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Assessment of Nutrition Knowledge, Fruits and Vegetable Consumption Pattern among Undergraduates of University of Nigeria, Nsukka

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Abstract

This study assessed the nutrition knowledge, and fruit and vegetable consumption patterns among undergraduates of the University of Nigeria, Nsukka. The study adopted a descriptive cross-sectional survey design involving multistage sampling of 415 students from a population of 44, 210 students. A validated questionnaire was used to elicit information on socio-demographic data, sources of nutritional information, and the barriers influencing fruit and vegetable consumption. Information on fruit and vegetable consumption was obtained using a food frequency questionnaire. Respondents' knowledge was evaluated based on 10 questions, each carrying a weight of ten making a total of 100%. This was categorized as good (≥70%), average (50-69%), and poor (<50%). Chi-square was used to establish a significant relationship among variables at p≤ 0.05. The result revealed that the majority (51%) had poor knowledge of the nutritional value of fruits and vegetables. A total of 96.2% consumed fruits and vegetables weekly but only 20.9% consumed them daily. The respondents mostly consumed bananas, oranges, and pineapples. Most of the vegetables were used daily. The barriers to fruit and vegetable consumption identified were cost, seasonal availability, fondness, and taste of the fruits. The prominent sources of nutritional information were social media and radio/television. Age, marital status, monthly allowance, and level of study had a significant relationship (P≤ 0.05) with knowledge of the nutritional value of fruits and vegetables. The study concludes that there was inadequate fruit consumption among the respondents, which coincides with their poor knowledge of the nutritional value of fruits and vegetables. Thus, universities should work with nutritionists to organize nutrition education programmes that teach students about the health benefits of fruits and vegetables, proper consumption habits, and practical ways to include them in their daily diets.

Introduction

Fruits and vegetables are recognized as an important component of an adequate and healthy diet, playing an important role in the prevention of various diseases and the maintenance of overall health. Fruits refer to the fleshy, seed-associated structures of plants that are typically sweet and edible

in their raw state. Common examples include apples, oranges, grapes, strawberries, and bananas, all of which are rich in essential nutrients (Fadeiye et al., 2019). These foods are not just a source of sustenance; they provide a wealth of micronutrients, such as potassium, folate, and dietary fiber, which are vital for normal bodily functions (Dada &Ebikeme, 2021). Additionally, fruits are an excellent source of antioxidant nutrients, particularly vitamin C, which is essential for wound healing, maintaining healthy teeth and gums, aiding iron absorption, protecting the body's cells from oxidative damage, and boosting the immune system (Turcotte, 2010). The low caloric and fat content of fruits, combined with their high dietary fiber and phytochemical content, contribute significantly to their health benefits, making them a critical component in disease prevention strategies (Obayelu et al., 2018).

The regular consumption of fruits has been strongly associated with the control and management of various non-communicable diseases (NCDs), including obesity, hypertension, cardiovascular diseases, diabetes, and stroke (WHO, 2014). On the contrary, insufficient fruit intake has been identified as a major dietary risk factor, contributing to the global burden of malnutrition and diet-related NCDs, including undernutrition and micronutrient deficiencies (Pem & Jeewon, 2015). The Global Burden of Disease study estimates that inadequate fruit consumption is responsible for over 2 million deaths annually, highlighting the critical need to promote increased fruit intake (Global Burden of Disease Collaborators, 2019). Given the important benefits of fruits, the inclusion of vegetables in the diet further increases the health benefits.

Vegetables refer to any part of the plant, excluding fruits and seeds, consumed as food. They are essential for human health, providing a rich source of vitamins, minerals, and dietary fiber, which are crucial for maintaining the nutritional quality of diets (Ramya & Priya, 2019). Like fruits, vegetables are associated with a reduced risk of chronic diseases, including coronary heart disease, certain types of cancer, depression, type 2 diabetes, and weight gain. The WHO estimates that low vegetable intake, particularly in inadequate diets, is responsible for about 31% of ischemic heart disease and 11% of stroke worldwide (Ramya & Priya, 2019). Thus, fruits and vegetables together form a cornerstone of a nutritious diet, and their adequate consumption is critical for the prevention of numerous chronic and non-communicable diseases (Kpodo et al., 2015).

