Available online: http://journal.ipb.ac.id/index.php/jgizipangan
ISSN 1978-1059 EISSN 2407-0920
J. Gizi Pangan, November 2022, 17(3):157-166
DOI: https://doi.org/10.25182/jgp.2022.17.3.157-166

Research Article

Consumer Fruit Preferences: The Role of Nutrition Knowledge in Fruit Purchase and Consumption

Eridiong O. Onyenweaku[1,2*]
[1]Food Evolution Research Laboratory, School of Tourism and Hospitality, College of Business and Economics, University of Johannesburg, Auckland Park 2006, South Africa
[2]Department of Human Nutrition and Dietetics, Faculty of Basic Medical sciences, University of Calabar, Calabar 540271, Nigeria

Article History:
Received *05-07-2022*
Revised *14-09-2022*
Accepted *21-10-2022*
Published *30-11-2022*

Keywords:
consumers preferences, consumption pattern, fruit choices, nutrition knowledge, plant-based diet

[*]**Corresponding Author:**
tel: +2348037217115
email: eridiongo@uj.ac.za

ABSTRACT

This study aims at ascertaining consumer fruit preferences and role of nutrition knowledge in consumers' attitudes and practice as it concerns fruit consumption. An online questionnaire was used for this cross-sectional survey carried out in South Africa. The questionnaire link was circulated in the nine provinces for 4weeks; information gathered include sociodemographic data, respondents' nutrition knowledge, and consumer fruit preferences alongside their fruit consumption patterns. Based on their responses, Nutrition Knowledge Scores (NKS) were calculated. Pearson correlation test was used to check for any relationship between the NKS, some sociodemographic factors and fruit preferences/consumption (significance was accepted at $p<0.05$). Three provinces; Gauteng, North West and KwaZulu-Natal accounted for over 70% of the 517 responses received. Almost half of the surveyed population had high NKS (45.5%) while 27.3% scored moderately and another 27.3% low. The most preferred fruits were oranges, bananas, and mangoes; others such as plums and berries were also preferred but not as consumed as the others due to their seasonal nature. The results show a positive relationship ($p<0.001$) between nutrition knowledge and fruit consumption frequency and healthy dietary patterns, but only significant but weak correlation between respondents' nutrition knowledge and priority factors that affect their dietary product choices and purchases. Nutrition education is vital in enhancing awareness that will in turn yield positive results in fruit consumption and health outcomes.

INTRODUCTION

Dietary choices are driven by many factors such as economic power, nutritional benefits, sensory qualities, nutrition awareness and holistic health outcomes of food purchases (Chivenge *et al.* 2015). Due to the importance of healthy diets in the maintenance of health and prevention of diseases, current researches examine the complex relationships between diet and disease, consumer knowledge and dietary patterns, economic status and purchasing behavior relating to various foods, including organic, genetically modified, and conventional (Muchiri *et al.* 2016). Globalizations and industrialization have brought about a lot of changes (both positive and negative) in lifestyle, food choices and dietary patterns (Frison *et al.* 2005; Kucich & Wicht 2016). Some positive changes brought about by industrialization include technological advancements in healthcare, communications and use of sophisticated software for information and dietary monitoring; the negative changes include increase in air and water pollution thereby reducing food safety/quality, sedentary lifestyle and consumption of junk foods etc. The upsurge in cases of non-communicable and infectious diseases is also a growing cause for concern. Medical professionals are now employing dietary management in addition to synthesized drugs used in the treatment and management of diet-related diseases (Onyenweaku *et al.* 2019). This is due

to the fact that over the years, the role of proper nutrition and adequate diet has been established. Research has shown that plant-based diets comprising of mostly fresh fruits and vegetables, are healthier than over-processed animal-sourced foods (Kucich & Wicht 2016).

Knowledge/awareness significantly influences people's choices, lifestyle and inadvertently their health outcomes; hence it is imperative that people have correct information with regards to food and health (Wardle *et al.* 2000; Nyawo *et al.* 2020). According to Kucich and Wicht (2016), a daily consumption of more than 7 portions of fruit and vegetables significantly reduces the risk of death from any disease, "yet many South Africans living below the poverty line have a very low or even zero intake of fruit and vegetables". Nutrition education on the importance of consuming healthy but affordable diet needs to be achieved by promoting indigenous alternatives that are of higher nutritional quality or equal to that of "exotic" fruits.

