ASSOCIATION BETWEEN FRUIT CONSUMPTION, NUTRITION KNOWLEDGE AND SOURCES OF NUTRITION INFORMATION AMONG UNIVERSITY STUDENTS IN EKITI STATE, NIGERIA

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ABSTRACT

Daily fruit consumption could help prevent micronutrient deficiency and certain non-communicable diseases. This study assessed fruit consumption, nutrition knowledge and, sources of food and nutrition information among university students in Ado-Ekiti. This cross sectional study involved multistage sampling of 300 students of a private university in Ado-Ekiti, Ekiti State, Nigeria. Pretested questionnaire was used to elicit personal data and sources of food and nutrition information. Information on fruit consumption was obtained through food frequency questionnaire. Participants' knowledge on fruits was evaluated based on 20 questions with each carrying a weight of five, making a total of 100%. This was categorized into good (≥ 70%), average (50-69%) and poor (<50%) knowledge. Chi square test was used to establish relationship among variables at 5% level of significance. Majority (62.3%) of the students were ≥ 20years; 64.0% consumed fruits less than four times in a week. A little above half (58.0%) had good knowledge of nutritional importance of fruit. The prominent sources of food and nutrition information among the respondents were social media (87.0%), internet (85.7%), relatives and friends (83.3%). The knowledge score had no significant relationship with fruit consumption frequency (p=0.083). The nutrition information sources that had significant relationship with fruit consumption frequency were television (p=0.003), magazine (p=0.015), poster/bill board (p=0.018), relatives/friends (p=0.045), neighbours (p=0.036) and seminar (p=0.000). There was inadequate fruit consumption among the students though they had good knowledge. Relatives/friends and television among other sources of information can be explored to reach the students with specific information on fruit consumption as a nutrition education intervention.

Keywords: Fruit consumption, nutrition knowledge, sources of food and nutrition information, university students

INTRODUCTION

Fruits are recognized as an essential part of a healthy diet (Slavin and Lloyd, 2012) and are excellent source of micronutrients which are required for normal body functions (Olufolaji, 2014; Oyedele *et al*, 2014). Fruits are generally low in calories and fat, and are rich in dietary fibre and phytochemicals which have tremendous health benefits (Slavin and Lloyd, 2012; Oyedele *et al*, 2014; Delians *et al*, 2014; Obayelu *et al*, 2018). Consumption of fruits has been associated with the prevention and management of non-communicable diseases which include overweight, high blood pressure, heart disease, diabetes and stroke (WHO, 2014; Obayelu *et al*, 2018). It implies that fruit consumption below the recommended intake contributes to increase in the incidence of malnutrition such as undernutrition, micronutrient deficiency and diet-related non-communicable diseases (Schneider *et al*, 2007; Liu, 2013; Pem and Jeewon, 2015).

Globally, inadequate fruit intake is one of the leading dietary risk factors for deaths; it is responsible for over 2 million deaths annually (Global Burden of Disease Collaborators, 2019). Low consumption of fruits among Africans has been observed (Obayelu *et al*, 2018; Msambichaka *et al*,

2018). There is high prevalence of micronutrient deficiencies in developing countries including Nigeria which has been attributed to low consumption of fruits (Obayelu *et al*, 2018). Reasons suggested for this in Nigeria include lifestyle changes which bring about a shift from traditional foods to heavily processed foods, food price, availability and inadequate knowledge on the nutritional value of fruits (Obayelu *et al*, 2018; Fadeiye *et al*, 2019).

