control or mitigation measures for COVID-19 outbreaks are already wreaking havoc on the world's food supply chains (Tasnim et al., 2020). Harvests are being slowed in some areas of the world due to lockdowns and border restrictions, leaving millions of seasonal workers without work and limiting food transport to markets. Africa's GDP growth rate is likely to drop, according to the United Nations Economic Commission for Africa (UNECA), from 3.2 to 1.8% (Bisong et al., 2020). This in Africa confirms the likelihood of a significant and distressing increase in the number of people living in extreme poverty and famine. The effect of the pandemic has led to governments adopting various strategies to reduce food insecurity at the household level. For countries such as Australia and USA, the government has introduced stimulus packages such as the Job seeker allowance, other social security benefits, and an increase in charity to cushion the food security needs of the most vulnerable in societies. Other measures adopted by other non-African countries to cushion their citizens included tax

relief, price restrictions on essential food items, and an increase in food pantry outlets (Owen et al., 2020; Gundersen et al., 2021). However, in Africa like Ghana, most COVID-19 hit areas were given one free meal per day, tax relief to the non-formal sector, and payment of salaries of formal sectors (Afriyie et al., 2020).

Student food insecurity has been an issue for most governments prior to the outbreak of COVID-19. Works by Bruening et al. (2017) and Knol et al. (2009) revealed that students staying on campuses have a high level of food insecurity than student households not residing on campuses and are mostly younger (Hagedorn and Olfert, 2018). Owen et al. (2020) also added that in the USA, black or Hispanic students, low income earners, students receiving benefits, and unemployed stand a high chance of being food insecure. Mental health difficulties, low nutritional quality, and poor academic achievements are all consequences of food insecurity for these students. The pandemic has worsened the already existing impact of student food insecurity as the gap between student households and non-student households further widen (Christensen et al., 2021). This Owen et al. (2020) attributed largely to students working in the service sector, which had the largest lay-off. Also, students in the USA for example are not qualified for federal food assistance programs, which most has been observed to reduce food insecurity in poor neighbours. Again, students in most countries were neglected for COVID-19 stimulus packages on the concept that students were dependent on parents. The implication of the concept has made stay-only students more food insecure than ever in most countries including Africa. For countries, which provide students with meals, the closure of schools made students even more vulnerable to food insecurity and its harsh consequences.

The education sector has equally had its first share of the challenges of the pandemic. According to Arora and Srinivasan (2020), the major areas of education affected by the pandemic include public financing of education at all levels, exchange programs, a reduction in contact time, class setting difficulties, continuity in student learning, and teachers' readiness to assist students with digital learning. The pandemic has had an estimated 94% impact on students globally, according to Upoalkpajor and Upoalkpajor (2021). Similarly, Azevedo et al. (2021) reported that the pandemic has given rise to learning losses and widened the education inequality faced by nations. Low and middle-income countries were the hardest hit. For these countries according to McCoy et al. (2021), the resulting impact of the pandemic is the widening income, health, and education gaps. The restrictions placed by most government have reduced the income earned by parents leading to nutritional, health, and food security challenges for students, especially in sub-Saharan Africa.

For students in Ghana, the effect of coronavirus has led to the closure of schools at all levels. This was in an attempt by the government to stop the transmission of the virus among students. The effect of the government policy to close down schools led to a disruption of the academic calendar, and a loss of jobs for traders and student workers. Measures introduced by the government during the pandemic period to help University students complete the academic calendar were the introduction of online classes and the return of students in batches at the latter stage of the pandemic. These policies by the government affected students' academic work as well as their food security status. A study by Asanov et al. (2021) revealed that 72% of public school children at the basic level had their food security status worsen by 30% due to a break in the school feeding program, which offers school children lunches. The report further emphasised that the situation has led to unequal access to education in the country with few-privileged students enjoying online classes. The major challenge discovered shows that despite the effect of the pandemic being moderately high in tertiary institutions, mainly due to student access to mobile devices like mobile phones and computers, the pandemic exposed the income inequality among students. An estimated 80% of students did not have enough internet connection to access online educational services like online classes and materials (Mishra et al., 2020).

Most work done on food insecurity and coronavirus among students in Ghana was done at the basic level to find out how basic school children are coping in the absence of a school feeding program. Others also looked at the effect of the pandemic on the academics of second-cycle institutions. Analytically, these studies used only descriptive statistics in their analyses. The limitation of their approach was their studies did not report on the factors responsible for students' food insecurity. This study uses the multivariate regression approach. The advantage of the multivariate regression approach is the fact that the approach provides the research with a good degree to which multiple dependent variables can be measured against independent variables and conclusions drawn to have a high level of accuracy. This study seeks to examine the effect of coronavirus on students' food insecurity status at the tertiary level. Core to this study's objectives are to (a) examine students' awareness level of COVID-19, (b) students perceived effect of COVID-19 on academic performance, (c) food insecurity status of students during COVID-19, (d) determine the best predictors of extent of food insecurity among students, (e) challenges faced by students during COVID-19, (f) identify mitigation strategies adopted by students during COVID-19.

This research will add to the increasing body of knowledge about COVID-19 and student food insecurity. The study will also further help policy makers to understand issues of food insecurity at the tertiary level and the need to improve stimulus packages like student relief funds, research allowance, and scholarship

opportunities to help cushion tertiary students. Universities will gain from this research by understanding how pandemics affect students and the areas authorities should pay more attention to during such periods. Also, the study is an opportunity for Ministries of Education and universities to increase student support services and also introduce feeding programs at tertiary levels to improve student dietary needs.

Research hypothesis

H_0: there is no association between socioeconomic characteristics of students and food insecurity status during COVID-19.

MATERIALS AND METHODS

Research design

The study drawing inference about the population of the study (students), used a cross-sectional survey design due to data being collected just once. The choice of cross-sectional survey design was to allow the overall structure of the research (data) to fit a quantitative research technique of data collection. For this research, the use of the cross-sectional survey allowed for the data to be observed paving way for the use of models to be generated for relationships among the variables of the study.

