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Research

IMPACT OF COVID-19 CONFINEMENT ON FOOD CONSUMPTION PATTERN, PHYSICAL ACTIVITY AND PERCEIVED BODY SIZE OF NIGERIAN UNDERGRADUATES

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Background and objectives

Unhealthy dietary practices and physical inactivity are major contributors to overweight and obesity which is fast becoming a public health concern among adolescents and young adults globally. This study aimed to investigate the impact of COVID-19 lockdown on food consumption pattern, physical activity and perceived body size changes of Nigerian undergraduates.

Methods

This cross-sectional study used a snowball sampling technique to select 310 respondents. An online questionnaire link was forwarded to eligible respondents to elicit information on their dietary pattern, physical activity levels and perceived body size. Data collection for these indicators followed standard procedures and were compared with standard references.

Results

The pattern of fruit, vegetable, legume, and meat/fish consumption significantly increased during the lockdown. Snack, soft-drink and dairy products experienced a decline in consumption ($p < 0.05$). The physical activity MET (metabolic equivalent) score of respondents reduced from 3378.85 to 3097.02 MET minutes/week. Information on the perceived body size using body silhouette classification reported that lockdown accounted for an elevation in the perceived prevalence of overweight/obese (11.0% to 23.9%).

Conclusion

COVID-19 confinement improved some dietary practices of the undergraduates, but significantly contributed to a decline physical activity levels and an elevation in perceived body size. Designing effective approaches such as home-made physical activity routines, and local food production may help avert such outcomes of restricted access to the external environment.

1. INTRODUCTION

The prevalence of overweight and obesity among university students in Nigeria, which reportedly ranged from 10-22.1%, is of public health concern (Nwachukwu et al. 2010; Ejike and Ijeh 2012; Shalom and Opeyemi 2014; Emmanuel et al. 2015). Overweight and Obesity potentiates multiple metabolic/non-communicable diseases (WHO, 2022a). Obesity and other Non-communicable diseases account for 74 percent of all deaths globally, 77 percent of which occur in low and middle income countries (WHO 2022a). In Nigeria, as of 2019, the economic impact of overweight and obesity was estimated to be US$2.37 billion equivalent to 0.5% of GDP (Dobbs et al. 2014; World Obesity Federation 2023).

Excessive intake of energy-dense foods from consumption of fast foods, drinking of sugar sweetened beverages, low fruits and vegetables intake, and high level of physical

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inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization are major contributors to overweight and obesity (WHO 2021). These unhealthy dietary habits have been reported to be habitual among adolescents and young adults (Papadaki and Scott 2002; Huang et al. 2003; Emmanuel et al. 2015).

There is a growing concern about the low level of physical activity in many countries (Sidebottom et al. 2021; WHO 2022b), global and regional reviews revealed that 25% and 20% of adults in the world and Africa, respectively, were physically inactive (Dumith et al. 2011; Guthold et al. 2011). More than 80% of adolescents and 27% of adults currently do not meet recommended levels of physical activity (WHO 2022b). Many recent studies have underlined the risks of excessive energy intake and sedentary lifestyle in young adults, which can be associated with the increased prevalence of obesity and other metabolic diseases (CVD) (Anthony, George, and Eaton 2014; Chapman et al. 2014). In Nigeria, physical inactivity has increased over the years and been found to be high among young adults (Adeloye et al. 2021).

COVID-19 was declared a global pandemic on January 30, 2020 (WHO 2020). During the following months, many countries implemented rigorous measures to restrict the disease spread, including social distancing, mandatory mask use, travel bans, and strict and partial lockdowns with non-essential services prohibited (Nirala et al. 2022). Due to the absence of a vaccine for the treatment of COVID-19 in 2020, Nigeria adopted "lockdown" as an approach to reverse epidemic growth and reduce case numbers (Nigeria Centre for Disease Control 2020). One of the notable stringent containment strategies was the closure of all educational institutions for over six months (Nigeria Centre for Disease Control 2020).