University students fall within adolescent and young adult age groups (Ezenwa *et al*, 2016; Al-Shehri *et al*, 2017; Fadeiye *et al*, 2019). These population groups are challenged in making healthy dietary choices (Delians *et al*, 2014; Kabir *et al*, 2018) and inadequate fruit consumption have been observed at this stage of life (Alsunni and Badar, 2015; Sabbour *et al*, 2018). Unhealthy eating habits developed as young adults may persist to adulthood and have long-lasting implications on health status. Only

In Nigeria, fruits are abundantly available (Banwat *et al*, 2012) but low demand for fruits by university students has been observed (Obayelu *et al*, 2018) and as low as 17% of university students consumed fruits daily (Oladoyinbo *et al*, 2019). Less than half of the students of the University of Ibadan consumed fruits on daily basis (Obayelu *et al*, 2018). In a study conducted among students of higher institution in Oyo State, 63% of the students were inadequate in their fruit intake (Layade and Adeoye, 2014). In Lagos, only 5.5% of secondary school adolescents met requirement of fruit intake by consuming five portions of fruit per day (Silva *et al*, 2017) and only 15% consumed fruit among secondary school adolescents in Oredo Local Government Area (Onyiriuka *et al*, 2013). Among Abia State university students, 82% consumed fruit less than four times in a day whereas 18% consumed it more than four times in a day (Ezenwa *et al*, 2016).

Previous studies revealed inadequate fruit intakes in other African countries. In Egypt, inadequate fruit intake was found in 58% of university students (Sabbour *et al*, 2018). The situation was similar in Uganda where fruit consumption was inadequate in 50% of adolescent students (Ndagire *et al*, 2018). Among Ghanaian undergraduates, more than 91% consumed fruits less than three times per day (Nsiah-Asamoah and Amoah, 2018).

Poor knowledge of the nutritional value of fruits has the potential to adversely affect their consumption. Lack of proper education on fruit intake is one of the causes of nutritional problems in Nigeria (Obayelu *et al*, 2018). A study in Nigeria revealed low knowledge of nutrition benefits of fruits among undergraduates (Ezenwa *et al*, 2016). Access to nutrition information is believed to increase knowledge of nutrition and promote individuals' fruit consumption habits. Various channels have been used to disseminate information to individuals. These include traditional media, internet, social media, health professionals, friends, relatives and seminars (Pambo *et al*, 2014; Nsiah-Asamoah and Amoah, 2018; Quaidoo *et al*, 2018). Hence, this study examined the association between fruit consumption, nutrition knowledge and sources of nutrition information among university students.

METHODOLOGY

The study was descriptive and cross-sectional in design, involving the students of Afe Babalola University, Ado-Ekiti, Ekiti State, Nigeria. The university was purposively selected as the only private university in the State. The sample size for this study was made up of 300 undergraduate students. A multistage sampling and stratifies proportionate sampling techniques were used to select the study sample. The calculated sample size was first divided into five based on proportion of population of each college in the University. The proportion of sample size for each college was then divided by the number of Departments in the college to select participants for the study.

Data collection

Data on personal characteristics of the students, nutritional knowledge of fruit and sources of nutrition information were obtained using validated pre-tested semi structured questionnaire. Twenty questions were used to determine the nutritional benefits of fruit of the participants. Each correct response carried a weight of five points and that gave a total of 100% while incorrect response attracted no point. Participants that scored 70-100%, 50-69% and below 50% were described as having good, average and poor knowledge respectively (Ezenwa *et al*, 2016).

DATA ANALYSIS

Data analysis was analysed using statistical package for the Social Sciences (SPSS) software version 20. Descriptive statistics was carried out and the results were presented in frequencies and percentages. Chi square test was carried out to establish association between variables at 5% level of significance.

Ethical Consideration

The study was approved by the Ethical Committee of Afe Babalola University. Verbal informed consent was obtained from each respondent after the nature and purpose of the study were explained to them. The respondents were assured of confidentiality of information given.

RESULTS

Personal and socio-demographic characteristics

Table 1 shows the personal socio-demographic characteristics of the respondents. Results shows that 43.0% were males and 57.0% females. A little more than half (62.3%) of the participants were aged 20 years and above, and cut across the major ethnic groups Yoruba (34.3%), Igbo (24.3%) and Hausa (11.3%). Less than half (42.7%) of the students received a monthly allowance of ₦40,000-₦50,000, and more than half (62.3%) were in 300 and 400 level of their study.

