

# Acceptability and consumption of tofu as a meat alternative among secondary school boarders in Enugu State, Nigeria

## Implications for nutritional counseling and education

Ngozi M. Eze, PhD<sup>a</sup>, Ukamaka G. Okwume, MEd<sup>a</sup>, Chiedu Eseadi, MEd<sup>b</sup>, Elizabeth A. Udentia, PhD<sup>c</sup>, Nkechi G. Onyeye, PhD<sup>a</sup>, Elizabeth N. Ugwu, PhD<sup>d</sup>, Benedette N. Akubue, PhD<sup>e</sup>, Helen A. Njoku, PhD<sup>f</sup>, Amaka B. Ezeanwu, MEd<sup>a,\*</sup>

### Abstract

Tofu, a food made of condensed soymilk that originated in China, has both nutritional and health benefits. The main objective of this study was to determine the acceptability and consumption of tofu as a meat alternative among students in boarding secondary schools in Enugu State, Nigeria.

In this study, the authors adopted a cross-sectional analytic design. A representative sample of 603 adolescents in the boarding secondary schools took part in the study. Power analysis was conducted to estimate the appropriate sample size for the current study. Correlations analysis, moderation analysis,  $\chi^2$ , analysis of variance (ANOVA), and *t* tests were employed for the analysis of the data.

Students' acceptance of the 3 cooking options of tofu (steamed, boiled, and fried) did not significantly differ by gender. It was found that 94.5% of the respondents recognized the benefits of tofu; there is no significant difference between the male and female students on the extent to which they would eat tofu in school; the recognition of benefits of tofu is not significantly associated with acceptance of steamed, boiled, and fried tofu among the students; and the recognition of benefits of tofu is not significantly associated with consumption of tofu among the students. The finding further revealed that gender did not significantly moderate the association between recognition of benefits of tofu and students' acceptability of tofu. Also, it was found that gender did not significantly moderate the association between recognition of benefits of tofu and consumption of tofu among students.

Further research is needed to identify the level of tofu acceptability and consumption among adolescents in boarding secondary schools in other states of Nigeria. Further research on factors influencing how recognition of benefits of tofu is associated with its acceptability among the Nigerian student population can have implications for nutritional counseling and regional health.

**Abbreviations:** ANOVA = analysis of variance, HA = high acceptance, HE = high extent, LA = low acceptance, LE = low extent, MA = moderate acceptance, RTBQ = Recognition of Tofu Benefits Questionnaire, SATMAQ = Students' Acceptability of Tofu as a Meat Alternative Questionnaire, SCTMAQ = Students' Consumption of Tofu as a Meat Alternative Questionnaire, VHA = very high acceptance, VHE = very high extent, VLA = very low acceptance, VLE = very low extent.

**Keywords:** acceptability, adolescents, consumption, nutritional counseling, recognition of tofu benefits, tofu

## 1. Introduction

Tofu is a food made of condensed soymilk that is pressed into solid blocks.<sup>[1]</sup> Tofu is an easily digestible, buttery, smooth-textured,

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<sup>a</sup>Department of Home Economics and Hospitality Management Education,

<sup>b</sup>Department of Educational Foundations, Faculty of Education, <sup>c</sup>Department of Home Science, Nutrition and Dietetics, University of Nigeria, Nsukka,

<sup>d</sup>Department of Home Economics, Federal College of Education, Eha-Amufu, Enugu State, <sup>e</sup>Department of Home Economics, <sup>f</sup>Department of Food Science and Technology, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.

\*Correspondence: Amaka B. Ezeanwu, Department of Home Economics and Hospitality Management Education, University of Nigeria, Nsukka, P.M.B. 410001, Enugu State, Nigeria (e-mail: amaka.ezeanwu@unn.edu.ng).

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cheese-like food that is made by curdling fresh hot soymilk with 1 or more coagulants. Tofu, which originated in China, is a good source of protein and contains all of the 9 essential amino acids that are vital to living a healthy and balanced lifestyle.<sup>[1]</sup> It is an excellent source of calcium, iron, and some minerals, such as manganese, selenium, phosphorous, magnesium, copper, zinc, and vitamin B1.<sup>[2]</sup> Tofu is also considered an excellent food from a nutritional and health viewpoint in that it is thought to provide the same sort of protection against cancer and heart disease as soybeans.<sup>[2]</sup> Tofu may reduce the risk of heart disease, as a study<sup>[3]</sup> has shown that a high intake of legumes, including soy, is linked to lower rates of heart disease. Tofu, which is also known to contain soy isoflavones, can help to reduce blood vessel inflammation and improve their elasticity.<sup>[4]</sup>