Study area

The University of Cape Coast is the study area for this study. The University of Cape Coast is one of 15 public universities in Ghana. It is located in Cape Coast, Ghana. The university is situated on a hill overlooking the Atlantic Ocean. The location of the school put it a few kilometers from Elmina and Cape Coast Castle, which are two important historic sit in Ghana. The university is the third university established in Ghana by Dr. Kwame Nkrumah in 1962 to produce highly skilled manpower for the education sector. The school obtained full independence from the University of Ghana in 1971 through an act of parliament. The school has two campuses namely an old site and a new site. The school has a total population of 74,720 students across six colleges. The colleges are made of different faculties, schools, and departments. The recent Times Higher Education 2022 world ranking placed the university as the number one university in Ghana.

Sampling procedure

The method of sampling used in the study was the simple random sampling technique. The simple random sampling was used after the Yamane formula was used to find out the corresponding sample size for a population of 74,720. The formula is specified as:

$$n = \frac{N}{1+Ne^2}$$

$$n = \frac{74720}{1+74720\,(0.05)^2}$$

$$n = 398$$

However, due to COVID-19 related restriction, financial and time constraints, only 291 out of the estimated 398 students were used for the study representing 73.1% (291/398×100). According to Rahi (2017), a sample size between 30 and 500 at a 5% confidence level is considered acceptable for quantitative analyses. This is further supported by Baruch and Holtom (2008) in "survey response rate levels and trends in organizational research". They stated that the rate of response for studies which involves the collection of data from individual requires at least 52.7%. Therefore, the sample size of 291 used for this study is deemed acceptable.

Data collection

The data for the study was collected using a structured questionnaire. The data collection instrument was divided into three (3) parts: section one looked at the background characteristics of students. The variables captured in this section include the age of students, gender of students, marital status, religious affiliation, current level, source of income, parent occupation and educational level, and monthly income received. Section two looked at the perception of students on the effect of the pandemic on academic performance. The third section dealt with students' awareness of COVID-19, while the fourth section examined their food insecurity status using the household food insecurity access scale indicator. The fifth section focused on the challenges that students faced during the pandemic, and the final section focused on the mitigation strategies that students used to mitigate the effects of the pandemic. Data collection was carried out on 25th October, 2020 to 1st November, 2020.

Data analysis

Microsoft Excel was used to store and clear the obtained data. The stored data were analysed using SPSS 26.0 and STATA 13. Analyses of the data were based on objectives. The first objective on awareness of students on COVID-19 was analysed using bar charts and pie chart. The second part of the data on the perception of students was analysed using Kendall's coefficient of concordance, minimum, maximum, mean, and standard deviation. The third objective on the food insecurity status of students was analysed using descriptive statistics. The fourth objective (best predictors of food insecurity) was analysed using multivariate regression. The challenges faced by students during COVID-19 (objective 5) and mitigation strategies adopted by students (objective 6) were analysed using graphs.

Model specification

Kendall's coefficient of concordance

Kendall's W is a non-parametric statistic that is used to normalize Friedman test data. Kendall's W is also known as Kendall's coefficient of concordance. The Kendall's W value ranges between 0 and 1 showing level of agreement. Kendall's coefficient of concordance model makes no assumptions about the probability distribution's nature. This enables it to deal with a wide range of different outcomes. The model can be specified mathematically as:

$$W = \frac{12s}{p^2(n^3-n)-pT} \tag{1}$$

where T = tied rank correction factor, S = the sum of squares from

Table 1. Statistics description.

Variable		Measurement unit	Proposed direction	Mean ± SD
Regressand	Extent of food insecurity	Rarely Sometimes Often		
Regressors	Age	Years	-	23.04±2.98
	Gender	1-Male 0-Female	-/+	
	Marital Status (MS)	1-Married, 0-Others	-	
	Religion	1-Christian, 0-Others	+/-	
	Years of formal education	Years	-	16.58±2.92
	Current level (Clevel)	1-Level 100, 0-Others	-	
	Employment status (Estatus)	1-Unemployed, 0-Employed	-	
	Source of income (Ysource)	1-Own, 0-Others	-	
	Occupation of mother (Mumocc)	1-Public sector, 0-Others	-	
	Occupation of father (Dadocc)	1-Public sector, 0-Others	-	
	Mother's education (Mumedu)	1-Attend school 0-Did not	-	
	Father's education (Dadedu)	1-Attend school 0-Did not	-	
	Household size (HHZ)	Number of people a roof	+	6.16±3.12
	Average income(Income)	In Ghana cedis	-	371.63±360.86
	Further education	1-Yes, 0-No	-	
	Scholarship	1-Yes, 0-No	-	
	Insurance	1-Yes, 0-No	-	

Source: Author Construct (2021).

each row equals the sum of ranks R_i, p=number of judges, and n=number of objects.
Therefore,

$$S = \sum_{i-1}^{n}(R_i - \bar{R})^2 \quad (2)$$

$$T = \sum_{k-1}^{m}(t_k^3 - t_k) \quad (3)$$

where t_k = the number of tied ranks in each k of m group and m = number of groups.

Multivariate regression

Multivariate regression is governed by multivariate statistics principles, which are used to address situations where multiple measurements are to be made on each dependent unit. Multivariate regression tends to determine how dependent variables respond simultaneously to changes in independent variables. The multivariate regression used in this paper is specified as:

Model 1: Y (Rare) $= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$ (4)

Model 2: Y (Sometimes) $= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$ (5)

Model 3: Y (Often) $= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$ (6)

The independent variables $(x_1 \dots x_n)$ are specified in Tables 1

and 2.

RESULTS AND DISCUSSION

Relationship between socio-economic characteristics and food insecurity

Table 3 reveals the cross-tabulated results of students' socioeconomic characteristics as against their food insecurity status. The result shows that gender, current level, source of income, employment status, and household size of students were revealed to have no association with food insecurity status.