Table 1: Personal socio-demographic characteristics

Characteristics	Frequency (N=300)	Percentage
Age (years)		
<20	113	37.7
≥20	187	62.3
Mean=21.65± 3.32		
Gender		
Male	129	43.0
Female	171	57.0
Ethnicity		
Hausa	34	11.3
Igbo	73	24.3
Yoruba	103	34.3
Others	90	30.0
Religion		
Christianity	236	78.7
Islam	64	21.3
Monthly allowance (₦)		
<20000	24	8.0
20000-29000	48	16.0
30000-39000	39	13.0
40000-50000	128	42.7
>50000	61	20.3
Level of study		
100	18	6.0
200	50	16.7
300	85	28.3
400	102	34.0
500	45	15.0

Fruit consumption of the respondents

Table 2 shows the fruit consumption of the participants. A large proportion (83.0%) of the participants consumed fruit with 64.0% consuming it less than four times in a week and 15.3% consuming it more than four times in a week. Fresh fruit was chosen by 71.3% of the respondents rather than processed fruit juice. The most commonly consumed fruits as seen on Figure 1 were apple (88.7%), citrus (86.7%), pineapple (82.7%), banana (82.3%), mango (75.3%) and watermelon (72.0%). Bush mango was consumed by only 34.0% of the participants ().

Table 2. Respondents' fruit consumption

Variables	Frequency(N=300)	Percent
Consume fruit		
Yes	249	83.0
No	51	17.0
Frequency of fruit intake/week		
Less than four times	192	64.0
Four times	27	9.0
More than four times	46	15.3
Choice of fruit		
Fresh fruit	214	71.3
Process fruit juice	86	28.7

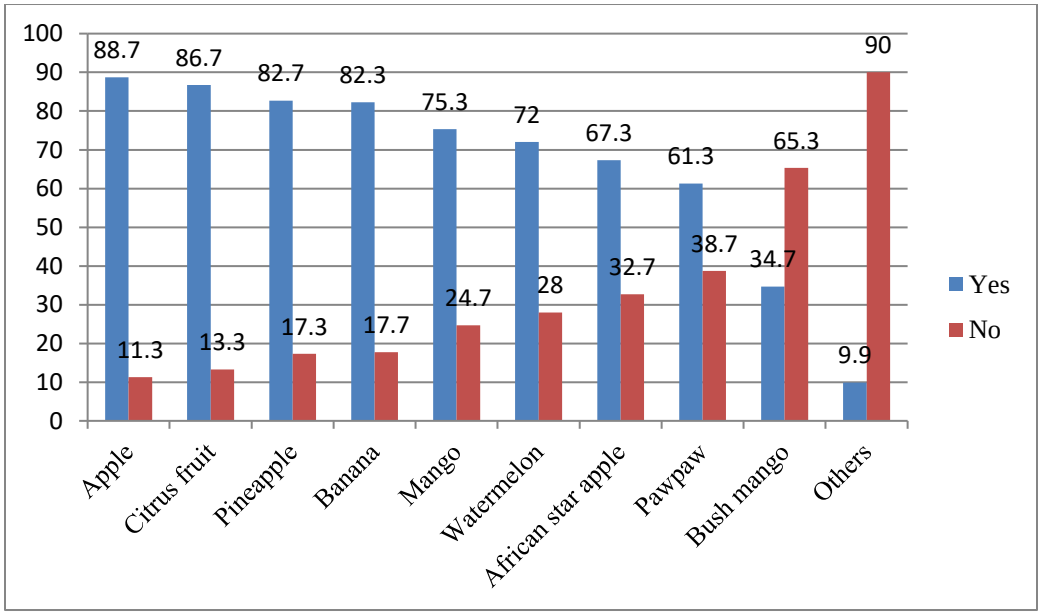

Figure 1: Types of fruit consumed

Nutrition knowledge on fruit consumption

Table 3 shows the nutritional knowledge statements on fruit. Some (27%) of the participants did not see fruits as food; a good proportion of them described fruits as a source of fat (37.7%) and protein (51.7%), and 36% of them felt that it is not healthy to eat fruit daily. Figure 2 shows that little above half (58.7%) had good knowledge of nutritional importance of fruit with more females (31.0%) than males (27.7%).

