

Impact of Nutrition Education on Knowledge of Fruit and Vegetable Consumption among College of Education Students in Southwest Nigeria

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ABSTRACT

Background: Adequate daily consumption of Fruits and Vegetables (FV) is associated with reduced risk of nutrition-related communicable diseases and micronutrient deficiencies.

Objective: This study evaluated the impact of Nutrition Education Intervention (NEI) on College of Education Students' (CES) knowledge of FV in Southwest Nigeria.

Methodology: A quasi-experimental design was employed among CES in Public Colleges of Education from two selected States (Oyo and Ogun) in Southwest Nigeria. The study population comprised 200-level CES students across the Colleges within the study area. A multi-stage sampling technique was adopted to select 474 respondents who were randomly assigned into control and experimental groups. A validated semi-structured questionnaire was used to gather information on demographic characteristics and CES's Knowledge of FV. The experimental group received a four-week NEI using an adapted manual/real object, while the control group did not receive NEI. A 19-item knowledge scale, categorized as poor (0-12) and good (13-19), was used to assess COE knowledge pre- and post-intervention. Chi-square, t-test, and Analysis of Covariance (ANCOVA) were employed at $p < 0.05$.

Results: About 20.9% and 78.1% were males and females, respectively; the mean age was 20.2 ± 2.8 years. The mean knowledge scores of the respondents' post-intervention was 11.654 ± 0.484 and 16.494 ± 1.028 for the control and experimental groups, respectively. The percentage of respondents who possessed good knowledge of FV increased from 71.7% to 89.0% after delivering NEI to them, while a decrease (72%-52%) was reported among the control group. There was a significant difference ($p < 0.05$) in the knowledge score of respondents, pre- and post-intervention.

Conclusion: NEI improved nutrition knowledge of FV among CES.

Keywords: Nutrition Education, Fruits and Vegetables, Knowledge, Colleges of Education Students

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INTRODUCTION

Nutrition plays a fundamental role in human health and development, with adequate intake of fruits and vegetables (FV) being essential in reducing the risk of micronutrient deficiencies and nutrition-related diseases. [1,2]. Fruits and vegetables are rich sources of vitamins, minerals, fi-

bre, and antioxidants that strengthen the immune system, reduce oxidative stress, and prevent chronic conditions such as diabetes, cardiovascular diseases, and certain cancers [3, 4]. Despite the WHO's [2] recommendation of a minimum daily intake of 400 g of fruits and vegetables for adults, research consistently shows that many

populations, particularly young adults, fail to meet this benchmark. [5]. In Nigeria, dietary patterns among undergraduates reveal a heavy reliance on energy-dense but nutritionally poor foods such as snacks, processed flour products, and sugar-sweetened beverages, with minimal inclusion of fruits and vegetables [6, 7]. This trend of heavy reliance on energy-dense foods is also prevalent in Colleges of Education, where students are confronted with limited financial resources, peer pressure, environment, and insufficient awareness of the health benefits of fruits and vegetables.[8]. These local and global challenges contribute to nutritional deficiencies and increase susceptibility to diet-related health risks.[2]

Nutrition education has been identified as an effective tool for promoting positive dietary practices, particularly by improving individuals' knowledge of healthy foods. [9] Adequate knowledge is a crucial first step towards behaviour modification, as it enables students to make informed choices about incorporating fruits and vegetables into their daily diets.[10] Knowledge is widely regarded as the first and most critical step toward adopting healthy dietary behaviours [11]. Students' understanding of the nutritional benefits, recommended intake, and preventive role of fruits and vegetables is essential for shaping long-term dietary habits [11]. However, research indicates that Nigerian undergraduates often have only partial or inadequate knowledge of fruits and vegetables. [12] For example, [3] found that although students were aware of the importance of FV, their overall nutrition knowledge was fragmented and often overshadowed by preferences for fast foods. It was found out that students could identify some health benefits of FV, but they lacked adequate knowledge about the recommended daily intake and the consequences of not consuming enough of them [13]. These gaps highlight the need for integrating structured education interventions that provide accurate and practical knowledge of fruits and vegetables.

Previous studies in Nigeria and beyond have established that nutrition education interventions significantly enhance participants' knowledge of fruits and vegetables, thereby influencing their dietary decisions [14,15]. However, despite the establishment of nutrition education interventions on fruits and vegetables consumption, a substantial knowledge gap still persists among College of Education students, who represent a critical group since they will eventually transfer knowledge to future generations as educators.[16] This study, therefore, focuses on evaluating the efficacy of a

nutrition education intervention in fostering students' knowledge of fruits and vegetables in Colleges of Education in Southwest Nigeria. By targeting knowledge as the central outcome, the study provides insights into the role of structured nutrition education in addressing gaps in dietary awareness and promoting long-term health among students.