From Table 3, it was revealed that males were more food insecure compared to females. This could be attributed to male students being more likely to purchase food outside than cook. With the COVID restriction like restricted movement and high pricing of food commodities on campus, such students stand a higher chance of seeing their food security status fall. This is inconsistent with Niles et al. (2020) and Van Woerden et al. (2019) and research which found female students were more likely to be food insecure than males. To them, females stand a higher chance of being food insecure due to income disparities, and social and cultural norms, which hail males over females.

Table 2. Interpretation of household food insecurity access scale indicator.

Occurrence question	Interpretation
HFIASI1	Did you worry about running out of food in the last four weeks?
HFIASI2	Due to a shortage of resources, have you been unable to consume the meals you prefer in the last four weeks?
HFIASI3	Due to a shortage of resources, did you have to eat a limited variety of foods in the last four weeks?
HFIASI4	Did you have to eat meals you did not want to eat because there was not enough food in the last four weeks?
HFIASI5	In the recent four weeks, did you have to eat a smaller meal than you felt you required because there was no enough food?
HFIASI6	In the last four weeks, did you have to eat fewer meals per day due to a lack of food?
HFIASI7	Was there been a time in the last four weeks you did not have enough food to eat due to a lack of resources?
HFIASI8	Have you gone to bed hungry in the last four weeks due to a lack of food?
HFIASI9	Have you gone a day or night without eating in the last four weeks because you did not have enough food?

Source: Author Construct (2021).

On the current level of students as against food insecurity status of students, it was reported students in level 100 were more food secure compared to the other levels. This could be attributed to level 100 students having fewer expenses because they do not pay utility bills and accommodation is subsided by the University.

This study's findings are in line with Sackey et al. (2021) and Martin and Dwyer (2021) found that continuing students were predisposed to be food insecure as a result of accumulated debt from student loans and other sources used to finance various student-related expenses.

Furthermore, Table 3 shows that students who obtain income from other sources other than their own money tend to be food insecure. This is because students who obtain money from multiple sources tend to have an inconsistent supply of money to spend on food relative to others who work to get incomes to feed themselves. On the employment status of students as against food insecurity status of students, it was reported that unemployed students were more food insecure because their major source of funding was from their parents and other relatives, which is often not regular. The finding on the income source of students and employment status is in line with Owen et al. (2020) and Bridgman et al. (2020) who revealed that due to lay-offs and other industrial unrest students who are unemployed and dependent on other people's incomes tend to be more food insecure due to the inability of givers mostly parent to remit such students funds. Lastly, Table 3 shows that students who had a family size being less than 12 members were predisposed to be food insecure. This contradicts the fact that individual share of household resources in larger household's amounts to each person gaining a small portion of the total resource. The findings of this research contradict the study by El Zein et al. (2019) that students who have their household size (family size) to be large are predisposed to experience food insecurity compared to smaller households. This is due to the per person share of household income being higher in smaller households than larger households.

Therefore, the null hypothesis of no association between socioeconomic characteristics of students and food insecurity is accepted.

Awareness of COVID-19

Heard of COVID-19

Figure 1 shows that majority of students used for the study have heard of COVID-19 (97%). This was due to students' access to information mainly from the media and the school COVID-19 campaign aimed at educating students on COVID-19 protocols. The school also adopted restrictive measures like students wearing nose masks before entering institutional, social, and religious facilities. This drew students' attention to the pandemic. A similar study by Alali et al. (2021) and Alheneidi et al. (2021) in Kuwait Universities revealed that 54% of students had heard of COVID-19. In the same study, the major source of information was social media.

Affected by COVID-19

The result in Figure 2 showed that most students were unaffected by the pandemic (70%). This was attributed to them taking the necessary COVID-19

Table 3. Relationship between socioeconomic characteristics and food insecurity.

Socioeconomic variable	Food security		Chi-square
	Yes	No	
Gender			0.740
Male	71	89	
Female	47	64	
Current level			0.603
100	24	23	
200	34	38	
300	41	59	
400	18	27	
Postgraduate	1	6	
Source of income			0.246
Own	4	10	
Others	114	143	
Employment status			0.251
Unemployed	97	117	
Employed	21	36	
Household size			0.200
2-12	112	149	
13-25	3	3	
>25	1	0	

n= 291.
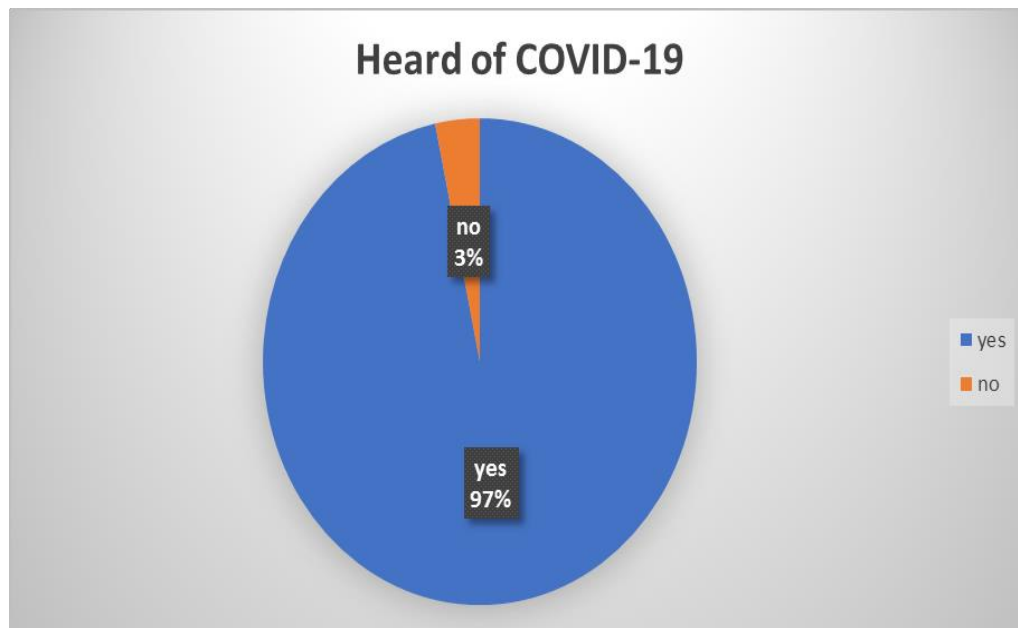Source: Omega Field Survey (2021).