Table 3: Nutrition knowledge on fruit consumption

Knowledge statements	Yes (%)	No (%)
Fruits are food	219 (73.0)	81(27.0)
Fruits contain Carbohydrate	132 (44.0)	168 (56.0)
Fruits contain Fat	113 (37.7)	187 (62.3)
Fruits contain Protein	155 (51.7)	145 (48.3)
Fruits contain Mineral	228 (76.0)	72 (24.0)
Fruits contain Vitamin	281 (93.7)	19 (6.3)
Fruits contain Water	257 (85.7)	43 (14.3)
Fruits contain Fibre	258 (86.0)	42 (14.0)
Fruits contain organic acid	249 (83.0)	51 (17.0)
Fruits can be eaten as snacks	231 (77.0)	69 (23.0)
Fruits prevent constipation	264 (88.0)	36 (12.0)
It is not healthy to eat fruits daily	108 (36.0)	192 (64.0)
Fruits are high in fibre	206 (68.7)	94 (31.3)
Fruits protect against heart diseases	247 (82.3)	53 (17.7)
Fruits make one fat	83 (27.7)	217 (72.3)
Fruits give calorie	120 (40.0)	180 (60.0)
Fruits give antioxidants	273 (91.0)	27 (9.0)
Fruits are sources of micronutrients	248 (82.7)	52 (17.3)
Fruits are sources of roughages	216 (72.0)	84 (28.0)
Fruits are sources of water	254 (84.7)	46 (15.3)

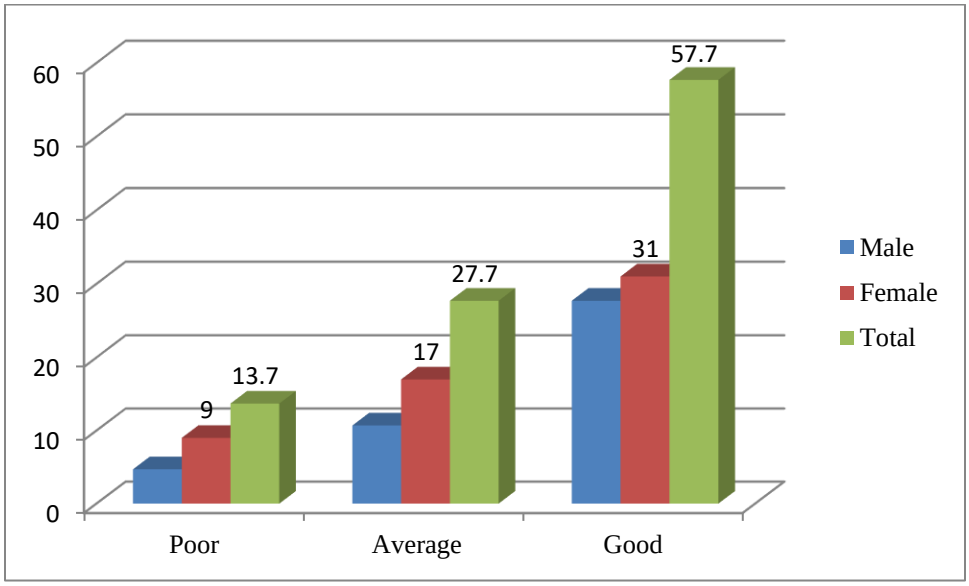

Figure 2: Nutritional knowledge score on fruit

Sources of nutrition information

The prominent sources of nutrition information among the participants were social media (87.0%), internet (85.7%), friends and relatives (83.3%), hospital (75.3%) and television (71.0%). Only 27.3% received information from radio. (Figure 3).