Recent data from the World Health Organization (WHO) have shown alarming trends in global health, with approximately 3.9 million deaths in 2017 alone linked to insufficient fruit and vegetable consumption (Ahmad et al., 2020). The impact of fruit and vegetable consumption extends beyond physical health, influencing mental well-being as well. Studies have found that individuals who meet the recommended daily intake of fruits and vegetables are less likely to experience moderate or high levels of psychological distress compared to those who do not (Richard et al., 2015; Bishwajit et al., 2017). Developing healthful eating

habits early in life is essential in mitigating the risk of chronic diseases later in life, making it necessary to focus on improving dietary practices and nutrition knowledge among younger populations, particularly university students.

Nutrition knowledge plays a crucial role in shaping dietary behaviors, yet there is a significant gap in this knowledge among Nigerian university students. Nutritional knowledge refers to an individual's understanding of the health benefits of food and its nutrients, which influences food selection and dietary habits (Zarnowiecki et al., 2012). While individuals with higher nutrition knowledge are more likely to make healthier food choices, there is often a disconnect between knowledge and behavior. This gap highlights the importance of nutrition education, both formal and informal, in encouraging positive dietary behaviors. For university students, who are in a transitional phase of life, the lack of adequate nutrition knowledge can lead to poor dietary choices, which not only affect their current health but also have long-term implications for their well-being and academic performance (Oti & Eshun, 2020).

In Nigeria, the situation is particularly concerning, as fruit and vegetable consumption is notably low (Obayelu et al., 2018). Several factors contribute to this, including lifestyle changes, the high cost of fresh produce, and a general lack of awareness about the nutritional value of fruits and vegetables (Obayelu et al., 2018; Fadeiye et al., 2019). University students, who typically fall within the age range of 16-22 years, represent a unique demographic that is particularly vulnerable to poor dietary choices (Ezenwa et al., 2017; Fadeiye et al., 2019). This age group is often faced with the challenge of making independent food choices for the first time, a task that many are unprepared for. The transition from living with family to living independently can lead to unhealthy eating habits, such as skipping meals, consuming fast food, and neglecting the intake of fruits and vegetables (Okafor et al., 2018).

The low intake of fruits and vegetables among Nigerian university students is a pressing public health concern. The WHO's recommendation of a daily consumption of at least 400g of fruits and vegetables is not being met, and this shortfall is contributing to an increased risk of morbidity and mortality within this population (WHO, 2003; Fadeiye et al., 2019). The shift away from traditional diets rich in fruits and vegetables towards processed foods high in fat and sugar has exacerbated this problem, leading to an increase in diet-related health issues (Obiakor-Okeke et al., 2014). University students, who often live away from home for the first time, are particularly vulnerable to these dietary changes. The lack of nutrition education and the unfamiliarity with making independent food choices result in poor nutrition practices that can have serious health consequences. Given the importance of adequate nutrition in maintaining health and preventing disease, this study sought to assess the level of nutrition knowledge and the patterns of fruit and vegetable consumption among undergraduates in University of Nigeria, Nsukka.

Objectives of the study

The objectives of this study were to:

1. determine the level of nutritional knowledge of the undergraduates in the University of Nigeria, Nsukka;
2. assess the fruit and vegetable consumption pattern of the undergraduates;
3. ascertain the relationship between the nutritional knowledge and the socio-demographic characteristics of the undergraduates and;
4. identify the factors that influence the consumption of fruits and vegetables among the undergraduates.