Some past researches observed that knowledge of healthy foods (or higher educational status generally) remarkably influences dietary habits and health status (Barreiro-Hurle *et al.* 2010; Webbink *et al.* 2010), while some others establish that such influences may vary based on individual personalities (i.e. cross-sectional heterogeneity). Conversely, the studies all assert that nutrition knowledge influences dietary patterns in the same way irrespective of their financial levels (Shimokawa 2013). This assumption may be controversial based on recent discoveries that consumers may respond differently in different economic situations (Shimokawa 2010; 2013).

Statistics also show the positive relationship between consumption of plant foods and household earnings as seen in the fact that lower socioeconomic groups have more limited choice of nutrient-dense fruits - apples, bananas and oranges being the preferred choice (Jansen & Stoltz 2008; Kumar *et al.* 2021). "A nutrient dense diversified diet may cost 69% more on average, so where households are reliant on grants and pensions, meeting this extra cost becomes prohibitive" (Temple *et al.* 2011). Most times, people select foods (including fruits) due to on certain reason(s). Various factors influence people's food choices/preferences, and they include: wholesomeness and nutritional value, cost, and currently the processing techniques (natural/organic, Genetically Modified-GM), as well as cultural values and possible environmental impact (Wunderlich & Gatto 2016). For instance, many published studies report that consumers' understanding of GM foods is poor. Many consumers are therefore very cautious with regards to GM foods, one study reported that "over 70% believe that GM-food production is unsafe for all living things" (Turker *et al.* 2013).

In order to comprehend variations in food product choices/preferences, various forces, both external (e.g. characteristics of the food products) and internal (e.g. past experience) that struggle for consumers' attention, must be taken into consideration (Lindberg *et al.* 2018). Nevertheless, the degree to which these forces ultimately affect consumers' purchasing choices varies with individual personalities, analyzing them will certainly increase understanding of consumers' purchase decision processes with regard to food and, thus, facilitating proper planning for food industry stakeholders (Garber *et al.* 2003; Lindberg *et al.* 2018). Consequently, there is the need to ascertain the extent to which presently nutrition knowledge influences consumers' consumption of fruits, their fruit preferences and ultimately - purchases. This will enable stakeholders increase nutrition education (where necessary), encourage proper food labelling and enforce policies that promote production/consumption of plant foods (fruits and vegetables) in order to improve health and increase life expectancy.

METHODS

Design, location, and time

The research design of this study is an online cross sectional survey. The nine (9) South African provinces were covered by this online survey namely Gauteng, North West, Northern Cape, Free State, Eastern cape, Western cape, KwaZulu-Natal, Limpopo and Mpumalanga. The choice of South Africa for this study was as a result of the 2 main researchers being resident in this country for data collection and the rich diversity of fruits present in the country. South Africa is also comprised of people from different races, nationals and continents; this helps in gathering views from people of different cultures and backgrounds. The survey took about six weeks – May to June, 2021. The ethical clearance for this study was obtained from the School of

Tourism and Hospitality Research and Ethics Committee, University of Johannesburg with the code - 20STH04.

Sampling

The study population consisted of 517 respondents who participated in the online cross-sectional survey, from the nine South African provinces mentioned above. Summarily, the number of responses from the different provinces were: Gauteng (222), KwaZulu-Natal (56), North West (110), Free State (23), Eastern Cape (26), Western Cape (26), Northern Cape (12), Limpopo (17) and Mpumalanga (25). The survey was distributed across diverse to people of different socio-economic class and culture. A target sample size of 384 was calculated using the Leslie Kish formula, as shown below:

$$n=Z\times Z.p(1-p)/e\times e \text{ (Kish 2017)}$$

Where:n=estimated sample size.

Z=standard normal deviation usually set at 1.96 for 95% confidence.

p=prevalence of any disease under study put at 50% where prevalence is not ascertained.

1–p=0.5

e=degree of accuracy desired, set at 0.05 Substituting the above values, n=384

We hereby report findings on the first 517 replies to the online survey on 'Consumer fruit preferences: the influence of nutrition knowledge on fruit purchase and consumption patterns'.