METHODS

Study Design, Location and Population

A quasi-experimental design was conducted in two selected States (Oyo and Ogun) in Southwest Nigeria. The study location was characterized by a predominantly student population in the four Public Colleges of Education in the study area. These include: Federal College of Education, Osiele, Abeokuta; Federal College of Education, Special, Oyo; Oyo State College of Education, Lanlate; and Sikiru Adetona College of Education and Technology, Omu-Ijebu. The study population comprised male and female 200-level students across the Colleges from the two selected States. The sample size (n) was approximately 474 (four hundred and seventy-four) respondents. These respondents were further randomly assigned to control (n=237) and experimental (n=237).

Sample Techniques

A multi-stage sampling technique was used to select the respondents. The first stage involved a simple random sampling method to select two out of the six States in Southwest Nigeria. The second stage was total enumeration sampling to select all four public Colleges in the two States. A simple random sampling technique by balloting was used to assign the colleges to control and experimental groups. The Federal College of Education, Oyo Town, in Oyo State and the State College, Omu-Ijebu, in Ogun State were the experimental groups, while the State College in Lanlate, Oyo State and Federal College of Education, Abeokuta in Ogun State were the control groups. The locations are geographically widely separated from each other to prevent diffusion of information. The third stage involved purposive selection of two schools from each of the selected Colleges of Education. In the fourth Stage, one department with the largest number of students was purposively selected from the selected schools, while the fifth stage involved total enumeration sampling to recruit all the 200 Level students from the selected Department, who gave their consent to participate in the study.

Data Collection Instruments

A validated semi-structured self-administered questionnaire consisting of two sections was used to gather information for the study. Section A elicited responses on demographic characteristics of the respondents, while Section B consisted of 19 items to assess knowledge questions of fruit and vegetable consumption among the respondents. For the knowledge questions, each correct item was scored 1, while any incorrect item was scored 0. The maximum score obtainable was 19 and was categorized as poor knowledge (0-12) and good knowledge (13-19). The data collection for this study was in 3 (three) stages.

Stage 1: Pre-Intervention Stage

In this stage, the research instruments were administered to obtain information on the demographic characteristics of respondents and knowledge of fruit and vegetable consumption in both groups.

Stage 2: Intervention Stage (Experimental Group)

A self-developed manual on Knowledge of Fruits and Vegetables, adapted from established sources [18, 19], was administered to the experimental group. The manual consisted of the following topics: introduction to fruits and vegetables, nutritional value and health benefits of fruits and vegetables, handling of fruits and vegetables, and fruits and vegetables consumption. The experimental group received a 2-hour weekly NEI for a period of four weeks consecutively in their intact classrooms. They were taught with the use of the adapted manual for this study and real objects, for the purpose of demonstration and proper assimilation. The respondents in the control group did not receive any NEI.

Stage 3: Post-Intervention Stage

The knowledge of the respondents in both groups was reassessed to determine any change in the baseline and post-intervention knowledge of fruits and vegetables.

Data Analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive data were expressed as frequencies and percentages. Chi-square was used to determine the significant relationship between the two groups. A t-test was used to compare the mean values between the two groups, while Analysis of Covariance (ANCOVA) was employed to determine the efficacy of the NEI in improving CES' knowledge of fruits and vegetables. A post hoc test was also used to determine the effect of the NEI on

knowledge outcomes of the respondents. The hypotheses were tested at the ($p < 0.05$) level of significance.

Inclusion and Exclusion Criteria

All the registered 200 Level CES who voluntarily signed the consent form to participate throughout the period of the study were included in the study, while those in other levels or those who did not give their consent form were excluded from the study.

Ethical Approval

Approval to collect data for this study was obtained from both Federal Medical Centre, Abeokuta, Ogun State, and Oyo State Ministry of Health with assigned numbers; FMCA/470/HREC/01/2013/53 and NUREC/OYOSHRIEC/10/11/22 respectively. Participation was strictly voluntary, and informed consent was sought from each respondent before being enrolled in the study. The participants were assured that their responses would be used solely for research purposes.

RESULTS

Demographic Characteristics of the Respondents

The majority of the respondents (72%) were between 18–24 years, with a mean age of 20.2 ± 2.8 years. More of the respondents were female (78%) than male (22%). Also, the majority of the respondents (97.0%) were single.

Baseline Knowledge of Fruits and Vegetables of the Respondents

The baseline information of both control and experimental groups was similar. Table 2 shows the control mean score (13.72 ± 2.430), while that of the experimental (13.67 ± 2.40). Both control and experimental groups have the same pre-knowledge information of fruits and vegetables consumption prior to the nutrition intervention.