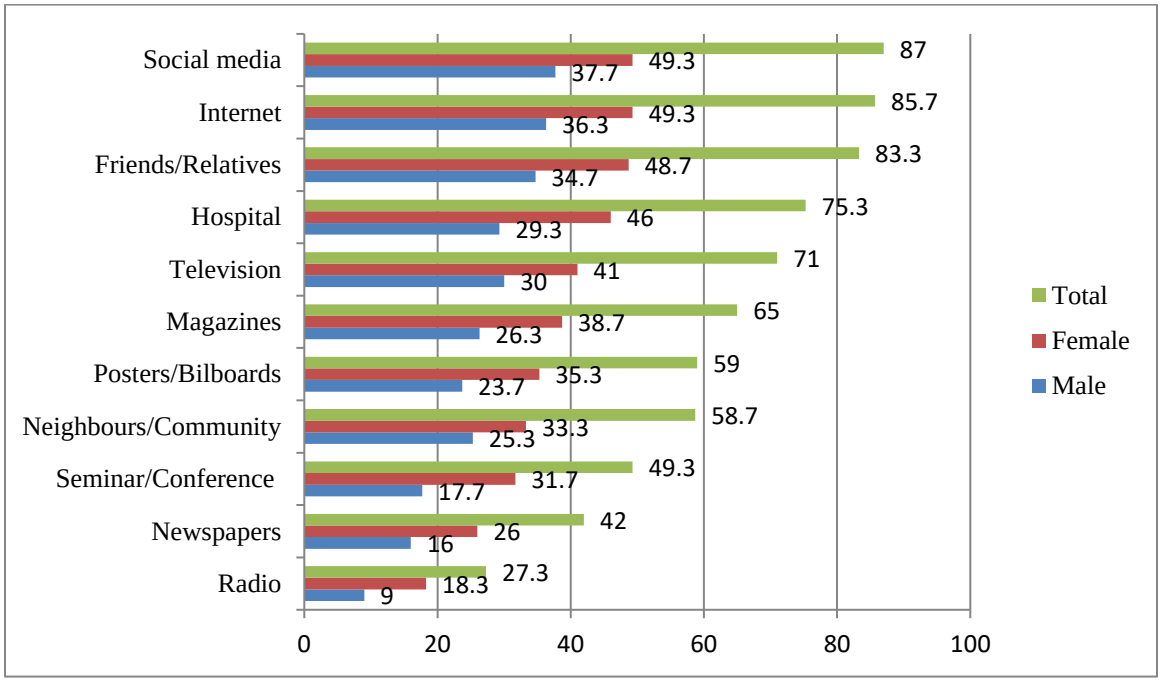

Figure 3. Sources of nutrition information

Nutritional knowledge and fruit consumption

The Chi-square analysis of the association between nutritional knowledge and fruit consumption is shown in Table 4. Nutritional knowledge had no significant relationship with fruit consumption (p=0.239), choice of fruit (p=0.263) and frequency of fruit consumption (p=0.083).

Table 4: Chi square analysis of Nutritional knowledge and fruit consumption

Fruit consumption	Knowledge score			Total N (%)	Chi-square	p- value
	Good N (%)	Average N (%)	Poor N (%)			
Consumed fresh fruit						
Yes	151 (50.3)	67 (22.3)	31 (10.3)	249 (83.0)		
No	25 (8.3)	16 (5.3)	10 (3.3)	51 (17.0)	2.867	0.239
Choice of fruit						
Fresh fruit	127 (42.3)	62 (20.7)	25 (8.3)	214 (71.3)		
Process fruit juice	49 (16.3)	21 (7.0)	16 (5.3)	86 (28.7)	2.669	0.263
Frequency of fruit intake/week						
Less than four times	124 (41.3)	46 (15.3)	22 (7.3)	192(64.0)		
Four times	15 (5.0)	10 (3.3)	2 (0.7)	27(9.0)	11.168	0.083
More than four times	22 (7.3)	15 (5.0)	9 (3.0)	46(15.3)		

*Significant at p<0.05

Frequency of fruit consumption and sources of nutrition information

Table 5 reveals the Chi-square analysis of frequency of fruit consumption and sources of nutrition information of the respondents. There exists a significant association between the frequency of fruit consumption and television (p=0.003), magazine (p=0.015), poster and bill board (p=0.018), relatives and friends (p=0.045), neighbours (p=0.036) and seminar (p=0.000) as sources of nutrition information.