Furthermore, study showed that supplementing food intake with 80 mg of isoflavones per day for 12 weeks improved blood flow by 68% in patients at risk of stroke.<sup>[5]</sup> Tofu also contains saponins which are compounds that are thought to have protective effects on heart health,<sup>[6]</sup> and to be capable of improving blood cholesterol and increasing the disposal of bile acids, both of which can help to lower the heart disease risk.<sup>[7]</sup> In addition, tofu may reduce the risk of diabetes, as a study showed that, for diabetic postmenopausal women, supplementing with

30g of isolated soy protein lowered blood glucose levels, improved insulin levels by 8.1%, insulin resistance by 6.5%, cholesterol by 7.1%, and total cholesterol by 4.1%.<sup>[8]</sup> Several other studies have found that men who consume higher amounts of soy, especially tofu, have a 32% to 51% lower risk of developing prostate cancer.<sup>[9,10]</sup> A previous study found that the risk of breast cancer in women decreased with increasing frequency of intake of tofu after adjustment for age and selected dietary, menstrual, and reproductive factors.<sup>[11]</sup> As these authors reported, the protective effect of high tofu intake was observed in pre- and postmenopausal women.<sup>[11]</sup> A recent study also observed that higher intake of tofu was linked to a 61% lower risk of stomach cancer in men.<sup>[12]</sup> Given these outcomes for both men and women, it is important for researchers to investigate whether gender would influence research outcomes on acceptability, consumption, and recognition of benefits of tofu.

In this study, the term “acceptability” of tofu is used to describe students’ decision and willingness to accept tofu as a meat alternative in the meals they are served. It further refers to the preference of tofu and/or act of choosing tofu as an alternative to meat in foods by students. Therefore, for the purpose of this study, the terms “acceptability” and “acceptance” were used interchangeably. On the other hand, consumption refers to the act of eating tofu by students. It is the intake of tofu in meals. Tofu is usually served alongside other meals. Given the nutritional and health benefits of tofu, it is possible that boarding secondary schools can use it as a meat alternative in foods that they serve to their students. Students who live in the boarding secondary schools are mostly adolescents.<sup>[13]</sup> The rationales for focusing on adolescents as study population in Nigeria cannot be overemphasized. One rationale is that many Nigerian adolescents have only a fair knowledge of the nutritional value of foods, which reflects in their meal patterns and nutrient intake.<sup>[14,15]</sup> Also, because of their low level of nutrition knowledge, it is possible that these adolescents might show poor acceptance of nutritive foods, such as tofu.

Furthermore, Nigerian adolescents, especially those living in boarding schools, still need adequate nutrition and a better standard of healthy living than is maintained in their homes, especially as it relates to feeding and meal patterns.<sup>[15]</sup> The meals served in many Nigerian boarding schools to these adolescents are usually small and some have poor nutritional value compared with those served in their various homes.<sup>[15]</sup> However, tofu can contribute a significant amount of protein to adolescents’ nutrition, providing 6g per serving, and it is also rich in Omega-3 fatty acids.<sup>[16]</sup>

Tofu can be boiled, fried, or steamed.<sup>[15]</sup> The nutritional and health values of tofu may be conveyed to schooling adolescents through nutritional counseling and education. Nutritional counseling and education aims to foster the gaining of knowledge by individuals about nutrition and encourages people to bring about the required changes in their food habits.<sup>[17]</sup> From the literature, it can be observed that several research efforts have focused on the nutritional value of tofu for the patient population, but no attention has been paid to its consumption and acceptability by a student population. To our knowledge, evidence regarding the level of acceptability and consumption of tofu among adolescents in school is relatively rare, especially in developing countries, such as Nigeria.

The main objective of this study was to determine acceptability and consumption of tofu as a meat alternative in foods among

adolescents in boarding secondary schools in Enugu State, Nigeria. Given three ways (boiled, fried, and steamed) to cook tofu, the study aimed to find out if their acceptability significantly differed among the students by gender. The study also aimed to ascertain if recognition of tofu benefits is associated with tofu acceptability among the students. It was also the aim of this study to find out if significant difference exists among male and female students on the extent to which they would eat tofu in their schools. The study aimed to ascertain the percentage of students who recognizes the benefits of tofu and if significant difference exist between male and female students in their recognition of benefits of tofu. Furthermore, the study aimed to ascertain if the recognition of tofu benefits is associated with tofu consumption among the students. The study also aimed to ascertain if gender is a significant moderator in the association between recognition of tofu benefits and the students’ acceptability of tofu. Finally, the study aimed to ascertain if gender is a significant moderator in the association between recognition of tofu benefits and the students’ consumption of tofu.

