Research Article

Effects of Gender and Ethnicity on Fruits Consumption by Students in a Ghanaian Technical University Before and During COVID-19

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Abstract

Fruits help reduce the risk of diseases and infections such as the Corona virus. This study sought to assess the differences in the consumption patterns of fruits among students before and during COVID-19. Structured questionnaire was used to gather information from two hundred and three (n=203) students. Descriptive statistical techniques, paired sample t-test and logistic regression models were used in the data analysis. Mango, banana, orange, grapes, apple, pineapple and coconut were the most consumed fruits before and during COVID-19. Male students were more likely to consume watermelon than female students in pre-COVID-19 period and during COVID-19 period (odds ratios respectively 2.009 and 1.403). Watermelon and coconut were more likely consumed by males while African star fruit and velvet tamarind were consumed mostly by females. Apart from the health benefits, family/friends was the main factor responsible for the choice of fruits. Ethnicity significantly affected the choices of fruits (p ≤ 0.05). The impact of family/friends on fruit consumption trend is enormous and is directly related to the ethnic groups of students. Policies and interventions must therefore be made towards household consumption of fruits.

Keywords: COVID-19; Fruits; Gender; Ethnicity; Students

Introduction

Fruits and vegetables have high concentrations of polyphenolic compounds [1] and are also important sources of micronutrients and dietary fibre which help in preventing major diseases [2]. However, there is a general difficulty with fruits consumption for many people. This results from the complexity of factors such as supply and affordability, food environments, access and food production [3]. The coronavirus disease (COVID-19) pandemic is a global issue that has brought about diet changes in the lives of many people. This has resulted in an extreme increase in unemployment which is associated with spike in food insecurity worldwide [4]. In Ghana, the first official cases appeared in late February and in March 2020. According to [5], healthy dieting with fruits has potential to reduce the risk of COVID-19 infection. Naturally, the young adult population of University students undergo stressful academic activities which contributes to poor eating behaviors [6]. The WHO has estimated about 2.8% death per annum worldwide which is attributable to inadequate intake of fruits and vegetables [7]. There is enough literature that outlines the influences for food choices among college students. Although predominant influences such as living situation and status in school are known factors that affect the level of fruit consumption, information on how

COVID-19 has influenced fruit intake of students is limited. Further, although gender affects consumer preferences for yam quality descriptors [8] little is known about its effects on fruits consumption. Gender refers to how cultural and social differences affect the roles and responsibilities of males and females. This includes factors such as age, ethnic group and poverty level [9].

Hence, this study posed and addressed the following questions:

1. Which fruits are commonly consumed by students?

2. What are the effects of gender and ethnicity on fruits consumption before and during COVID-19?

3. Which factors account for the choices of fruits by students?

Methods

Study design and sampling

Pre-tested structured questionnaire was used to gather information on fruits consumption, their preferences and the factors associated with choices of fruits before and during the pandemic. Students from the four Faculties (Engineering, Applied Sciences, Arts and Design and Business School) were randomly interviewed. In total, two hundred and three (n=203) students were considered for the study, averagely, 50 from each faculty.

Data analysis

Data was analyzed with the Statistical Package of Social Science (SPSS) version 23. Descriptive statistical technique was used to rank the fruits consumption pattern from frequent to least consumed by the students. Differences in consumption patterns of fruits in pre-COVID-19 and during COVID-19 was determined using paired sample t-test. Inferential statistical technique was used to determine the probability level of rejecting or failing to reject the null hypothesis that two mean scores were the same. Logistic regression model was used to determine the factors responsible for the changes in fruits consumption pattern of students between pre-Covid-19 and during Covid-19 period and the effect of gender and ethnicity on fruit consumption pattern. The variables for fruits were categorized to form dichotomous dependent (Y_i), where 1= frequent consumption and 0=least frequent consumption. The model specification; $ln(P_i/(1 - P_i)) = \beta_0 + \sum_{j=1}^{k} \beta_j X_i$, where, P_i was the probability of the ith fruit consumed and X_i is the kth explanatory variable. The dependent variable, $ln(P_i/(1 - P_i))$ in the equation was the log-odds ratio in favour of fruit consumption.

Ethical considerations

Verbal informed consent was sought from all participants. An assurance was given on data anonymity during analysis.