Data collection

Random sampling (within the study population–South Africa), alongside the snowball sampling method, was used to recruit the study participants bringing the total sample size to 517 participants. The questionnaire link was circulated online because it was easier to gather data this way during this period due to the continued restrictions in movements and social distancing as a result of the third coronavirus wave in South Africa.

Questionnaire design and administration. In order to get data from respondents, a well-structured questionnaire was designed and used in this survey. The survey instrument was designed from a review of previous literature and content-validated by nutrition experts, then pre-tested on 20 persons. The reliability coefficient (Cronbach Alpha) of the questionnaire was 0.75. The questionnaire was structured to gather data on socio-demographics, nutrition knowledge, fruit preferences/consumption and factors that influence consumers' choices and purchase of fruits. The Microsoft word document of the questionnaire was prepared and then converted into the online survey format using Google forms which ensured anonymity of the participants. The questionnaire was circulated electronically using the online survey link which was distributed to participants via social media and electronic means (WhatsApp and emails). The dietary-related knowledge, attitudes, perceptions and practices of the participants were also covered. A review of literature from research articles and journals was employed in designing the questionnaire. Participation in the study was voluntary.

Informed consent and data privacy. Before completing the questionnaire, respondents were asked to carefully read and understand the summary of the research. The informed consent process assured survey participants that all information given were to be strictly used for research purposes. Participants' responses were recorded anonymously and kept confidential according to Google's privacy policy "(https://policies.google.com/privacy?hl=en)". Names and/or contact information were not required of participants. Furthermore, participants were allowed to stop participating in the study and leave the questionnaire page at any point before submission, and that way their responses would not be saved. Just the "submit" button was used for saving responses when tapped on. Participants voluntarily agreed to take part in this anonymous study by completing the survey.

Data analysis

The Statistical Package for Social Sciences software (SPSS, version 25.0) was used to analyse the data in this research. Descriptive statistics such as frequencies, percentages and charts, were used to define the proportion of responses for each question and the total distribution in the total score of each questionnaire. Among the questions asked, the ones pertaining to nutritional knowledge were scored and the total score of all the knowledge-related questions was 15 marks. For example, a correct response of "Yes" was scored 2 marks, "No" zero mark and "Not certain" 1 mark. Using percentiles, the scores were classified as low (2–9), average (10–12) and high (13–15). Data was recoded to get percentage scores. Significance was accepted at $p<0.05$ and Pearson's Chi square test/logistic regression

were also used to check for association between variables. Phi values were also used to ascertain the strength of association viz: <0.5=Weak association, >0.07=Strong association (Kirk 2008).

RESULTS AND DISCUSSION

Socio-demographics characteristics of the surveyed population

Table 1 presents the socio-demographic characteristics of the surveyed population (517 people). The provinces were represented thus: Gauteng (43%), North West (21%), KwaZulu-Natal (11%), Western Cape (5%), Eastern Cape (5%) and the other four provinces accounted for the remaining 15%. Females constituted 38.3% of this population and among them, 40.6% were aged between 18–29 years old while about 50% were aged between 30–49 years. Most of them had a tertiary education level (68.1%) and just few had secondary education level (23.2%) or less (8.7%). A higher percentage of them reported to be single (52.4%) while 33.3% were married. About 40% were living in a household of 1–2 persons, the others in either 3–5 person households (48.5%) or above (12.4%). They generally had a public (16.6%) or private job (19.7%), and others were self-employed (32.7%); 22.2% were unemployed. Some of them reported a low monthly income of below R5,000 i.e. 271USD (29.6%), others earned between R5,000–R20,000 (40%) i.e 271–1,086USD while about 30.3% earned above R20,000 i.e. 1,209USD per month.