Methodology

Study design: The study employed a descriptive survey design to assess the nutritional knowledge and fruit and vegetable consumption patterns of undergraduate students. A descriptive design aims to gather data from a large population in order to describe the current status, opinions, behaviours or characteristics of that population. This design was appropriate for this study as it allowed the researcher to collect and analyze data on the knowledge and pattern of consuming fruits and vegetables by the undergraduate students.

Study population: The total population for the study was 44,201 undergraduate students in University of Nigeria Nsukka. This information was obtained from the ICT department of the university which is responsible for documenting the number of students enrolled.

Sample size and sampling procedure: Using Yamane (1967) formula, a sample size of 415 respondents was determined after accounting for non-response. A multistage sampling technique was employed for the study, beginning with the random selection of 10 faculties, representing more than 50% of the university's faculties. Proportional sampling was then used to allocate the sample size across these faculties, followed by a random selection of respondents in each faculty.

Instrument for data collection: Data was collected using a structured questionnaire designed to obtain information on socio-demographic characteristics, fruit and vegetable consumption patterns, and nutritional knowledge of the respondents. Consumption patterns were assessed using a food frequency questionnaire, and nutrition knowledge was evaluated through a series of yes/no questions, with scores categorized as good (70-100%), average (50-69%), or poor (below 50%) following Dada and Ebikeme's (2021) guide.

Validation and reliability of the instrument: The questionnaire was content validated by three experts and tested for reliability using Cronbach's Alpha with a score of 0.86 showing good consistency of test instruments.

Method of data collection: Two research assistants were recruited and trained to distribute and collect the questionnaires, ensuring a high response rate of 96%, with 398 complete questionnaires used for analysis.

Data and statistical analysis: Data were analyzed using Statistical Product for the Service Solution (IBM-SPSS) version 23.0. Descriptive (mean, frequency and percentage) statistics were used to summarize the data while Chi square was

used to establish significant relationships among variables at $p \leq 0.05$.

Results

Demographic characteristics of the respondents

The socio-demographic characteristics of the respondents showed that the majority (60.8%) were aged 21-25, followed by 25.9% aged 16-20 years, 9.5% aged 26-30, while a few of the respondents were above 30 years. Most of the respondents (93.7%) were single, with 5% married and 1.3% widowed. More than half (57.3%) of the respondents were female, while 42.7% were males. Additionally, (30.2%) of the respondents received less than ₦10,000 as a monthly allowance, 55% received between ₦10,000-29,000, 11% received between ₦30,000-49,000, and 3.8% received over ₦50,000 monthly allowance. Furthermore, 31.2% were in their 400 level, 24.1% in 300 level, 17.3% in 200 level, 16.3% in 100 level; 9.5% in 500 level, and 1.5% in 600 level.

The level of nutritional knowledge of the respondents

Figure 1 presents the respondents' level of nutrition knowledge on fruits and vegetables. About half (50.8%) of the respondents had poor nutrition knowledge of fruits and vegetables, while 34.9% and 14.3% had good and average nutrition knowledge of fruits and vegetables respectively.