Respondents' Knowledge Score Category at Baseline

As shown in Table 3a, a high number (72%) of participants in the control group at baseline had good knowledge of the benefits of fruit and vegetable consumption, as opposed to a lower proportion of them (27.8%) who had poor knowledge. This revealed that there was a significant gap at baseline in the control group between those who had good knowledge and those who had poor knowledge. However, the gap nearly flattened at the end of the study. In the intervention group, however, a high number of respondents (72%) already had good knowledge at baseline.

Table 1: Demographic Characteristics of the Respondents

Variables	Freq (474)	Percentage (%)
Age (years)		
< 18	111	23.4
18-24	339	71.5
25-30	21	4.4
>30	3	
Mean±SD = 20.2±2.8		
Gender		
Male	104	21.9
Female	370	78.1
Marital Status		
Single	460	97.0
Married	14	3.0

Table 2: Baseline Knowledge of Fruits and Vegetables among Respondents, Based on Correct Responses

Items	Control group n=237	Intervention group n=237
Identification of a non-leafy vegetable	163(68.8)	167(70.5)
Knowledge of citrus fruits as a source of vitamin C	233(98.3)	229(96.6)
Knowledge of the recommended daily fruit intake	57(24.1)	58(24.5)
Knowledge of the role of fruits and vegetables in preventing digestive problems	206(86.9)	210(88.6)
Knowledge of the standard fruit serving size	135(57.0)	114(48.1)
Knowledge of the recommended daily quantity of fruit		
Knowledge of the role of spinach in eye health	137(57.8)	133(56.1)
Identification of onion as a vegetable	194(81.9)	191(80.6)
Knowledge of the nutritional value of fresh versus canned fruits and vegetables	225(94.9)	222(93.7)
Knowledge of fruit serving estimation by hand size	36(15.2)	42(17.7)
Knowledge of the role of fruit consumption in preventing type 2 diabetes and heart disease	184(77.6)	173(73.0)
Knowledge of the role of fruits and vegetables in digestion	196(82.7)	186(78.5)
Knowledge of fruits and vegetables as sources of vitamins and minerals	178(75.1)	188(79.3)
Knowledge of the health risks associated with improper handling and preparation of fruits and vegetables	211(89.0)	205(86.5)
Knowledge of the contribution of fruits and vegetables to meeting nutritional needs	194(81.9)	196(82.7)
Identification of onion as a non-green vegetable	135(57.0)	143(60.3)
Knowledge of the role of fruits and vegetables in maintaining healthy skin	195(82.3)	202(85.2)
Knowledge of fruits and vegetables as sources of nutrients	226(95.4)	224(94.5)
Knowledge of the contribution of fruit and vegetable consumption to healthy living	225(94.9)	226(95.4)
Weighted knowledge Mean	13.72±2.43	13.67±2.40

Note: Values are presented as frequency and percentage of respondents who answered each knowledge item correctly.

Table 3a: Frequency and % of Respondents' Knowledge Score Category at Baseline

Range of Scores	Control group		Intervention group	
	Pre	p-value	Pre	p-value
Poor Knowledge (0-12)	66(27.8)	<0.001	67(28.3)	<0.001
Good Knowledge (13-19)	171(72.2)		170(71.7)	
Total	237		237	

Respondents' Knowledge Score Category at Endline

There was a significant shift ($\chi^2 = 19.82$; p -value < 0.001) at the end of the study, with a lower proportion of them (52%) maintaining good knowledge, while a slightly lower proportion (47%) had poor knowledge. By the end of the

study, a greater number of respondents (89%) in the intervention group had acquired good knowledge of the benefits of fruits and vegetables. The number increased significantly ($\chi^2 = 22.48$; value < 0.001) after the study intervention was provided. (Table 3b)

Table 3b: Frequency and % of Respondents' Knowledge Score Category at Endline

Range of Scores	Control group (237)		Intervention group (237)	
	Post	p-value	Post	p-value
Poor Knowledge	113(47.7)	<0.001	26(11.0)	<0.001
Good Knowledge	124(52.3)		211(89.0)	

Respondents' Estimated Marginal Means of the Intervention on Knowledge of Fruits and Vegetables Achievement Test

The Estimated Marginal Means (EMM) for the intervention group, as presented in Table 4, revealed that the Experimental Group (Nutrition Education Intervention Group) achieved a mean

score of 16.494, while the Control Group recorded a mean score of 11.654. Additionally, the 95% confidence interval bounds show a clear distinction between groups, with the Experimental Group ranging from 14.475 to 18.514, and the Control Group ranging from 10.703 to 12.604.