Participants' nutrition knowledge scores and fruit consumption pattern

On the whole, the participants showed a good knowledge of the importance of fruit consumption in promoting health and preventing diseases (Table 2a). A good number of the participants (84.7%) agreed that fruits are important for maintain good health; although 11.4% asserted that some fruits are not good for consumption giving reasons such as 'apples are too sweet', 'lemons are too sour' and 'bananas are too starchy'. Up to 67.7% of the respondents gave the correct response that fruits contain micronutrients and antioxidants that are useful to the body, 20.3% were not sure. About 73% of the respondents had a Nutrition Knowledge Score (NKS) which was above average. With regards to their fruit consumption pattern (seen

Table 1. Socio-demographics characteristics of the sample population

Variable	Sub-variable	Frequency	%
Province	Gauteng	222	42.9
	KwaZulu-Natal	56	10.8
	North West	110	21.3
	Western Cape	26	5.0
	Eastern Cape	26	5.0
	Limpopo	17	3.3
	Mpumalanga	25	4.8
	Free State	23	4.4
	Northern Cape	12	2.3
	Total	517	100.0
Sex	Female	198	38.3
	Male	291	56.3
	Prefer not to say	28	5.4
	Total	517	100.0
Age group	18–29 years	210	40.6
	30–39 years	156	30.2
	40–49 years	100	19.3
	50–59 years	39	7.5
	60 years & above	12	2.3
	Total	517	100.0
Marital status	Single	271	52.4
	Married	172	33.3
	Divorced	48	9.3
	Widowed	26	5.0
	Total	517	100.0
Education	No formal education	17	3.3
	Primary school	28	5.4
	Secondary (High) School	120	23.2
	Tertiary institution	352	68.1
	Total	517	100.0
Monthly income	R0–R4,999	153	29.6
	R5,000–R9,999	101	19.5
	R10,000–R19,999	106	20.5
	R20,000–R29,999	73	14.1
	Above R30,000	84	16.2
	Total	517	100.0
Household size	Live alone	98	19.0
	2	104	20.1
	3–6	251	48.5
	≥6	64	12.4
	Total	517	100.0
Employment sector	Public	86	16.6
	Private	102	19.7
	Informal	45	8.7
	Unemployed	115	22.2
	Self employed	109	32.7
	Total	517	100.0

R: South African Rand

Table 2a. Respondents' nutrition knowledge scores

Questions	Answers	% responses (n=517)
Are fruits important in maintaining good health?	No	7.0%
	Yes	84.7%
	Not sure	18.3%
Do you think some fruits are not good for consumption?	No	11.4%
	Yes	88.6%
If no (to above question), mention the fruits with reason	Apples–too sweet	5.5%
	Lemons–too sour	4.5%
	Bananas–too starchy	2.4%
Fruits contain micronutrients and antioxidants that are useful to the body	True	67.7%
	False	12.0%
	Do not know	20.3%
What special potentials do you think consuming fruits may have?	Protects the body	72.3%
	Detoxifies the system	75.4%
	Boosts the body's immunity	79.4%
	Assists in weight loss	67.4%
	Improves digestion	72.6%
	No idea	28.6%
Nutritional knowledge scores	High (13–15)	45.5%
	Average (10–12)	27.3%
	Low (0–9)	27.3%

on Table 2b), the respondents mostly consumed fruits 3–6 times a week (36.6%) and some others – less than 3 times a week (36.4%). It is worthy of note that 7.2% of the respondents said they do not consume fruits at all, while only 19.9% consumed fruits on a daily basis. Supermarkets (75.2%) and local markets (72.2%) were the most popular sources of fruits while 'personal garden' was the least (39.9%). The most commonly consumed fruits reported were citrus–oranges, grapes and lemons (78.3%) > bananas (76.3%) > mangoes (70.1%) > pawpaw (68.3%). The least consumed fruits were plums (40%) followed by pineapples (58%). The most common way of consuming fruits was reported to be as whole fruits (79.2%) followed by as salads (65.5%) then as juices (64.8%). A good proportion (45.5%) of the surveyed population had high NKS while 27.3% had average scores.

Relationship between nutrition knowledge and fruit consumption patterns/frequency

Table 3a shows the results of the Regression analyses carried out on respondents' nutrition knowledge scores and fruit consumption patterns. As seen in the Table, the logistic regression model was statistically significant, chi (2)=45.613, $p<0.001$, the model correctly explains 16.6% (Nagelkerke R2) of the variation in nutritional knowledge amongst respondents. Wald test shows that respondents' nutritional knowledge significantly affects their fruit consumption. In addition, the ordinal regression model was statistically significant, chi (2)=33.609, $p<0.001$, the model correctly explains 6.9% (Nagelkerke R2) of the variation in nutritional knowledge amongst respondents. Wald test shows that respondents' nutrition knowledge significantly affects their frequency of fruit consumption, the higher the nutritional knowledge, the higher their frequency of fruit consumption. The ordinal regression model was statistically significant, chi (2)=4.077, $p<0.043$, with poor goodness of fit, the model correctly explains only 1.0% (Nagelkerke R2) of the variation in nutritional knowledge amongst respondents. Wald test shows that nutrition knowledge significantly affected the frequency of fruit consumption for COVID-19 prevention by the respondents. Similarly, in checking for association between