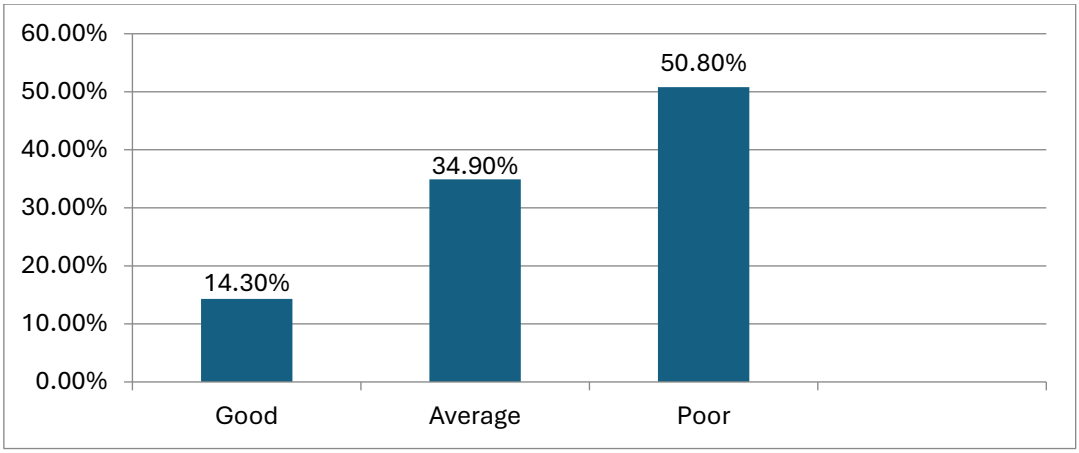

Fig 1: Level of nutrition knowledge of the respondents

Respondents' pattern of consuming fruits and vegetables

Table 1 presents the results on the fruit and vegetable consumption patterns of the respondents. The result revealed that a greater portion (62.2%) of the respondents consume fruits and vegetables, with 52.8% consuming them 2 to 3 times per week, and 20.9% consuming them daily. In terms of consumption preferences, over half (65.8%) of the respondents prefer to consume fruits in their whole form. Meanwhile, 25.6% favour processing fruits into smoothies, while 4.8% and 3.8% prefer to consume fruits as salads and packaged fruit juice respectively.

Table 1: Fruit and vegetable consumption pattern of the respondents

Variable	Frequency	Percentage
Consumption of fruits and vegetables		
Yes	383	96.2
No	15	3.8
Frequency of Fruits and Vegetables Consumption		
Daily	83	20.9
Once a week	35	8.8
2-3 times a week	210	52.8
4-5 times a week	65	16.3
Never	5	1.3
Fruits Consumption Preference		
As Whole fruit	262	65.8
As packaged fruit juice	15	3.8
As Smoothie	102	25.6
As Fruit salad	19	4.8

Factors affecting respondents' fruit and vegetable consumption

Table 2 shows the mean ratings of the respondents' responses on the factors affecting their consumption of fruits and vegetables. The result revealed that all factors, except item 10, were rated above the mean cut-off point of 3.0 on a five-point rating scale. This indicates that the respondents generally agree that the major factors affecting their fruit and vegetable consumption include the cost of the fruits and vegetables ($\bar{x}$=4.18), availability of fruits and vegetables in the school environment ($\bar{x}$=4.17), seasonality ($\bar{x}$=4.17), personal preference or fondness ($\bar{x}$=4.15), taste ($\bar{x}$=3.95), and appearance ($\bar{x}$=3.77). However, respondents disagreed ($\bar{x}$=2.68) with the notion that fruits and vegetables are unsatisfying or do not make one full and therefore, did not consider it a factor.

Table 2: Factors that Influence Fruits and Vegetable Consumption

Factors	Mean	S. D	Decision
Personal preference or fondness	4.15	1.27	Agree
Taste	3.94	1.22	Agree
Appearance	3.77	1.09	Agree
Seasonality	4.17	1.09	Agree
Cost	4.18	1.08	Agree
Health conditions	3.91	1.09	Agree
Availability in school environments	4.17	0.89	Agree
Poor storage capacity	3.74	0.96	Agree
Fruits and vegetables take time to prepare, and consume	3.02	1.16	Agree
Fruits and vegetables do not satisfy or make one full	2.68	1.03	Disagree
Unsure of the source of the fruit and vegetable	3.13	0.99	Agree

Mean ≤ 3.0 is agree, *S.D, Standard deviation*

Sources of respondents' nutritional information

Table 3 shows the respondents' sources of nutritional information. Data revealed that the majority (94.2%) rely on social media as their primary source of nutritional information; followed by radio/television (86.4%), friends (82.4%), seminars (73.4%), and hospitals (66.6%).