Figure 1. Heard of COVID-19; n= 291.
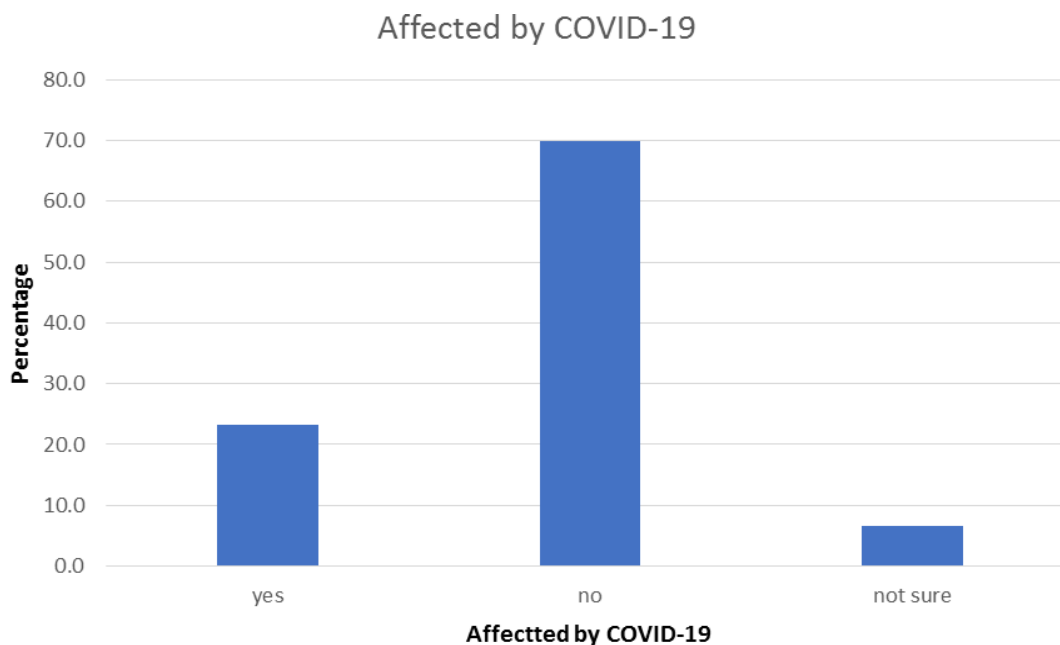Source: Omega, Field Survey (2021).

Figure 2. Affected by COVID-19; n= 291.
Source: Omega, Field Survey (2021).

protocols as advocated by the school COVID-19 campaign in addition to information from the media. This indicates that complying with COVID protocols reduces the possible effect of the virus on individuals. The study result is consistent with Ye et al. (2020) and Owen et al. (2020) who also found out that the majority of students were not affected by COVID-19 due to measures undertaken by the government and social support systems put in place by schools.

COVID-19 and students' life

From Figure 3, it was revealed that the majority of students had their student life affected by COVID-19 (80%). This shows that the COVID-19 effect is not only a macro concept but also has an effect on micro individuals like students. For example, level 400 students were concerned about graduating and national services. A similar study by Doolan et al. (2021) and Cardenas (2021) revealed that indeed students' lives have been affected by the pandemic's emergence. The pandemic according to students has distorted their social interaction, academics, and student routine. The level of effect on students' life according to the European Students' Union was uneven across countries and tertiary institutions.

Extent of COVID-19 effect on students' life

Figure 4 looks at the extent of the effect as reported in

Figure 3. It reveals that despite the majority of students reporting that COVID-19 has affected them, the majority in Figure 4 said the effect was moderate (58%). The universities' decision to embrace alternate strategies such as online lectures, free internet packages, students returning in batches with last year's first, and financial aid to international students could be ascribed to the pandemic's minimal impact on students' lives. This study's conclusions contrast those of Aristovnik et al. (2021) report on COVID-19's influence on students' lives, which found that COVID-19 has had a significant impact on students' lives, particularly at the tertiary level. In their studies, they found out that the main effect was students' inability to have personal contact hours with lecturers, internet instability, and the psychological burden of losing loved ones whiles studying.