Table 2b. Respondents' fruit consumption patterns

Questions	Answers	% responses (n=517)
How often do you eat fruits?	I do not consume	7.2%
	Less than 3 times a week	36.4%
	3–6 times a week	36.6%
	More than 6 times a week	19.9%
Where do you obtain the fruits you consume?	From nearby farmers	42.9%
	Supermarkets/shops	75.2%
	Personal gardens	39.9%
	Local market	72.2%
Most popular way of consuming fruits: as -	As smoothies	55.4%
	As salads	65.5%
	As juices	64.8%
	As whole fruits	79.2%
	As dried fruits	45.0%
Top 5 most frequently consumed fruits	Citrus–oranges, lemons, grapes	78.3%
	Bananas	76.3%
	Mangoes	70.1%
	Pawpaw	68.3%
	Apples & English pear	68.2%

factors that consumers consider priority when purchasing food products, the result showed a positive, significant but weak correlation between respondents' nutritional knowledge and the priority factors (Table 3b).

The study population consisted more of young people who were well-educated. Most of those who earned lower monthly incomes were students who were either self-employed or working part-time jobs while studying. Almost half of the study population had high NKS with majority asserting that fruits were important in maintaining good health and preventing disease; this is similar to the report of Shimokawa (2013). A small but significant part of the surveyed population asserted that some fruits were not healthy for consumption, giving reasons such as: apples being too sweet, lemons being too sour and bananas being too starchy. To some extent, this could apply but particularly when giving dietary recommendations to people living with certain conditions such as diabetes (Muchiri *et al.* 2016), stomach ulcers or even obesity (obese individuals are advised to limit their intake of carbs/starchy foods); but generally speaking, fruits are healthy and beneficial especially when consumed in adequate amounts (WHO 2003). People with gastrointestinal reflux problems or certain ulcers, are usually advised to reduce intake of very acidic fruits such as oranges, sour apples and lemons; these could sometimes be diluted in water and taken on a non-empty stomach. This helps to prevent the negative side effects that may have occurred in those special cases if such fruits are not consumed cautiously. A good percentage of the respondents consumed fruits on a daily basis and some others 3–6 times a week. This is a commendable practice despite the fact that this particular study was not focused on the quantity, but on the frequency of fruit consumption (i.e. choices/consumption patterns). Chivenge *et al.* (2015) made a contrary observation where respondents were not consuming fruits (especially the indigenous ones) frequently. This could be due to differences in cultural dietary patterns, economic status of participants, or even dietary ignorance. Similar to results reported by Obayelu *et al.* (2019), the most popularly consumed fruits seem to be oranges (and lemons), bananas, mangoes and paw paw. This may be partially due to their availability in these regions and affordability, unlike certain 'exotic' fruits which are expensive and not easily available everywhere-like blue berries, rasp berries and plums (Kucich & Wicht 2016). Consumption of these 'exotic' fruits

Table 3a. Relationship between nutrition knowledge and fruit consumption patterns/frequency

Variable	Logistic regression test	Test value	*p*
Fruit consumption	Wald	219.509	0.001
(Correctly classified cases-88.6% eat fruit)	Score	50.68	0.001
	Chi-Square	45.613	0.001
	-2 Log likelihood	321.502	0.001
	Nagelkerke r square	0.166	
	PLUM-ordinal regression		
	Wald (FOFC=1)	28.608	0.001
	FOFC=2	18.487	0.001
	FOFC=3	109.162	0.001
Frequency of fruit consumption[b]	Nutrition Knowledge	33.486	0.001
	Chi-Square	33.609	0.001
	-2 Log likelihood	57.408	0.001
	Nagelkerke r square	0.069	
	PLUM-ordinal regression		
	Wald (NFFC=1)	0.872	0.35
	NFFC=2	0.009	0.924
Fruit consumption for COVID-19 prevention[c]	Nutrition knowledge	4.076	0.043
	Chi-Square	4.077	0.043
	-2 Log likelihood	31.235	0.043
	Nagelkerke r square	0.01	