Results and Discussion

Background characteristics of the students

There was even distribution of the respondents from the faculties, about 25% from each. The distribution by gender was 54.7 male and 45.3% female. Figures 1 and 2 show the age and ethnic group distribution respectively. The Akan comprised of the Asante, Fante, Guan, Akyem and Akuapem representing 24.1% of the students in the study. The Ewe ethnic group formed the majority representing 49.3%. The Ga ethnic group was made up of the Ga and Ga-Adangbe representing 14.3% of the students in the study. The 'other' ethnic group was made up of the Dagati, Frafra, Hausa, Krobo, Kokomba and Mole-Dagbane.

Students' consumption patterns of fruits pre-COVID-19 and during COVID-19

From table 1, there were nine fruits identified with significant differences in their consumption pattern. These are mango, banana, orange, grapes, apple, pineapple, coconut, velvet tamarind and African star fruit. These fruits were frequently consumed during COVID-19 period than before
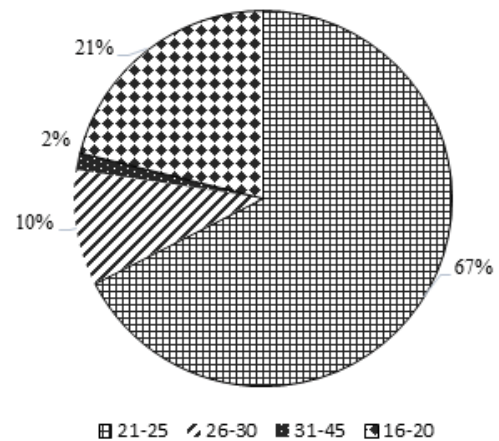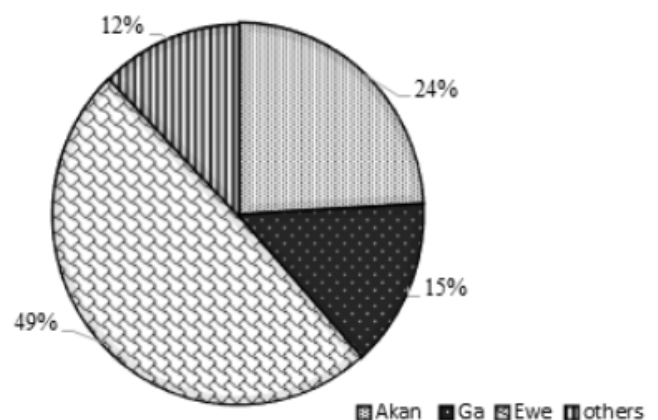