Table 5. Respondents' nutrition information sources and fruit consumption

Sources of Nutrition information	Fruit consumption frequency per week			Total N	Chi-square	p-value
	<4times N (%)	4times N (%)	>4times N (%)			
Radio						
Yes	47 (57.3)	11 (13.4)	15 (18.3)	82	9.853	0.131
No	136 (63.0)	14 (6.5)	24 (11.1)	216		
Television						
Yes	135 (63.4)	21 (9.9)	31 (14.6)	213	13.693	0.003*
No	50 (57.6)	4 (4.6)	8 (9.2)	87		
Newspaper						
Yes	76 (60.3)	10 (7.9)	20 (15.9)	126	1.647	0.649
No	109 (62.6)	15 (8.6)	19 (10.9)	174		
Internet						
Yes	164 (63.8)	20 (7.8)	29 (11.3)	257	6.070	0.108
No	21 (48.8)	5 (11.6)	10 (23.3)	43		
Magazine						
Yes	128 (65.6)	20 (10.0)	21 (10.8)	195	10.438	0.015*
No	57 (54.3)	5 (4.8)	18 (17.1)	105		
Poster, bill board						
Yes	118 (66.7)	15 (8.5)	24 (13.6)	177	10.117	0.018*
No	67 (54.5)	10 (8.1)	15 (12.2)	123		
Hospital						
Yes	142 (62.8)	20 (8.8)	30 (13.3)	226	2.609	0.456
No	43 (58.1)	5 (6.8)	9 (12.2)	74		
Relatives, friends						
Yes	161 (64.4)	20 (8.0)	33 (13.2)	250	8.028	0.045*
No	24 (48.0)	5 (10.0)	6 (12.0)	50		
Neighbours						
Yes	105 (59.7)	14 (8.0)	31 (17.6)	176	8.566	0.036*
No	80 (64.5)	11(8.9)	8 (6.5)	124		
Seminar, conference						
Yes	86 (58.1)	17 (11.5)	30 (20.3)	148	24.059	0.000*
No	99 (65.1)	8 (5.3)	9 (5.9)	152		
Social media						
Yes	167 (64.0)	19 (7.3)	32 (12.3)	261	5.594	0.133
No	18 (46.2)	6 (15.4)	7 (17.9)	39		

*significant at p<0.05

DISCUSSION

The focus of this study was to examine the association between fruit consumption nutrition knowledge and sources of nutrition information among undergraduate students In this study, majority of the students were young adults, older than 20years in age and received high monthly allowance. This positioned them to be able to afford adequate fruit intake.

A large proportion of the participants consumed varieties of fruits. However, two-thirds of them consumed fruits less than four times in week showing inadequate consumption of fruit according to WHO recommendation that fruits should be part of daily diet (WHO, 2003). This result is similar to the finding of Msambichaka *et al* (2018) among Tanzanians whereby the study population did not meet the recommendation for daily intake of fruits. However, it is worse in comparison with those of Sabbour *et al* (2018) among medical students in Egypt and Ezenwa *et al* (2016) among Abia State University students in Nigeria where half of the students consumed fruits less than four times in a week and 18% of them consumed fruits more than four times a week. This disparity might be due to the difference in structure whereby students in private universities live on campus and go out occasionally on permission unlike in public universities where students are free to move around without restrictions, thereby have more opportunities to visit markets to purchase fruits. Fruits are good and reliable sources of micronutrients and inadequate intake of fruits may expose individuals to micronutrient deficiency especially vitamin C. Inadequate fruit intake has been found to be the most common risk factor for non-communicable diseases among university employees in Jos, Nigeria (Agaba *et al*, 2019). The most preferred and commonly consumed fruits such as apple, citrus, pineapple and banana are similar to the results of previous studies in Nigeria (Layade and Adeoye, 2014; Obayelu *et al*, 2018; Fadeiye *et al*, 2019; Amawulu *et al*, 2019) and among students from Ghanaian university (Nsiah-Asamoah and Amoah, 2018).