a: The logistic regression model was statistically significant, chi (2)=45.613; p<0.001; b: The ordinal regression model was statistically significant, chi (2)=33.609; p<0.001; c: The ordinal regression model was statistically significant, chi (2)=4.077; p<0.043 with poor goodness of fit; NFFC: Nutrition knowledge vs Fruit Frequency Consumption; FOFC: Frequency of Fruit Consumption; PLUM: Polytomous Universal Model

Table 3b. Relationship between nutrition knowledge & priority factors in product purchase

Variable	Test	Priority
Nutritional knowledge	Pearson correlation	0.124**
	Sig. (2-tailed)	0.005
	N	517

Result shows positive, significant but weak correlation between respondents' nutritional knowledge & their priority

whenever they are in season, is however highly encouraged as they have been found to be rich in antioxidants that prevent cancers and many other diseases (Kucich & Wicht 2016).

On the other hand, the prices of food products also go a long way to affect consumer choices; these exotic types of fruits (apart from being unavailable sometimes) are usually costly because they are sometimes imported and difficult to store for long periods. It therefore becomes necessary to promote consumption of healthy indigenous fruits/vegetables especially where finances are a limitation for some people (Temple *et al.* 2011). Most of the indigenous fruits are free of preservatives used on the imported ones, and so may be a healthier/fresher choice for consumers. Another factor that influences consumer choice of fruits is the taste and texture (Layade & Adeoye 2014); less sweet, sour and hard fruits (such as lime, guava and walnuts) are sometimes not as appealing as others.

It is imperative to note here that meeting the WHO (2003) '5-a-day' recommendation is important in maximising the health benefits of

fruits/vegetables to prevent disease. The World Health Organization (WHO) '5-a-day' guidelines were developed following the recommendation that consumption of 400 g of fruits/vegetables per day can reduce the risks of chronic diseases", viz: cardiovascular disorders, certain cancers and obesity (WHO 2003; 2020). The guidelines recommend the daily consumption of a minimum of 5 portions of various fruits and vegetables. Consumption of fruits/vegetables may also help in weight reduction when combined with reduced fat intake, this "may reduce the risk of Type 2 diabetes and impaired cognitive function" (Bazzano *et al.* 2008; WHO 2020). In a large survey conducted across the United States, it was reported that majority of the participants (61%) consumed less than the WHO recommended 5 portions of fruits/vegetables per day (Erinosho *et al.* 2012). While some previous research may have reported no association between nutrition knowledge and fruit consumption patterns (Variyam 2008; Barreiro-Hurle *et al.* 2010),– which may be due to differences in methodology and statistical analyses (Shimokowa 2013), the results of this study show that the higher the nutrition knowledge, the higher their frequency of fruit consumption. This agrees with the report of some other studies where knowledge had positives outcomes on dietary intake and health (Ahmad *et al.* 2022; Lin & Yen 2008; Brinkley & Golub 2011) and it goes to show that nutrition awareness promotes healthy food choices. This study also showed that respondents with higher nutrition knowledge scores consumed certain fruits to prevent COVID-19 infection (more than those with low NKS). This implies that they understand the function of micronutrients present in fruits, as immune system boosters (Kumar *et al.* 2021). Consequently, knowledge can be said to be a major determinant of consumer food choices and consumption patterns.

Limitations of the study

This study was limited to an online survey due the COVID-19 precautionary measures such as social distancing which did not allow research assistants to go to certain peri-urban settlements to include respondents from those places. As a result, this study only covers a particular socio-economic class of people who are educated and have access to android phones and the internet. The study was focused on the current nutrition/ health situation of the young population during the second wave of the COVID-19 pandemic (in the first half of 2021). The validity of answers is also a general problem of online surveys which may be difficult to ascertain.