Figure 1: Age distribution of respondents

Figure 2: Ethnic groups identified

Table 1: Percentage responses of fruits consumption by students

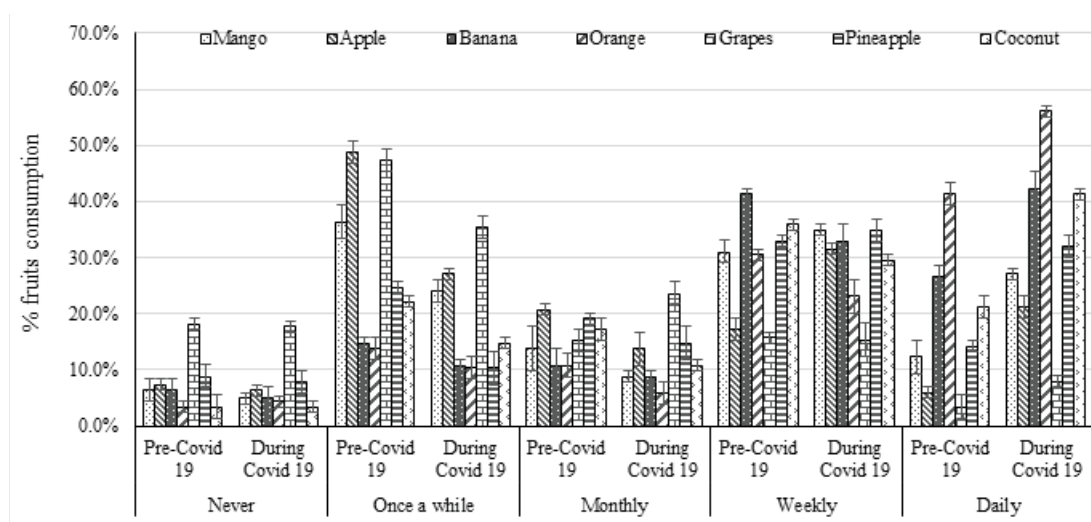|	Never (%)		Once a while (%)		Monthly (%)		Weekly (%)		Daily (%)	
	Pre-Covid 19	During Covid 19	Pre-Covid 19	During Covid 19	Pre-Covid 19	During Covid 19	Pre-Covid 19	During Covid 19	Pre-Covid 19	During Covid 19
Mango	6.4	4.9	36.5	24.1	13.8	8.9	31	35	12.3	27.1
Apple	7.4	6.4	48.8	27.1	20.7	13.8	17.2	31.5	5.9	21.2
Banana	6.4	4.9	14.8	10.8	10.8	8.9	41.4	33	26.6	42.4
Soursop	43.8	49.8	42.4	32	6.9	6.9	3.9	7.4	3	3.9
Orange	3.4	4.4	13.8	10.3	10.8	5.9	30.5	23.2	41.4	56.2
Tangerine	13.3	16.7	51.2	42.9	12.8	18.2	15.8	11.8	6.9	10.3
Grapes	18.2	17.7	47.3	35.5	15.3	23.6	15.8	15.3	3.4	7.9
Pineapple	8.9	7.9	24.6	10.3	19.2	14.8	33	35	14.3	32
Strawberry	50.7	55.7	33	25.6	11.3	5.9	2	8.4	3	4.4
Pawpaw	12.3	10.8	25.6	23.6	21.2	20.2	27.6	29.6	13.3	15.8
Coconut	3.4	3.4	22.2	14.8	17.2	10.8	36	29.6	21.2	41.4
Watermelon	8.4	11.8	17.2	20.2	21.7	16.7	37.4	30.5	15.3	20.7
"Yooyi" - Velvet Tamarind	37.4	43.8	31.5	38.4	6.4	8.9	20.2	5.4	4.4	3.4
"Alasa: - African Star fruit	35	46.3	28.6	27.1	7.4	11.8	20.2	8.4	8.9	6.4
Guava	35.5	41.4	40.9	31	11.3	9.9	6.9	11.8	5.4	5.9

Figure 3: Students' response for the seven commonly consumed fruits

COVID-19 except for velvet tamarind and African star fruit. Out of the nine identified significantly consumed fruits for the two periods, seven fruits were found to be consumed at least weekly (mean score ≥ 3.50) during the COVID-19 period (Figure 3). There was a decrease in consumption of watermelon, velvet tamarind and African star fruit during COVID-19 period. There were no significant differences in consumption of soursop, tangerine, strawberry, pawpaw, watermelon and guava. From figure 3, orange, banana and coconut were consumed on the average, weekly in both periods. Mango, pawpaw, pineapple, watermelon, apple and tangerine were also consumed monthly averagely during pre-

COVID-19 period. Pineapple, pawpaw, watermelon, grapes, tangerine and apple were also consumed monthly on the average. Knowledge on the influence of nutrition on immune system function may have affected consumption of some fruits during COVID-19 by the students since fruits have the tendency to reduce the risk of COVID-19 infection [5]. For Soursop, tangerine, strawberry, pawpaw, watermelon and guava, there were no significant differences in consumption. From the three main factors that influenced consumption in figure 4 (health benefit, family/friends and availability/ convenience), it is suggestive that the knowledge of the health benefits of these fruits to the students could be low. It could
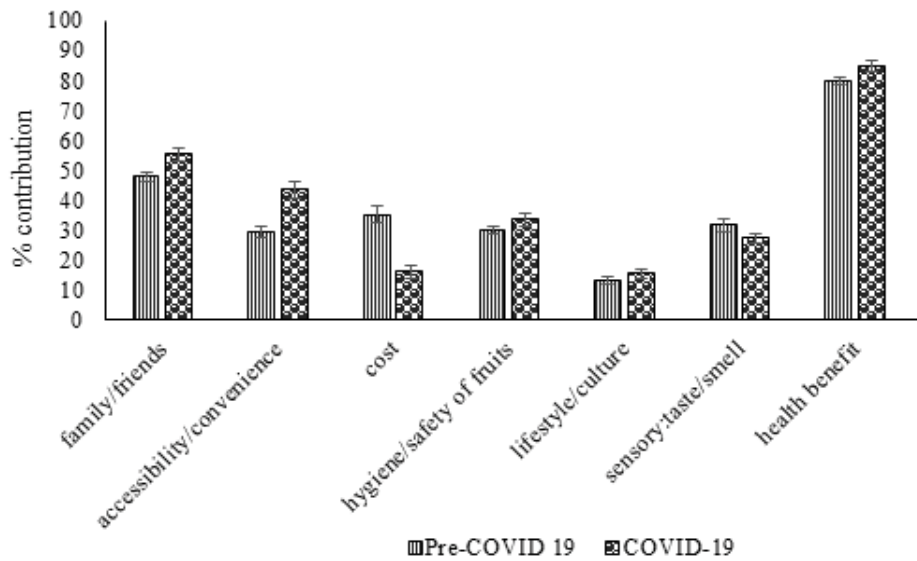
Figure 4: Percentages of factors responsible for the change in fruit consumption by students