More than half of the participants had good knowledge of nutrition of fruit. Comparing this result with other studies, it is better than the findings of Ezenwa *et al* (2016) among students of Abia State University with 6% having good knowledge and Elhassan *et al* (2013) among the Ahfad university students in Sudan with more than half of the students having poor knowledge of the nutrition of fruit. This might suggest that the participants in the current study were more exposed to nutrition information. More females than males had good knowledge. This result was contrary to that of Egyptian undergraduates where knowledge for fruit consumption was higher in males than females (Sabbour *et al*, 2018) but similar to the findings of Yaya and Bishwajit (2018) among Namibia adults and Tanzanians (Msambichaka *et al*, 2018).

A large number of the students received nutrition information from social media, relatives/friends, internet, hospital and television compared to other sources of nutrition information. This finding is higher than those of Salama and Ismael (2018) with 39% receiving information from internet, 21% from newspaper, 21% from media and Ali *et al* (2015) having family (30%) and

television (30%) as the major sources of information. This current result is opposite to that of Eze and Eze (2016) in Zaria metropolis where radio was the prominent source of information on fruits. Since more than three quarters of the students received nutrition information from these sources, they can be explored to reach this population group with specific nutrition information on the benefits of fruit to good health and the need to consume it daily. Only about a quarter received information from the radio. It implies that these students appear not to be well disposed to receiving nutrition information from the radio. This suggests that radio may not be fashionable to reach this population group with nutrition information.

A little above half had good knowledge score of the nutrition of fruits but less than 10% consumed fruits more than four times a week. This might be responsible for low consumption frequency of large number of the students. This implies that good knowledge score did not translate to good practice among these students. However, it can be assumed that good knowledge will enhance good practice. This finding is higher than 6% of Abia State University students (Ezenwa *et al*, 2016) and 8% of Ain Shams University Students in Egypt (Sabbour *et al*, 2018). This suggests that greater proportion of private university students had good knowledge of the nutrition of fruits but consumed fruits less frequently compare to public university students. Meanwhile, this result is similar to that of Farhati *et al* (2019) among pregnant women in Bandung City where knowledge score was high but fruit intake frequency was low. Meanwhile, the Chi-square analysis of the association between knowledge and fruit consumption was insignificant. This implies that knowledge was not translated to practice among the participants in the current study.

The study equally reveals a relationship between the respondents' fruit consumption frequency and nutrition information sources. The nutrition information sources that had significant relationship with fruit consumption frequency were television, magazine, poster and bill board, relatives and friends, neighbours and seminar. This outcome suggests that these sources of information can be potential channels that can be used to pass across nutrition information on fruit.

University campus can be a window of opportunity to improve on fruit consumption pattern in the population. There is need for specific nutrition education messages for this population group using prominent channels of information they are familiar with such as social media, television and hospital. For instance, message on consumption of fruit as snack can help improve fruit consumption pattern. A study at the University of Calabar, Nigeria revealed that about two-thirds of adults consumed pastries and biscuits compared to one-fifth of them that consumed fruits as snacks (Onyenweaku *et al*, 2019).

CONCLUSION AND RECOMMENDATION

The consumption of fruit among the students was revealed to be low in spite of their fairly high knowledge of the nutrition benefits of fruits. The sources of nutrition information that were associated with fruit consumption frequency include relatives and friends, and television. These communication channels can be explored to reach the students with

specific nutrition information on fruit in order to improve their fruit consumption. Hence, nutrition education is recommended among this population group.

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