The impact of the lockdown which led to restriction of outdoor activities and school closure (Ammar et al. 2020), stockpiling of foods due to earlier restrictions in market activities, a decrease in purchasing power or the capacity to produce and distribute food (Food and Agricultural Organization 2020; Iheme et al. 2020), and emotional over/under-eating from boredom of confinement or depression (Evers et al. 2018). In Nigeria, several studies reported the impact of the COVID-19 lockdown on various characteristics, including food security and nutrition (Amare et al. 2020; Madzorera et al. 2021; Balana et al. 2022). However, information on changes in lifestyle, food consumption patterns and anthropometric characteristics of Nigerian undergraduate students during the COVID-19 lockdown remains scarce. Therefore, this study aimed to assess the impact of the COVID-19 lockdown on the food consumption pattern, physical activity level and anthropometric characteristics of undergraduates in Nigeria.

2. MATERIAL AND METHODS

Study design and population: The sample for this cross-sectional study comprised undergraduate students from four Nigerian universities, three of which are public (University of Ibadan, Ibadan; University of Nigeria, Nsukka and Michael Okpara University of Agriculture, Umudike) and one private (Bowen University, Iwo).

Sampling technique: A non-probability snowball sampling technique was employed to select 310 participants. An online survey questionnaire was shared on social media platforms to eligible respondents.

2.1. QUESTIONNAIRE

Data for this study were collected using an online self-administered questionnaire between 5th March 2020 and 7th December 2020. The survey questionnaire assessed relevant household socio-economic characteristics, dietary/food consumption habits, physical activity level and anthropometric status.

2.2. DATA ANALYSIS

2.2.1 Food consumption pattern: The number of days per week at least one food from each food groups was consumed during and after lockdown was assessed, assigning a score of one for each day.

2.2.2 Physical Activity and sedentary lifestyle: The scoring guide for the short-form of the International Physical Activity Questionnaire (IPAQ) was used to categorize the respondents' physical activity levels (IPAQ 2016). The amount of time participant reported that was spent before and during lockdown in vigorous, moderate activities and walking was converted to MET minutes per week which represent energy expended carrying out physical activity. Responses were analyzed categorically into low physical activity (less than 600 MET minutes per week), moderate physical activity (between 600 and 1500 MET minutes per week), and high physical activity (greater than 1500 MET minutes per week).

2.2.3 Body size perception: Body silhouettes were used to assess perceived body size of the university students. Participants were shown an array of four adult body sizes and were asked to identify the image that most accurately represented their body size before and after lockdown was categorized into underweight, normal, overweight and obese.

2.3. STATISTICAL ANALYSIS

Data collected online were extracted and imported into IBM SPSS version 25 for analysis. Descriptive statistics (mean, frequency and percentage) were computed for the categorized and continuous variables. The Paired t-test and McNemar Browker test were used to assess the impact of COVID-19 lockdown on the dietary, physical activity and perceived body size changes of the respondents. Significance level was set at $P<0.05$.

2.4. ETHICAL CONSIDERATIONS

Participants affirmed their willingness to participate in the study by clicking on the "proceed" button on the first page of the questionnaire, having read the study objectives and

Table 1. Impact of COVID-19 Lockdown on Mean Weekly Consumption Pattern of Undergraduates

Food Groups	Before lockdown	During the lockdown	Mean difference	p-value
Fruits	2.63 ± 1.86	3.33 ± 2.05	-0.71	0.04*
Vegetables	2.86 ± 1.91	4.58 ± 2.01	-1.73	0.01**
Legumes and Nuts	2.54 ± 1.67	3.37 ± 2.11	-0.83	0.00**
Meat and Fish	4.01 ± 2.81	4.97 ± 2.17	-0.96	0.00**
Milk and dairy products	4.37 ± 2.03	3.83 ± 2.17	0.54	0.03*
Snacks	4.61 ± 2.27	3.10 ± 2.25	1.50	0.00**
Soft drinks	3.97 ± 2.07	2.49 ± 2.11	1.48	0.00**

P-values statistically significant at 0.05* and 0.01**

Table 2. Proportions of Physical Activity at different Levels of intensity/exertion among Nigerian Undergraduates

Physical Activity Level	Before the lockdown		During the lockdown		p-value
	N	%	N	%	0.00**
Low	56	18.4	100	32.9	
Moderate	118	38.8	102	33.6	
High	130	42.8	102	33.6	
Total	304	100.0	304	100.4	
Mean ± S.D	3378.85 ± 3368.68 MET* minutes/week		3097.02 ± 666.32 MET* minutes/week		

*MET: Metabolic equivalent
P-values statistically significant at 0.05* and 0.01**

scope. The research was conducted in accordance to the guidelines laid down in the Declaration of Helsinki.