Area of students' life affected by COVID-19

In the area of students' life affected by the pandemic, it was revealed in Figure 5 that the majority of students reported that the pandemic has affected their academic calendar (30%) with examination, instructional period, and movement being the least affected (3%). This study's findings are consistent with those of Alghamdi et al. (2021) and Khoshaim et al. (2020), studies on Saudi University students, showing that the impact of COVID-19 on students was not just academic but also on social, religious, and environmental. However, they further added that the academic effect was high than the other aspects. The academic aspect was in terms of
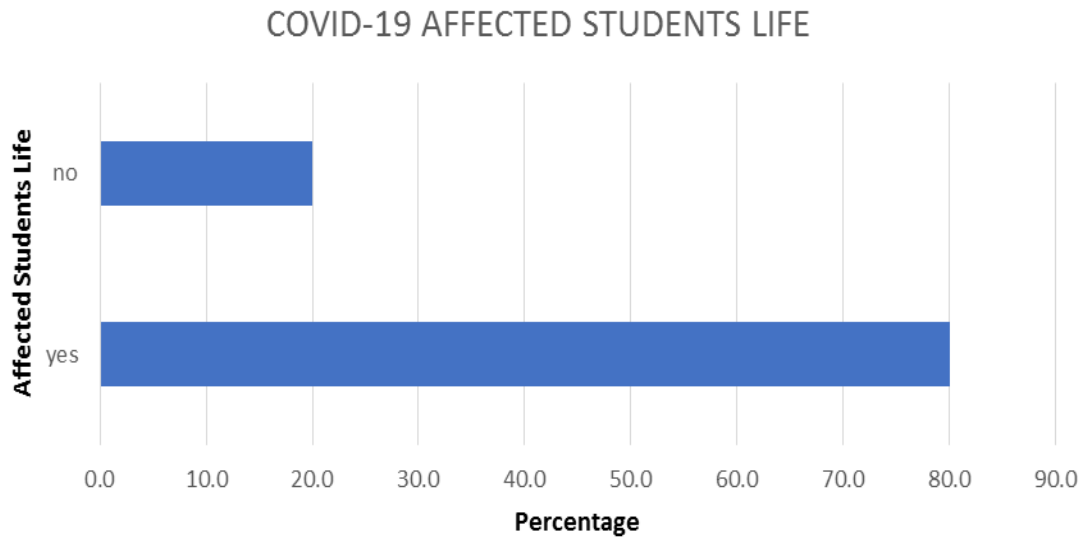
COVID-19 AFFECTED STUDENTS LIFE

Figure 3. COVID-19 and Students' Life; n= 291.
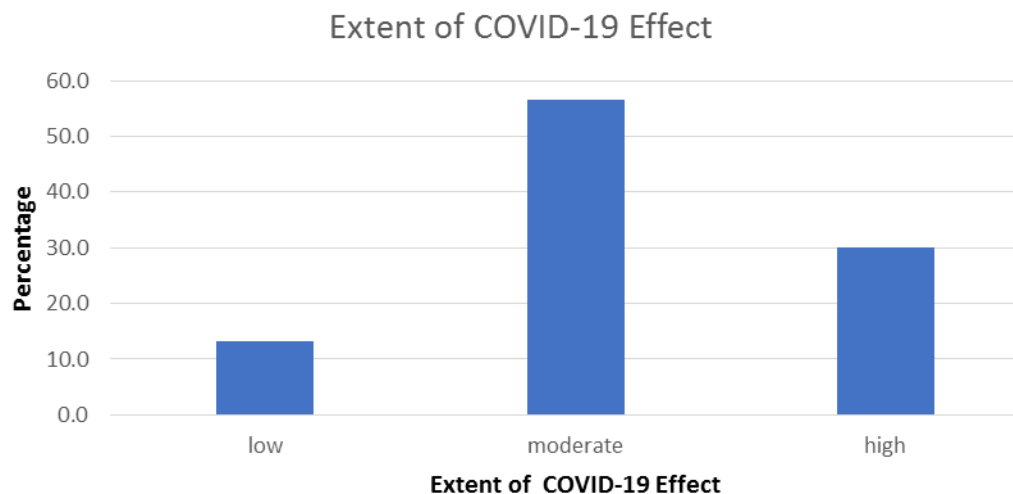Source: Omega, Field Survey (2021).

Extent of COVID-19 Effect

Figure 4. Extent of COVID-19 effect on students' life; n= 291.
Source: Omega, Field Survey (2021).

inconsistency in the educational system.

Students perceived effect of COVID-19 on academic performance

From Table 4, the model summary shows that there is a 4.5% level of agreement among students concerning the perceived effect of COVID-19 on their academic performance. The overall mean (3.78) indicates that the majority of students agreed that their academic performance was affected by the pandemic.

COVID-19 had a significant impact on students' class attendance (Mean rank= 4.10), according to the results on the perceived effect of COVID-19 on academic performance. This could be attributed to the difficulty students faced in accessing class online due to lack of access to internet devices and internet connectivity challenges. The result of this study agrees with Hashemi (2021) whose study in Afghanistan revealed that the majority of Afghan students were affected by COVID-19 in terms of class attendance both in-person and online. This he attributed to poor internet access, internet disparity between urban and rural students, students
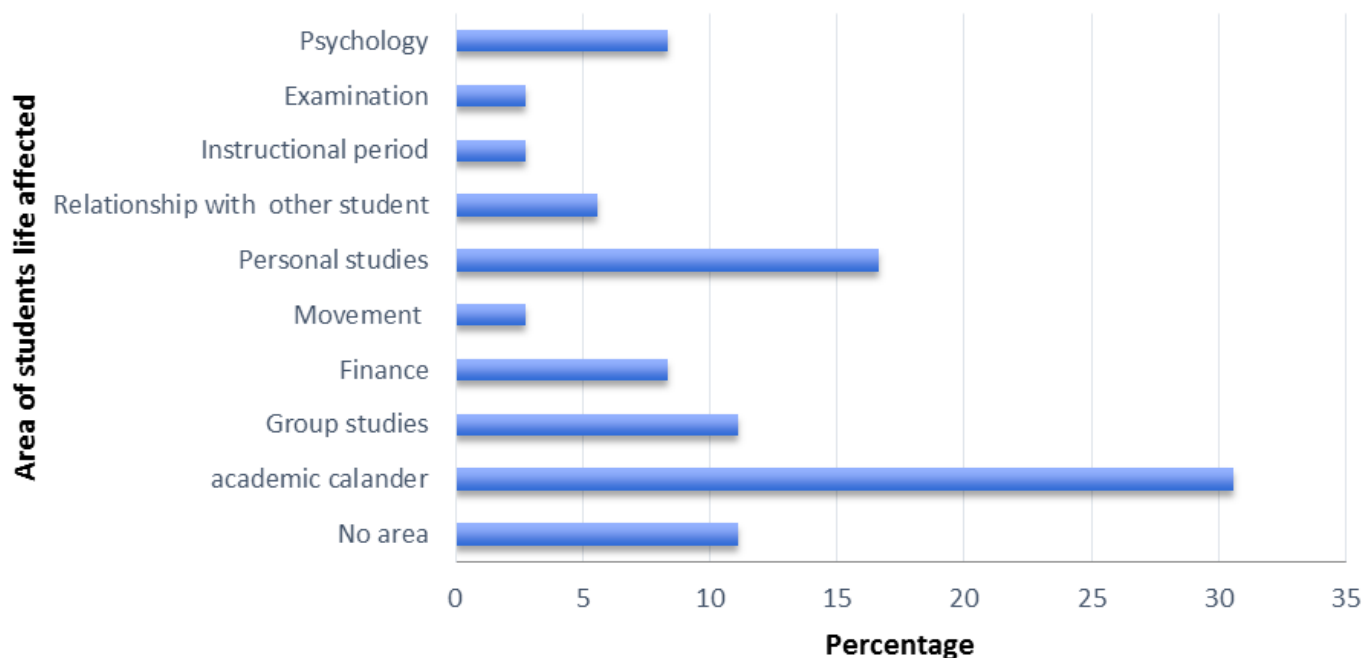
Area of students life affected