Table 2: Logistic regression model of the factors responsible for the changes in fruits consumption

Factors	Odds ratios of fruits consumption						
	Mango	Apple	Banana	Orange	Grapes	Pineapple	Coconut
Family/friends	2.234	2.760*	2.003	2.311*	2.312*	1.165	0.803
Accessibility/convenience	0.436*	0.584	0.891	1.009	0.593	0.544	0.712
Cost	1.175	0.345	0.851	0.833	0.705	0.991	0.758
Hygiene/safety of fruit	0.721	1.254	1.071	0.802	1.069	3.892*	1.69
Lifestyle/culture	0.397	0.231	0.94	1.005	0.707	3.617*	0.54
Senses - taste, aroma, appearance	0.854	1.522	0.695	1.874	0.641	0.682	0.749
Health benefit	1.532	0.851	0.764	0.755	2.854*	1.337	0.675

* Odds ratio significant at 0.05(5%)

Table 3: Logistic regression on the effect of gender and ethnicity on fruit consumption in the pre-COVID-19 and during COVID- 19

	Pre-COVID 19				During COVID19			
Variables	Gender (Ref.: Female)	Ethnicity (Ref.: Ewe)			Gender (Ref.: Female)	Ethnicity (Ref.: Ewe)		
	Male	Akan	Ga	Other	Male	Akan	Ga	Other
Mango	0.91	2.014*	1.655	1.637	0.776	2.062*	1.329	2.094
Apple	0.911	1.663	0.978	0.938	0.099	0.81	0.494	0.739
Banana	1.241	2.876*	0.606	1.457	1.429	7.22	0.778	2.51
Soursop	1.093	5.380*	2.402	2.819	2.042	0.747	0.787	0.591
Orange	1.135	2.719*	2.361*	3.233*	0.918	3.363*	0.663	0.945
Tangerine	1.221	1.204	0.879	0.641	0.736	0.774	0.618	0.742
Grapes	0.927	2.550*	0.838	0.714	0.821	2.021*	1.181	2.134
Pineapple	1.023	2.092*	0.597	1.688	0.593	2.663*	0.927	2.661*
Strawberry	0.8	2.145	0.851	0.993	1.159	1.02	1.179	1.403
Pawpaw	0.964	2.404*	1.297	2.702*	1.135	1.495	0.94	1.046
Coconut	1.45	2.769*	0.944	1.807	5.505	3.205*	1.38	2.056
Watermelon	2.009*	2.033*	2.005	1.11	1.403	2.598	1.306	2.496*
Velvet Tamarind	0.048	0.462	1.182	0.731	0.819	0.589	0.662	1.22
African Star Fruit	0.051	1.3	0.871	1.185	0.67	1.397	0.216	1.924
Guava	0.707	1.52	0.236	0.575	0.688	1.359	0.597	2.027

* Significant at 0.05

also result from their unavailability on the markets during COVID-19 period which could have affected their purchase by family/friends. Some students (averagely 10%) never consumed the most commonly consumed fruits. The findings point to the fact that there is need for fruit consumption interventions at tertiary levels.