Table 3: Respondents' sources of nutritional information

Sources	Yes F (%)	No F (%)
Radio/television	344(86.4)	54(134.6)
Friends and relatives	328(82.4)	70(17.6)
Seminars/conferences	292(73.4)	106(26.6)
Social media	375(94.2)	23(5.8)
Hospital	265(66.6)	133(33.4)
Total	**398**	**100.0**

F = frequency; % = percentage

Relationship between respondents' nutritional knowledge and their socio-demographic characteristics

Table 4 presents the relationship between the respondents' nutritional knowledge and their socio-demographic characteristics. From the table, age, marital status, monthly allowance and level of study correlated significantly with the respondents' nutritional knowledge ($p < 0.05$). Data reveals that approximately 39% of the respondents aged 21-25 years and 60% of those above 30 years had good and average nutritional knowledge, respectively. In terms of marital status, more single respondents (52%) had poor nutritional knowledge compared to other groups.

Students whose monthly allowances were between ₦10,000-29,000 (54%) had poor knowledge compared to other groups. More students in the 600 level (83%) demonstrated good nutritional knowledge, compared to students in other levels. Although gender did not correlate significantly with respondents' nutritional knowledge ($p > 0.05$), more females (54%) than males (46%) exhibited poor nutrition knowledge while more males (38%) had good nutrition knowledge compared to their female counterparts.

Table 4: Relationship between respondents' nutritional knowledge and their socio-demographic characteristics

Variable	Good F(%)	Average F(%)	Poor F(%)	Total F(%)
Age (years)				
Below 16	2(1.4)	3(5.3)	5(2.5)	10(2.5)
16-20	40 (28.8)	8(14%)	55(27.2%)	103(25.9%)
21-25	87 (62.6)	37(64.9%)	118(58.4%)	242(60.8%)
26-30	8 (5.8)	6(10.5%)	24(11.9%)	38(9.5%)
Above 30	2 (1.4)	3(5.3%)	0(0%)	5(1.3%)
	χ^2 =19.621, df = 8, p-value = 0.012*			
Gender				
Male	65(46.8%)	27(47.4%)	78(38.6%)	170(42.7%)
Female	74(53.2%)	30(52.6%)	124(61.4%)	228(57.3%)
	χ^2 = 2.824, df = 2, p-value – 0.244			
Marital Status				
Single	135(36%)	44(12%)	194(52%)	373(93.7%)
Married	4(20%)	8(40%)	8(40%)	20(5.0%)
Widowed	0(0%)	5(100%)	0(0%)	5(1.3%)
	χ^2 =42.801, df = 4, p-value = 0.000*			
Monthly allowance				
Less than ₦ 10,000	42(35%)	14(12%)	64(53%)	120(30.2%)
₦10,000-29,000	68(31)	34(15)	118(54)	220(55)
₦ 30, 000-49,000	19(44)	9(21)	15(35)	43(11)
₦ 50,000 and above	10(67%)	0(0%)	5(33%)	15(3.8%)
	χ^2 =25.289, df = 10, p-value = 0.005*			
Level of study				
100	20(31%)	13(20%)	32(49%)	65(100%)
200	24(35%)	3(4%)	42(61%)	69(100%)
300	44(45.8%)	12(12.5%)	40(41.7%)	96(100%)
400	36(29%)	24(19%)	64(52%)	124(100%)
500	10(26%)	4(11%)	24(63%)	38(100%)
600	5(83%)	1(17%)	0(0%)	6(100%)
	χ^2 =25.933, df = 10, p-value = 0.004*			

F = frequency; % = percentage; $\chi 2$ = Chi-square value; df = degree of freedom; *Correlation is significant at p<0.05

Discussion

The demographic characteristics of the respondents obtained from this study were consistent with those of Dada and Ebikeme (2021) and Fadeiye et al. (2019) who had similar population. In this study, majority of the respondents were young adults, females and single. This confirms that the undergraduates are young adults who are yet to start family life. This study also revealed that the respondents receive a monthly allowance that is less than ten thousand naira. This also shows that many of them depend on their parents or

guardians for their upkeep. This is in line with Fadeiye et al. (2019) who reported that the average Nigerian student, irrespective of gender receives about five to ten thousand naira as a monthly allowance.