Figure 5. Area of students' life affected; n= 291.
Source: Omega, Field Survey (2021).

Table 4. Students perceived effect of COVID-19 on academic performance.

Statement	Median	Mean	Mean Rank	Rank
Graduation on time and overall progress	4.0	3.76	3.96	4th
Class attendance	4.0	4.10	4.69	1st
Attention span in class	4.0	3.69	3.69	6th
Understanding of the material covered in class	4.0	3.61	3.50	7th
Overall academic performance	4.0	3.89	4.13	3rd
Current health status	4.0	3.88	4.18	2nd
Access to food	4.0	3.55	3.84	5th

n= 291 Min= 0 Max= 5 Overall mean= 3.78 Chi-square= 70.262 df= 6 Kendall's W =0 .045.
Source: Omega, Field Survey (2021).

lacking ICT devices, and high prices of internet packages. However, COVID-19 had less effect on students understanding of the concept taught in class (Mean rank= 3.50). This was because the online platform used by the school had added features such as the chat area, which allowed shy students to ask questions. Hammerstein et al. (2021), Qadir and Al-Fuqaha (2020), and Ní Fhloinn and Fitzmaurice (2021) revealed that COVID-19 did not have much effect on student understanding of the concept taught especially in reading but had moderate difficulty in terms of understanding mathematical concepts taught online.

Food insecurity status of students during COVID-19
Food insecurity status of students

The food insecurity status of students is as shown in Figure 6. It was revealed that the majority of students were food secure (56%). This shows that the majority of students did not have their food security affected by the pandemic. This could also be attributed to interventions such as the university supporting foreign students with money, providing funding to less privileged students, providing school fee part payment services to students, and the closure of school allowing students to stay home
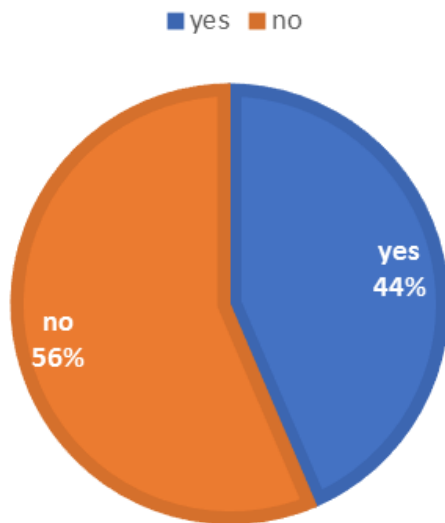
FOOD INSECURITY STATUS

■ yes ■ no

Figure 6. Food insecurity status of students; n= 291.
Source: Omega, Field Survey (2021).

Table 5. Extent of food insecurity among students.

Extent	Freq.	%
Rarely	112	57.4
Sometimes	53	27.2
Often	30	15.4

n= 291.
Source: Omega, Field Survey (2021).

and also save the remaining income for school. This study's findings are in line with previous findings of Davitt et al. (2021) and Owen et al. (2021) whose studies on the effect of COVID-19 on students' food security revealed that the majority of students in Midwestern University were food secure. They further reported that the main source of food insecurity for students was the barrier to food access for students who consumed fast foods due to movement restrictions.

Extent of food insecurity among students

Table 5 shows the level of food insecurity among students. It was revealed from Table 5 that food insecurity in its dimension of inaccessibility, unavailability, instability, and non-utilisation rarely happens to students (75.4%) with often being the least (5%). This indicates that students are food secure in all its dimension despite the pandemic. The findings of the study are in line with Owens et al. (2020) who also reported that most students

Table 6. Household food insecurity Access scale indicator.

Occurrence question	Mean	SD
HFIASI1	0.32	0.750
HFIASI2	0.31	0.739
HFIASI3	0.29	0.708
HFIASI4	0.25	0.667
HFIASI5	0.22	0.655
HFIASI6	0.23	0.657
HFIASI7	0.15	0.498
HFIASI8	0.11	0.404
HFIASI9	0.08	0.338

n= 291; min= 0, max= 3.
Source: Omega, Field Survey (2021).

(67.5%) reported that they experience mild or rare food insecurity during the period of COVID-19. Similar works by Mialki et al. (2021) and Parekh et al. (2021) likewise revealed that 56.1% of students in American public universities were mildly food insecure. This they attributed to student relief services offered by the various universities to students.

Household food insecurity access scale indicator

The results from Table 6 show that out of the 9 occurrence questions of the household food insecurity access scale indicator, students reported "No" to begin food insecurity. The lowest was the HFIASI9 and the highest being HFIASI1. This goes to confirm that students of the University of Cape Coast were food secure during the period of COVID-19.

Best predictors of extent of food insecurity among student

Table 7 displays the factors that predicted the extent of food insecurity among students during the pandemic. Using a multivariate analysis, the dependent variables were captured as rarely, sometimes, and often food insecure. The model summary reveals that a total of 173 students answered questions on the extent of food insecurity. Furthermore, the R-square observed for each dependent variable shows that 60.8% of the data fit the regression model for rarely food insecure as 33.8 and 25.0% fit the regression for sometimes and often. Generally, this indicates that the model is a good fit.