CONCLUSION

This study reports that oranges, apples, bananas and mangoes are some of the most popularly consumed fruits. Various factors are determinants of consumer's dietary choices and food product prices, palatability and dietary knowledge are some main factors. The results in this paper suggest that nutrition knowledge affects the frequency of fruit consumption and people's ability to use diet as medicine - which is seen in the case of consumption of certain fruits as preventive diet for COVID-19. Fruits contains micronutrients and antioxidants which boost the immune system and fight diseases. Adequate consumption of fresh fruits (and vegetables too) should be encouraged. Many participants had a high nutrition knowledge score and it is recommended that people apply dietary knowledge in making food product choices. Nutrition labels are also quite helpful currently as they will enable consumers make informed choices, especially with the advances in technology which has birthed GMOs. Consequently, nutrition education via various means such as seminars, health talks, courses and social media, should be promoted by stakeholders in order to increase people's nutrition awareness and understanding of the role of diet in maintenance of good health and prevention of disease. Fresh crop production should also be supported by government in order to increase availability of fresh fruits and vegetables all-year round.

ACKNOWLEDGEMENT

The author would like to acknowledge Dr Hema Kesa for all her supervision and support; also Dr. Omotayo Awodiji and Dr. Adekunle Ayanwale for their expertise assistance in the statistical analysis/interpretation of results in this study.

DECLARATION OF CONFLICT OF INTERESTS

The author declares no conflict of interests.

REFERENCES

Ahmad A, Wagustina S, Dwiriani CM, Estuti W, Salfiyadi T, Arnisam A, Fitrianingsih E. 2022. The efficacy of nutrition education on anemia and upper arm circumference among pregnant women in Aceh Besar District of Indonesia during the covid-19 pandemic. J Gizi Pangan 17(1):27–36. https://doi.org/10.25182/jgp.2022.17.1.27-36

Barreiro-Hurle J, Gracia A, De-Magistris T. 2010. "Does nutrition information on food products lead to healthier food choices?." Food Policy 35(3):221–229. https://doi.org/10.1016/j.foodpol.2009.12.006

Bazzano LA, Li TY, Joshipura KJ, Hu FB. 2008. Intake of fruit, vegetables, and fruit juices and risk of diabetes in women. Diabetes Care 31(7):1311–1317. https://doi.org/10.2337/dc08-0080

Brinkley JK, Golub A. 2011. Consumer demand for nutrition versus taste in four major food categories. Agric Econs 42:(1) 65–74. https://doi.org/10.1111/j.1574-0862.2010.00471.x

Chivenge P, Mabhaudhi T, Modi AT, Mafongoya P. 2015. The potential role of neglected and underutilized crop species as future crops under water scarce conditions in Sub-Saharan Africa. Int J Environ Health Res 12(6):5685–5711. https://doi.org/10.3390/ijerph120605685

Erinosho TO, Moser RP, Oh AY, Nebeling LC, Yaroch AL. 2012. Awareness of the fruits and veggies-more matters campaign, knowledge of the fruit and vegetable recommendation, and fruit and vegetable intake of adults in the 2007 food attitudes and behaviors (FAB) survey. Appetite 59(1):155–160. https://doi.org/10.1016/j.appet.2012.04.010

Frison E, Smith If, Cherfas J, Eyzaguirre P, Johns T. 2005. Using biodiversity for food, dietary diversity, better nutrition and health. South African J Clin Nutr. 18(2):112–114. https://doi.org/10.1080/16070658.2005.11734050

Garber Jr LL, Hyatt EM, Starr Jr RG. 2003. Measuring consumer response to food products. Food Qual & Pref 14(1):3–15. https://doi.org/10.1016/S0950-3293(02)00030-7

Jansen A, Stoltz E. 2008. Is the Zero-Rating of Basic Foodstuffs in South Africa Well Targeted? Pretoria (SA): National Treasury South Africa.

Kirk RE. 2008. Statistics: An introduction. 5th ed. Belmont (USA): Thomson Wadsworth.