## 2. Methods

### 2.1. Ethical approval

The approval for conducting the study was obtained by the authors from their respective institutions’ departmental research ethics committee. Parents of the participants provided written informed consent. The participants also gave their assent. The researchers also complied with the ethical requirements for conducting research with human participants as stated in the World Medical Association’s Declaration of Helsinki.

### 2.2. Study design

The study adopted a cross-sectional analytic design.

### 2.3. Setting

This study was conducted in secondary boarding schools in Enugu State, Nigeria. These schools were chosen because they operate boarding houses with refectories where tofu can be prepared and served to students in their meals. Also, previous study indicates that the protein needs of students in the boarding houses are not met due to high cost of animal protein sources in the State.<sup>[15]</sup> Meanwhile, tofu is a cheap and rich source of protein compared with animal proteins. Thus, the researchers’ choice of these boarding schools is a viable one to obtaining data regarding students’ acceptability and consumption of tofu as meat alternative in their meals.

### 2.4. Participants

The study’s participants were a representative sample of 603 adolescents randomly selected from 7 boarding secondary schools in Enugu State, Nigeria. The inclusion criteria included the school’s approval to enable the researchers collect the necessary data from the participants, participant’s parents providing informed consent, the participant’s availability to complete the questionnaire and return it on the spot to the researchers, and living in a boarding secondary school hostel. Thus, an exclusion criterion was implied when students or their schools did not meet any one of the inclusion criteria. The sample

from each boarding secondary school used in this study is as follows:

Schools	<i>N</i>
School # 1	110
School # 2	211
School # 3	42
School # 4	126
School # 5	42
School # 6	42
School # 7	30

*n* = sample per school.

## 2.5. Measures

**2.5.1. Demographic questionnaire.** A demographic questionnaire was used to obtain the respondents' personal information, such as age, gender, and class level.

**2.5.2. Recognition of tofu benefits questionnaire.** The Recognition Tofu Benefits Questionnaire (RTBQ) is a 1 item-questionnaire which assesses students' recognition of the potential benefits of tofu. The item statement was: do you think tofu has any nutritional and health benefits? Respondents are required to answer "Yes or No" and responses are scored as 0 or 1 respectively. Three experts with doctoral degree in nutrition and dietetics and 2 other experts in Educational Research, Measurement, and Evaluation validated the RTBQ through an expert-consensus validation procedure as in a previous study.<sup>[18]</sup>

**2.5.3. Students' acceptability of tofu as a meat alternative questionnaire.** The Students' Acceptability of Tofu as a Meat Alternative Questionnaire (SATMAQ) is a 3-item questionnaire that was developed by the researchers for this study. The SATMAQ was designed to ascertain students' level of acceptability of 3 different types of tofu (steamed, boiled, and fried) as a meat alternative in foods. The item statements were: To what extent would you accept steamed tofu as a meat alternative in your meal? To what extent would you accept boiled tofu as a meat alternative in your meal? To what extent would you accept fried tofu as a meat alternative in your meal? Items are answered on a 5-point scale: very high acceptance (VHA)=5, high acceptance (HA)=4, moderate acceptance (MA)=3, low acceptance (LA)=2, and very low acceptance (VLA)=1. The internal consistency reliability of the SATMAQ was established using Cronbach alpha method. Based on the study sample, a reliability coefficient of 0.85 was obtained for the SATMAQ. Three experts with doctoral degree in nutrition and dietetics and 2 other experts in Educational Research, Measurement, and Evaluation validated the SATMAQ through an expert-consensus validation procedure as in a previous study.<sup>[18]</sup>

**2.5.4. Students' consumption of tofu as a meat alternative questionnaire.** The Students' Consumption of Tofu as a Meat Alternative Questionnaire (SCTMAQ) is a 10-item questionnaire developed by the researchers to determine the extent to which students would consume tofu. Items are answered on a 5-point scale: very high extent (VHE)=5, high extent (HE)=4, moderate extent (ME)=3, low extent (LE)=2, and very low extent (VLE)=1. The internal consistency reliability of the SCTMAQ was established using Cronbach alpha method. Based on the study sample, a reliability coefficient of 0.83 was obtained for the SCTMAQ. Three experts with doctoral degree in nutrition and

dietetics and 2 other experts in Educational Research, Measurement, and Evaluation validated the SCTMAQ through an expert-consensus validation procedure as in a previous study.<sup>[18]</sup>

## 2.6. Power estimation

Power analysis was conducted to determine the appropriate sample size for the study. Sample size was calculated based on the target power (0.85) and alpha-level ( $\alpha=0.05$ ) using Gpower computer software.<sup>[19]</sup> The power estimation suggested a minimum sample size of 298.