A look at the best predictor variables revealed that age was significant in predicting the food insecurity status of students across the various categorisations. For rarely food insecure, it was revealed that as students' age increases, their food insecurity becomes rare by 0.01275. Similarly, as students' age increases, they are likely to

Table 7. Multivariate regression of the extent of food insecurity among student.

Variable	Rarely		Sometimes		Often	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
YSource	0.12169	0.20213	-0.05648	0.18385	-0.12112	0.14677
HHZ	-0.00339	0.01113	0.00129	0.01013	0.01043	0.00808
Gender	0.00714	0.07932	0.09032	0.07215	-0.09107	0.05759
Age	0.01275*	0.00716	0.01159*	0.00651	0.00945*	0.00520
MS	0.16120	0.16683	0.03251	0.15175	-0.19500	0.12114
Clevel	-0.11226	0.10229	0.25025**	0.09304	-0.12152	0.07428
Estatus	-0.17041*	0.09448	0.11795	0.08594	0.07755	0.06860
Mumocc	0.08407	0.09763	-0.00757	0.08880	-0.07039	0.07089
Dadocc	0.06983	0.09240	-0.12845	0.08404	0.08546	0.06709
Dadedu	-0.03573	0.14084	-0.06287	0.12810	0.16150	0.10227
Mumedu	0.12164	0.11283	-0.03118	0.10262	-0.07362	0.08192
Fedu	0.15049	0.11455	-0.11466	0.10419	0.04662	0.08318
Income	0.00004	0.00009	-0.00003	0.00009	9.60e-06	0.00007
Insurance	0.26070**	0.11454	-0.03742	0.10419	-0.17300**	0.08317
Equation	Obs.	Parms	RMSE	R^2	F	P-value
Rarely	173	14	0.492	0.608	17.613	0.000
Sometimes	173	14	0.447	0.338	5.794	0.000
Often	173	14	0.357	0.250	3.781	0.000

n= 291. *Sig. at 10%, **Sig. at 5%.
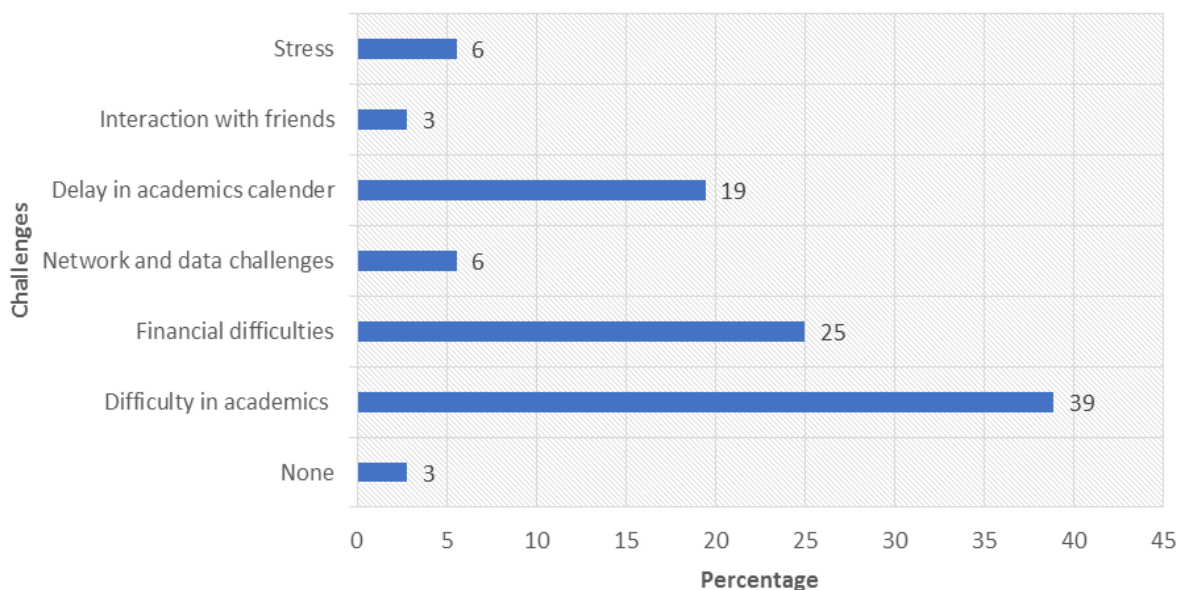Source: Omega, Field Survey (2021)

Figure 7. Challenges faced by students during COVID-19; n= 291.
Source: Omega, Field Survey (2021).

become sometimes (0.011659) or often food insecure (0.00945). This indicates that food insecurity is not a respecter of the age of students. Students can be food insecure at any age level. The results of this study are

inconsistent with Reimold et al. (2021) who also reported that the age of students was crucial to predicting their food security status. Ideally, as students grow older, they become more food secure, which they ascribe to the fact that mature students are more likely to be working and hence food secure.

Secondly, it was revealed that the current level of students influences their food insecurity status. From Table 7, students who are in Level 100 are more prone to be sometimes food insecure by 0.25025. This could be attributed to Level 100 students paying a huge sum for fees and other miscellaneous costs associated with being a fresher. Hence their income falls initially and tends turn to rise after a couple of months into the semester. Mialki et al. (2021), Parekh et al. (2021) and Owens et al. (2020) added that the current level of students was significant in predicting the extent of food insecurity among students. In their studies, they revealed that graduate students were the most likely group of students to see their food secure status change quickly because graduate students during the period of COVID-19 were on campus and restricted access to food outlets.