Nutrition knowledge simply refers to the awareness and understanding of the concepts and processes relating to diet and health (Żarnowski et al., 2022). This study revealed that approximately half of the respondents have poor nutrition knowledge of fruits and vegetables, a finding with serious health implications. This lack of awareness may lead to inadequate consumption of these important foods, increasing the risk of diet-related diseases such as obesity, diabetes, and cardiovascular issues. The result obtained from this study may be attributed to insufficient access to proper nutritional information by the respondents. This report aligns with that of Ezenwa et al. (2016) who revealed low knowledge of the nutritional benefits of fruits among undergraduates at Abia State University, Uturu. This result is however in contrast with that of Dada and Ebikeme (2021) who reported a high knowledge among university students in Ekiti state. This they attributed to a better exposure of the students to nutritional information.

Fruits and vegetable consumption patterns simply refer to the quantity, variety, and frequency with which fruits and vegetables are habitually consumed in an individual's diet (Mahmood et al., 2021). The findings of this study revealed that many undergraduates consume fruits and vegetables, with the majority consuming them two to three times per week. While the result may suggest that students include fruits and vegetables in their diets, the frequency and manner of consumption may not be sufficient to meet the recommended daily intake, which could have significant implications for their health. This is in line with the findings of Sabbour et al. (2018) who reported that insufficient fruit and vegetable consumption has been observed to be a challenge to undergraduates. This also supports the report of Aduloju et al. (2019) who stated that the consumption of fruits and vegetables in Africa is low and below the recommended daily intake. The fact that less than a third of the respondents consume fruits and vegetables daily aligns with the earlier finding that 50.8% of the students had poor nutritional knowledge. Thus, this emphasizes that a lack of proper knowledge may contribute to poor consumption patterns. The preference for consuming fruits in whole form is a good practice, as it allows the body to benefit from the dietary fiber present in the pulp, which aids digestion, prevents constipation, and helps reduce blood cholesterol levels, thereby decreasing the risk of heart disease according to Barber et al. (2020). However, the low percentage of students consuming fruits and vegetables daily indicates a problem in dietary habits that could have long-term health consequences if not addressed.

Factor refers to a circumstance that prevents or encourages an individual from doing something or engaging in certain behaviours (Garcia et al., 2022), such as the consumption of fruits and vegetables. The findings of this study revealed that the cost of fruits and vegetables is a major factor influencing students' consumption of fruits and vegetables. Fruits and vegetables that are expensive may be consumed less by students, whereas they are more likely to consume cheap ones. However, it is likely that nutritious and high-quality fruits and vegetables may not be easily affordable to students. This issue aligns with the economic constraint often faced by students. With limited monthly allowances, students may prefer to purchase other necessities over

fruits and vegetables. This finding is in line with Layade and Adeoye (2014), who suggested that increasing the students' allowances could lead to a higher consumption of fruits and vegetables. The availability of fruits and vegetables within the school environment also impacts the respondents' consumption. Students may not have the time or energy to source these fruits outside the campus, further reducing their intake. This challenge is complicated by the seasonal availability of certain fruits and vegetables, which limits consistent access throughout the year. Personal preferences, taste, and appearance were also indicated as barriers, indicating that even when fruits and vegetables are available, students may choose not to consume them. These barriers are similar to those reported by Hartmann et al. (2018) who identified economic hindrances, social, food selection habits, and attitudes as major challenges to fruit and vegetable consumption among students.