From figure 4, students consumed fruits for health benefits indicated by 79.8 and 84.7 percent for pre-COVID-19 and during COVID-19 period respectively. The results asserts to the fact that the increase in fruit consumption during Covid-19 was to boost students' immune system [10]. The increase in the consumption of apple, orange and grapes by students was due to family and friends (Odds ratios of 2.760, 2.311 and 2.312 respectively) holding other factors constant (Table 2). In the present study, the percentages of the influence of cost on consumption before and during Covid-19 are 35.0 and 14.8% respectively. This shows that cost was not a major deciding factor for the students during COVID-19 era as it was during pre-COVID-19. Generally, disasters bring about distraction in food systems with relation to the prices [11]. Hence, increased prices of fruits was normal to the students during COVID-19 period. In the midst of restrictions and lockdowns, fruits choices by family/friends had great influence on consumption patterns (Figure 4). Food decision making is affected by family. A study found that family diet and parental decisions on food choices result from socialization into, and strong cultural norms [12,13]. Hence, cultural differences lead to differences in consumption of certain fruits as found in this work. Hygiene or safety of fruit, lifestyle and culture were responsible for the change in consumption of pineapple. From the results, these factors were thrice more responsible for the change in consumption of pineapple (Table 2) and were statistically significant (p-value < 0.05). Fruit hygiene is essential as work done, indicate that most fruit vendors lacked proper hygiene and could aid in the transmission of food borne illnesses [14]. Students were therefore cautious as food safety hazards have direct influence on their health. Accessibility was one factor that significantly affected fruits consumption during COVID-19 period. This could be due to the general disruptions to food supply chains.

Gender and fruits consumption and preference

The effect of gender on fruit consumption and preference was examined using logistic regression (Table 3). The results showed that, male students were more likely to consume watermelon than female students in pre-COVID-19 period and during COVID-19 period (odds ratios were respectively 2.009 and 1.403). During COVID-19 period coconut was 5 times more consumed by the male students than the female students, odds ratio of 5.505 which was statistically significant (p-value < 0.05). The male students less likely consumed velvet tamarind and African star fruit in the pre-Covid-19 period than the female students, p-value < 0.05.

From the results, gender of students significantly affected the consumption pattern of watermelon, velvet tamarind and African star fruit in the pre-Covid-19 period, while gender significantly affected consumption of coconut in the Covid-19 period. Velvet tamarind has high antioxidant activity [15] and it is reported to relieve menstrual cramps, prevent anaemia, and act as anti-ulcer agent [16]. African star fruit on the other hand is rich in vitamin C and polyphenols and has detoxification potentials [17]. The combined health effects of these two fruits may have accounted for their high consumption by females. The high consumption of coconut by males could be due to the presence of vitamin E, selenium, fibre and manganese, which improve men's sexual health [18]. Research shows that coconut water could enhance reproductive functions by increasing testosterone levels and subsequently affecting fertility in males [19]. Another reason for the high consumption by males could be the 'satisfying' nature of the mesocarp (fleshy middle layer). Together with the water, people are more likely to get satisfied with consumption of just one coconut fruit.

Effects of ethnicity on fruits consumption and preference

The effect of ethnicity on fruit consumption and preference was examined using logistic regression (Table 3). There was significant effect of students' ethnicity on fruit consumption pattern. From the results, the Akan students were twice more likely to consume mango, banana, orange, soursop, grapes, pineapple, pawpaw, coconut and watermelon more than the Ewe students during the pre-Covid-19 and Covid-19 period. It was also revealed that, Ga students were twice more likely to consume more orange during Covid-19 than the Ewe students. Further, students in other ethnic group also consumed orange and pawpaw thrice and twice respectively more than Ewe students. A study found similar association between frequencies of vegetable intake by ethnicity [20]. Racial and ethnic differences were also found among stroke survivors in their consumption of fruits and vegetables [21]. The findings are related to the consumption patterns of family/friends of these students as realized in this study (Table 2).

Conclusions

The study has shown that COVID-19 has not had significant impact on the preference ranks for most consumed fruits by students. Gender of students significantly affected the consumption pattern of watermelon, velvet tamarind and African star fruit in the pre-Covid-19 period. It significantly affected consumption of coconut during COVID-19 period. Gender preferences for some fruits could be due to the knowledge on associated health benefits. However, the impact of family/friends on fruit consumption trend is enormous and is directly related to the ethnic groups of students. Policies and interventions must therefore be made towards household consumption of fruits.

Acknowledgment

Conflicts of interest

The authors report no conflict of interest.

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