Thirdly, the employment status of students was also found to predict the extent of food insecurity among students. It was revealed from Table 7 that students who have some sort of employment were rarely food insecure (0.17041). This shows that the employment status of students plays a significant role in determining their food insecurity level. This could be because students who are employed tend to have high disposable income compared to unemployed students. A similar study conducted by Davitt et al. (2021), Parekh et al. (2021), and Mialki et al. (2021) revealed that students with employment stand a better chance of being food secure compared to students who depend on their parents and others for support.

Lastly, it was revealed in Table 7 that students having insurance tends to have improved their food insecurity status. Table 7 revealed that students having insurance had their food insecurity rare (0.26070) but never often (-0.17300). This is because students covered by insurance packages spend less on health bills thereby freeing their income to be spent on food.

Challenges faced by students during COVID-19

Figure 7 shows that 39% of students faced difficulties in their academics. The difficulties faced in academics include the inability to have group studies, poor performance, learning and teaching difficulties, difficulty in attending lectures, and limited access to lecturers. The least challenge faced by students was interaction with friends (3%) and no challenge (3%). The findings of this study agree with similar studies by Apriyanti (2021), Rasmitadila et al. (2020), and Mailizar et al. (2021) who reported that during COVID-19 institutions, educators,

parents, and students had a burden of addressing academic issues mainly having to do with the transition from face to face to indirect methods forcing students into learning complexities and limitations. Other factors cited in the various studies included the psychological effect of the closure of schools, lack of equipment for online classes, difficulty to access online materials, and inadequate technology infrastructure.

Mitigation strategies adopted by students during COVID-19

Figure 8 depicts the varied mitigation measures used by students to counteract COVID-19's effects. The Figure revealed that the dominant strategy adopted by students was online studies (23%) with the least being the change in data plan (7%) and self-management (7%). This study's conclusions contradict previous research by McGee et al. (2021) and Fox et al. (2021) who revealed that students most adopted mitigation strategy were compliance with COVID-19 protocols. The protocol students complied with the most was mask-wearing and social distancing.

CONCLUSION AND RECOMMENDATION

Coronavirus has become a global health concern as economies are struggling to recover from its effect. The pandemic has forced the closure of many educational institutions and also reveal the cracks in educational systems around the globe. One such country is Ghana. The limited access to internet, internet connectivity issues, the disparity in access to internet devices, and internet charges made most students unable to participate in-class activities. The issue was further compounded by the fact that most students in the country became food insecure due to government regulations like restricted movement in some areas and school closure. This study was conducted to find out the effect the pandemic has had on student food insecurity status. It was revealed that there is no significant association between food insecurity status and socioeconomic characteristics of students. Furthermore, the study revealed that students had a high level of awareness of the pandemic and the effect of the pandemic was moderate. The most affected area of their life was the distortion of the academic calendar. Also, students perceived that the effect of the pandemic on their academic life was felt in terms of class attendance. Despite the epidemic, this study found that students were food secure, contrary to other studies that found students to be food insecure. The best predictors of food insecurity status of students were age, employment status, insurance cover, and current level. Again, the major challenge faced by students during the pandemic was academic difficulties and the best mitigation strategy
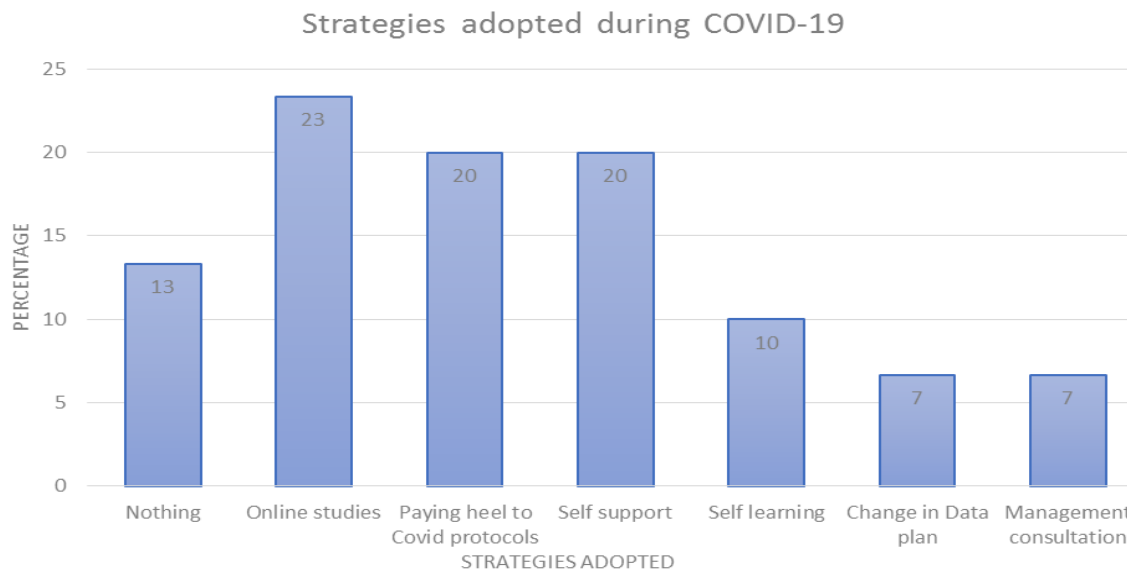
Strategies adopted during COVID-19

Figure 8. Mitigation strategies adopted by students during COVID-19; n= 291.
Source: Omega, Field Survey (2021).

adopted was online studies.

The study recommends that the University authority and task force on COVID-19 continue creating awareness of the pandemic despite the fall in incident rate and also encourage students to be vaccinated to reduce the spread and possible outbreak leading to the closure of the school. Again, the University academic board should endeavour to create a sustainable academic calendar to help students' complete programs on time. Furthermore, the University ICT unit should make internet provisions for students to help them access classes online and also improve students' research activities. On food security, the University should increase the number of beneficiaries on its scholarship programs and also give students soft loans to cushion them. Lastly, the university through its incubation program should support student businesses with consultancy, financial, and mentor services to make extra income to improve their food security status.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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