The result showed that many of the respondents source their nutritional information from social media, radio and television, friends, seminars, and hospitals. These findings are consistent with those of Dada and Ebikeme (2021) who similarly reported that students' sources for nutritional information are from social media, radio, and television. The high reliance on social media is likely due to the widespread use of digital platforms among undergraduates, who find it more accessible and engaging compared to other sources. However, this heavy dependence on social media raises concerns about the reliability of the information students receive. Unlike more regulated sources like hospitals or seminars, social media content can vary widely in accuracy, potentially leading to misinformation. This issue is particularly troubling when considering the earlier finding that 50.8% of students have poor nutritional knowledge. If students are frequently exposed to inaccurate or misleading information online, it could further worsen their already limited understanding of nutrition, leading to poor dietary choices.

The findings of this study reveal several significant relationships between respondents' socio-demographic characteristics and their knowledge of the nutritional values of fruits and vegetables. Age was significantly related to nutritional knowledge, with many of the respondents aged 21-25 years and those above 30 years exhibiting good and average knowledge respectively. This suggests that as students mature and gain more life experiences, their awareness and understanding of nutrition improve. This aligns with the findings of Onyeji and Ejike (2020), who also reported that age significantly influences the nutritional knowledge of students at Alex Ekwueme Federal University Ndufu-Alike, Ikwo. Gender differences in nutritional knowledge were also observed, with males having more good knowledge than females. However, the study found no significant relationship between gender and nutritional knowledge. This result is in line with Ifebajo et al. (2020) who had similar reports among residents of Somolu L. G. A. of Lagos state, but contrasts with the findings of Aluyor and Oligbi (2020) who reported equal levels of nutritional knowledge between male and female students.

Furthermore, the study identified a significant relationship between marital status and nutritional knowledge with married respondents having more good nutrition knowledge compared to others. This is expected because these individuals now have an additional responsibility for taking care of the nutritional needs of their family members. Again, monthly allowance

also played a significant role. Students with higher monthly allowances exhibited good knowledge, while those with lower allowances exhibited poorer knowledge. This suggests that finances significantly impact students' ability to access and utilize nutritional information, as those with more disposable income are likely to have better access to nutritious foods and educational resources. The findings of the study also revealed that the level of study was significantly related to nutritional knowledge. Students in the final year of university had more good nutrition knowledge compared to students in other levels, which could be attributed to their advanced stage in the university, where they may have had more opportunities to learn about nutrition either through formal education or personal experience. This is however not consistent with Elzaki et al. (2019) who reported no significant relationship between the level of study and nutritional knowledge among university students.

Conclusion

The study assessed the nutritional knowledge and fruit and vegetable consumption patterns of undergraduates of the University of Nigeria, Nsukka. Based on the findings, the study concludes that nutritional knowledge of fruits and vegetables among undergraduates is generally low, with over half of the respondents exhibiting poor knowledge. The study identified major socio-demographic characteristics including age, marital status, and monthly allowance that significantly influenced this nutritional knowledge. The study also revealed that while most students consume fruits and vegetables, the frequency and quality of their consumption are insufficient as only a small fraction consumes them daily. Factors such as cost, seasonality, availability, and personal preferences further affect adequate consumption of fruits and vegetables. The reliance on social media as the primary source of nutritional information raises concerns about the accuracy and reliability of the information students receive. Therefore, there is an urgent need for more structured and reliable sources of nutritional education, both within the academic curriculum and through extensive public health programmes.

Recommendations

The following recommendations were suggested by the researcher based on the findings.

1. Universities, in collaboration with nutritionists should organize nutrition education programmes that focus on the importance of fruits and vegetables. This is to enhance the students' understanding of the health benefits, proper consumption patterns and practical ways to incorporate these foods into their daily diets.
2. The university should collaborate with local farmers and vendors to ensure that fruits and vegetables are readily available and affordable within the campus. Initiatives such as subsidized prices could help encourage higher consumption rates among students.

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