Kish L. 2017. Survey Sampling. First Edition Published 1965. New York (USA): John Wiley & Sons, Wiley Classics

Kucich DA, Wicht MM. 2016. South African indigenous fruits-Underutilized resource for boosting daily antioxidant intake among local indigent populations? South African J Clin Nutr 29(4):150–156. https://doi.org/10.1080/16070658.2016.1219470

Kumar P, Kumar M, Bedi O, Gupta M, Kumar S, Jaiswal G, Rahi V, Yedke NG, Bijalwan A, Sharma S, Jamwal S. 2021. Role of vitamins and minerals as immunity boosters in covid-19. Inflammopharmacology 29(4):1001–1016. https://doi.org/10.1007/s10787-021-00826-7

Layade AA, Adeoye IB. 2014. Fruit and vegetable consumption among students of tertiary institutions in Oyo state. Russ J Agric & Socio-Econ Sci 30(6):3–8. https://doi.org/10.18551/rjoas.2014-06.01

Lin BH, Yen ST. 2008. Consumer knowledge, food label use and grain consumption in the US. Applied Econs 40(4):437–448. https://doi.org/10.1080/00036840600690298

Lindberg BG, Tang X, Dantoft W, Gohel P, Seyedoleslami ES, Lindvall JM, Engström Y. 2018. Nubbin isoform antagonism governs drosophila intestinal immune homeostasis. Plos Pathog 14(3):e1006936. https://doi.org/10.1371/journal.ppat.1006936

Muchiri JW, Gericke GJ, Rheeder P. 2016. Effect of a nutrition education programme on clinical status and dietary behaviors of adults with type 2 diabetes in a resource-limited setting in South Africa: A randomized controlled trial. Public Health Nutr 19(1):142–155. https://doi.org/10.1017/S1368980015000956

Nyawo T, Kesa H, Onyenweaku E. 2020. Food safety and hygiene: Knowledge, attitude and practices among food handlers. Afr J Hosp Tourism & Leisure 10(2):547–558. https://doi.org/10.46222/ajhtl.19770720.117

Obayelu OA, Ibe RB, Adegbite O, Oladimeji A. 2019. Demand for Selected Fruits among students of a tertiary Institution in Southwest Nigeria. Intl J Fruit Sci

19(1):45–56. https://doi.org/10.1080/15538362.2018.1533911

Onyenweaku EO, Ene-Obong HN, Oko GE, Williams IO. 2019. Contribution of eggs and other cholesterol-containing foods to total dietary cholesterol intake, and their influence on serum lipid profile of adults in Calabar, Nigeria. Eur J Nutr 9:329–340. https://doi.org/10.9734/ejnfs/2019/v9i430080

Shimokawa S. 2010. Asymmetric intra-household allocation of calories in China. American J Agric Econs 92(3):873–888. https://doi.org/10.1093/ajae/aap043

Shimokawa S. 2013. When does dietary knowledge matter to obesity and overweight prevention? Food Policy 38:35–46. https://doi.org/10.1016/j.foodpol.2012.09.001

Temple NJ, Steyn NP, Fourie J, De Villiers A. 2011. Price and availability of healthy food: A study in rural South Africa. Nutrients 27(1):55–58. https://doi.org/10.1016/j.nut.2009.12.004

Turker T, Kocak N, Aydin I, Istanbullouglu H, Yildiran N, Turk YZ, Kilic S. 2013. Determination of knowledge, attitude, behavior about genetically modified organisms in nursing school students. Gülhane Tip Dergisi 55(4):297–304.

Variyam JN. 2008. Do nutrition labels improve dietary outcomes? Health Econs 17(6):695–708. https://doi.org/10.1002/hec.1287

[WHO] World Health Organization. 2003. Diet, Nutrition and The Prevention of Chronic Diseases: Report of a Joint FAO/WHO Expert Consultation. WHO Technical Report Series No. 916. Geneva (CH): World Health Organization.

[WHO] World Health Organization. 2020. Factsheet on healthy diet. https://www.who.int/news-room/fact-sheets/detail/healthy-diet [Accessed June 16th 2022].

Wardle J, Parmenter K, Waller J. 2000. Nutrition knowledge and food intake. Appetite 34(3):269–275. https://doi.org/10.1006/appe.1999.0311

Webbink D, Martin NG, Visscher PM. 2010. Does education reduce the probability of being overweight? J Health Econs 29(1):29–38. https://doi.org/10.1016/j.jhealeco.2009.11.013

Wunderlich S, Gatto K. 2016. Consumers' food choices and the role of perceived environmental impact. Intl J Sust Dev & Plann 163:989–995. https://doi.org/10.2495/SDP-V11-N6-989-995/017