3. RESULTS

Table 1 shows that there was a statistically significant increase in the fruit (p = 0.04), vegetable (p = 0.01), legumes/nut (p = 0.00) and meat/fish intake (p = 0.00) of the respondents during the COVID-19 lockdown compared to beforehand. There was a decline in the mean consumption of dairy products (p=0.03), snacks (p=0.00) and soft drinks (p=0.00) during the COVID-19 lockdown.

Information on how the lockdown influenced physical activity is summarized in Table 2. The physical activity level of the students significantly decreased (p =0.00) during the lockdown compared to before the COVID-19 lockdown. Students' involvement in sedentary/low physical activities increased from 18.4% to 32.9%, while activities involving high physical activity declined (42.8% to 33.6%). This was reflected in a mean reduction from 3378.85 to 3097.02 METs in minutes/week.

The perceived body sizes of the respondents is shown in Table 3. A significant (p < 0.05) increase in the perceived overweight or obesity occurred during the lockdown (23.9%) compared to before the lock down (11.0%). Also, the percentage of students in the underweight category reduced during the COVID-19 lockdown period compared to prior while more students reported being in the Normal BMI category during the COVID-19 lockdown compared to before.

4. DISCUSSION

This study provides information on the impact of the COVID-19 lockdown on the food consumption pattern, physical activity level and perceived body size changes of undergraduate students in Nigeria. Overall, both favorable and unfavorable changes with regards to food consumption pattern, physical activity level, and perceived body size changes were reported among undergraduate students in the study.

The food consumption pattern of undergraduate students across the world have been reported to be worrisome prior to the pandemic period (Arulogun and Owolabi 2011; Avram and Oravitan 2013; Bernardo et al. 2017; Viljoen, van der Spuy, and du Rand 2018). This study also revealed that prior to the COVID-19 lockdown period, students had increased consumption of unhealthy snacks that are high in fat and sugar, carbonated drinks, dairy, meat and fish products while consumption of fruits, vegetables are legumes were reported to be low. However, during the lockdown period there was increased intake of fruits, vegetables, legumes, meat and fish while consumption of dairy products, unhealthy snacks and carbonated drinks reduced. This could be due to the fact that during the lock-down period, individuals were confined to their homes, restaurants and fast-food outlets were closed and there was increased consumption of homemade meals. A similar change in food consumption pattern was reported among adult population in Saudi Arabia, where there was increased intake of fruits, vegetables, and water, and decreased intake of sweetened

Table 3. Impact of COVID-19 Lockdown on Perceived Body Size of Nigerian Undergraduates

Body Mass Index	Before the lockdown		During the lockdown		p-value
	N	%	N	%	0.01**
Underweight	120	38.7	54	17.4	
Normal	156	50.3	182	58.7	
Overweight	20	6.5	44	14.2	
Obese	14	4.5	30	9.7	
Total	310	100	310	100.0	

P-values statistically significant at 0.05* and 0.01**

juices and soft drinks during the Covid-19 quarantine period compared to before the lockdown period, however intake of sweets, including cakes, chocolate, and ice cream was said to have increased during the lockdown period unlike in this study where a decreased intake was observed (Bakhsh et al. 2021). Jalal and colleagues in their study among university students in Saudi Arabia however reported a decrease in fast and fried food consumption among the study population during the COVID-19 lockdown period than before the period (Jalal et al. 2021).

In contrast to findings from our study, decreased consumption of grains, fruits, vegetables, dairy, nuts, meat, and meat alternatives was reported among university students in Canada which resulted in a decrease in macro- and micronutrient intake and the increase in the prevalence of nutrient inadequacy observed among the respondents during the COVID-19 lockdown period (Bertrand et al. 2021). Among adult French population, increased consumption of sweets, chocolate, cookies, cakes, alcoholic drink and increased energy intake was observed during the lockdown period, while there was a decrease in the consumption of fresh fruits, vegetables and fish. This was reported to be attributed possibly to reduced grocery shopping and/or difficulties accessing their usual food stores or finding their preferred food products (Deschasaux-tanguy et al. 2020).