Table 4: Estimated Marginal Means of the Intervention on Knowledge of Fruits and Vegetables Achievement Test

Treatments	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Control group	11.654 ^{a,b}	0.484	10.703	12.604
Intervention group	16.494 ^a	1.028	14.475	18.514

a. Covariates appearing in the model are evaluated at the following values: Knowledge of fruits and vegetables achievement test = 13.70.

b. Based on modified population marginal mean

Impact of Nutrition Education on Respondents' Knowledge on Consumption of Fruits and Vegetables

The results of the two-way ANCOVA analysis presented in Table 5 ($\eta^2 = .049$; $F_{(1, 473)} = 24.002$; $p < .05$) indicated that the treatment (nutrition education intervention) had a statistically significant effect on respondents' knowledge of fruits and

vegetables consumption. Consequently, the null hypothesis stating that there is no significant effect of the nutrition education intervention on respondents' knowledge of fruits and vegetables consumption is rejected in favour of the alternative hypothesis. The treatment variable alone explains 4.9% of the variance ($\eta^2 = .049$) in respondents' knowledge scores

Table 5: ANCOVA Results on the Impact of Nutrition Education on Knowledge of Fruits and Vegetables

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1830.134 ^a	7	261.448	18.937	.000	.221
Intercept	1698.772	1	1698.772	123.045	.000	.209
KFV Pre-Test Score	5.874E-5	1	5.874E-5	.000	.998	.000
Treatments	331.373	1	331.373	24.002	.000	.049
Gender	1.031	1	1.031	.075	.785	.000
Marital status	6.496	1	6.496	.471	.493	.001
Treatments * Gender	.077	1	.077	.006	.941	.000
Treatments * marital status	5.847	1	5.847	.424	.515	.001
Gender * marital status	1.347	1	1.347	.098	.755	.000
Treatments * Gender * marital status	.000	0	.	.	.	.000
Error	6433.655	466	13.806			
Total	97070.000	474				
Corrected Total	8263.789	473				

DISCUSSION

The majority of the respondents (72%) were between 18 and 24 years, with a mean age of 20.2 ± 2.8 . A higher percentage of them were female (78%), while the majority (97.0%) were single. Findings from the study revealed a non-significant level of knowledge of CES about fruits and vegetables pre-intervention. This is similar to the findings of [20, 21], who posited that the baseline results on knowledge of their study groups were not significantly different. A similar study was also conducted by [22, 23] reported that both control and experimental groups had similar knowledge levels at baseline. In addition, this study [24] on the effect of the nutrition education programme on food-related knowledge contradicted the findings of this study, as it found out that there was no significant difference between the mean scores of the nutritional knowledge of study participants at the baseline. Findings in this study revealed a statistically significant difference between the control and experimental groups. There was an increase in the mean knowledge of the experimental group from pre- to post-intervention; this is in agreement with [30, 31, 32] stating that a tailored nutrition education program can improve the nutrition knowledge and food choice of undergraduate students. The study revealed that NEI had a statistically significant impact on students' knowledge of FV; this suggests that the four-week NEI program substantially enhanced CES's knowledge, confirming the impact of the intervention [33]. The findings align with previous studies that have shown nutrition education to be a powerful tool in enhancing nutrition-related knowledge among adolescents and young adults [34, 35]. This is similar to the report by [20] who stated that targeted nutrition education programs in Malaysia significantly improved young adults' knowledge about fruits and vegetables, equipping them to make better-informed dietary decisions, and also agrees with the studies [36, 37]. Additionally, estimated marginal means demonstrated that students in the experimental group achieved significantly higher scores on the level of knowledge of FV compared to their peers in the control group. In line with this, the present study validates the effectiveness of a structured, classroom-based nutrition education program in significantly improving the knowledge of students. This is also consistent with [38 and 39], who observed a significant increase in the level of knowledge after NEI. The implications of these findings may guide policymakers in developing nutrition promotion strategies towards tertiary institution students, hence enhancing their

knowledge of the health benefits of FV. This also agrees with studies [29 and 30], which described that equipping undergraduates with enhanced knowledge of FV through NEI can lay the groundwork for healthier dietary practices and chronic disease prevention.

CONCLUSION

This study examined the impact of nutrition education intervention on knowledge of fruits and vegetables among Colleges of Education students in Southwest Nigeria. Based on the research findings, the researcher hereby concludes that NEI is effective in enhancing students' knowledge of fruits and vegetables. The intervention led to measurable improvements in knowledge, as students who received the intervention performed better than those in the control group. The significant increase in the knowledge of the experimental group is associated with the nutrition education. This shows that the nutrition education ensures higher achievement and better performance in the experimental group.

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