Among Australia university students, snacking frequency and the energy intake from snacks increased during the lockdown period only in female students than prior to the lockdown (Gallo et al. 2020). In Zimbabwe, the confinement resulted in reduced fruits and vegetable intake (except for dark green vegetables), nuts and seeds and dairy products, an increase in alcohol consumption while no change was reported in egg and meat consumption, this was mainly attributed to reduction in food access (Matsungo and Chopera 2020).

Olodu et al. (2021) in their study among University students in Southwest Nigeria reported that overall, the diet of the students remained unchanged however there was slight increase in fruit consumption, water intake and the use of dietary supplements and a decrease in the consumption of ice-cream, sweetened drinks, candy, chocolate and pastries during the lockdown period. There was a decrease in physical activity level of undergraduate students during the COVID -19 pandemic compared to before the pandemic, this was expected as the pandemic disrupted the normal daily routine of individuals, the stay-at-home order resulted in working from home, limited transportation or commuting which may include walking, restriction on sporting activities and gym closure. Similar results were reported in other studies carried out within and outside Nigeria during the COVID-19 pandemic period. Low physical activity was also reported among majority of the university students in a study carried out in Southwest Nigeria during the lockdown period (Olodu et al. 2021).

Among college students in the United States, there was reduction in the average days per week of engaging in all intensity of physical activity while sedentary behavior was seen to increase from pre- to during the quarantine period (Sidebottom et al. 2021). Similar findings were also reported among university students in Canada, Saudi Arabia and Australia, where increased sedentary behavior and decreased physical activity was reported during the lock down period, this was majorly attributed to the loss of incidental walking through commute, daily activities, or as part of one's vocation, including walking between classes on campus (Jalal et al. 2021; Bertrand et al. 2021; Gallo et al. 2020).

As regards the perceived body size of the undergraduate students in the study, there was an increase in the number of students who were normal weight, overweight and obese, this implies that majority of the students gained weight during the COVID-19 period, this could be due to a decrease in the level of physical activity among the students. A scoping review of the impact of the lockdown during COVID-19 pandemic among different population groups across different countries reported increased weight gain during the pandemic across the several studies and it was linked with increased screen time, reduced physical activity and increased eating due to stress, boredom, seeing or smelling food, snacking after dinner and being around friends and family (Bennett et al. 2021), however, Jalal and colleagues in their study reported that majority of the university students maintained the same weight during the COVID-19 lock down period (Jalal et al. 2021).

Even though the COVID-19 lockdown resulted in a reduction in the physical activity level of university students in Nigeria, it promoted healthy eating behavior, as there was an increase in fruit, vegetables and legume consumption and a decrease in the consumption of snacks and carbonated drinks compared to before the lockdown period.

5. CONCLUSION

This study revealed that there were significant changes in the dietary pattern, physical activity level and perceived body size of Nigerian university students during the COVID-19 lockdown. The positive impacts were increase in the consumption of healthy foods such as fruits, vegetables, legumes and nuts while the negative impacts were a decline in physical activity and increased in the perceived body size of the university students. Thus, concerted efforts should be made to improve school food environments with varied healthy foods in addition to increased participation in physical activity especially indoor energy-exerting games/activities during times of confinement or restricted movement of young people.

DECLARATION OF COMPETING INTEREST

The authors have no conflict of interest to declare.

AVAILABILITY OF DATA AND MATERIAL

The datasets used and/or analyzed during this study are available from the corresponding author on reasonable request.

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AUTHOR'S CONTRIBUTION

Conceptualization: Gideon O. Iheme, Anuoluwapo F. Taiwo. Formal Analysis: Gideon O. Iheme. Investigation: Gideon O. Iheme, Anuoluwapo F. Taiwo, Okeoghene E. Makanjuola. Writing – original draft: Gideon O. Iheme, Anuoluwapo F. Taiwo. Writing – review & editing: Okeoghene E. Makanjuola, Netochukwu P. Onwubuya. Data curation: Netochukwu P. Onwubuya.

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