## 2.7. Data collection

Data were collected between January and April, 2016. The researchers adopted a direct delivery and retrieval approach to collect the required data for this study. Respondents were met face-to-face in classrooms in the boarding secondary schools that they attended and they received the questionnaire to complete and return directly to the researchers.

## 2.8. Data analysis

First, we computed the descriptive statistics and correlations of the scores of each measure. Using descriptive statistics (mean and standard deviation), item scores were designated as the dependent variables and gender as the independent variable. Using purposively set benchmark mean values, the item scores of the SATMAQ (acceptability of tofu as a meat alternative) were interpreted as follows: VHA=above 4.00, HA=3.50 to 4.00, MA=3.00 to 3.49, LA=2.50 to 2.99, and VLA=1.00 to 2.49. Using similar purposively set benchmark mean values, the item scores of the SCTMAQ (extent of consumption of tofu as a meat alternative) were interpreted as follows: VHE=above 4.00, HE=3.50 to 4.00, ME=3.00 to 3.49, LE=2.50 to 2.99, and VLE=1.00 to 2.49.  $\chi^2$ , analysis of variance (ANOVA), and Student *t* test were used to examine the differences among students at the .05 level of significance. The normality of the distribution of the data was assessed using the Shapiro–Wilk normality test ( $P=.85$ ). During coding, the numerical value of 1 was used as the label for male students, whereas the value of 2 was used as the label for female students. Statistical analyses was done using SPSS version 22 (IBM Corp.) Also, a moderation analysis, which aimed at ascertaining the moderating effects of gender in the association between recognition of tofu benefits and students' acceptability of tofu, was conducted using PROCESS 3.0 software<sup>[20]</sup> with 95% bias-corrected bootstrap confidence intervals based on 5000 bootstrap samples.

## 3. Results

Table 1 shows the demographic characteristics of the participants. Mean age of the participants was  $16.51 \pm 0.55$  years.

The results of ANOVA in Table 2 indicated that students' acceptance of the 3 cooking options of tofu (steamed, boiled, and fried) was not significantly different by gender. As can be seen in Table 2, there was no significant difference between male and female students in their acceptance of steamed tofu,  $F(1601)=.069$ ,  $P=.793$ . Also, there was no significant difference between male and female students in their acceptance of boiled tofu,  $F(1601)=.743$ ,  $P=.389$ . Finally, there was no significant difference between male and female students in their acceptance of fried tofu,  $F(1601)=.087$ ,  $P=.768$ .

**Table 1****Demographic characteristics of the participants.**

Characteristics	Male	Female	Test statistics	Significance	95% CI
Age*	16.53 ± 0.52	16.47 ± 0.59	$t = 735.68$	<0.001	16.462, 16.549
Gender, $n$ (%)	348 (57.71)	255 (42.29)	$\chi^2 = 14.34$	<0.001	—

$n$  = number of participants by gender, CI = confidence interval,  $t$  =  $t$  test,  $\chi^2$  = chi-square.

\* Mean age in years.

**Table 2****Results of ANOVA on acceptability of tofu among students by gender.**

Cooking options		Sum of squares	df	Mean square	F	Sig.
Steamed tofu	Between groups	0.037	1	0.037	0.069	0.793
	within groups	320.812	601	0.534		
	total	320.849	602			
Boiled tofu	Between groups	0.326	1	0.326	0.743	0.389
	within groups	263.946	601	0.439		
	total	264.272	602			
Fried tofu	Between groups	0.042	1	0.042	0.087	0.768
	within groups	287.892	601	0.479		
	total	287.934	602			

df = degree of freedom, F = ANOVA, Sig. = significance.

Results of correlation analysis in Table 3 showed that the recognition of benefits of tofu is not significantly associated with acceptance of steamed tofu ( $r = 0.025$ ,  $P = .538$ ), boiled tofu ( $r = -0.021$ ,  $P = .604$ ), and fried tofu ( $r = 0.032$ ,  $P = .435$ ) among the students. In addition, the recognition of benefits of tofu is not significantly associated with consumption of tofu among the students ( $r = 0.019$ ,  $P = .639$ ) (see Table 3).

Results of linear regression in Table 4 showed that 94.5% of the respondents recognized the benefits of tofu. Thus, the benefits of tofu as a meat alternative were recognized by a good number of adolescents in boarding secondary schools in Enugu State, Nigeria. In this respect, there was no significant difference between the male and female students in their recognition of benefits of tofu,  $\chi^2(1) = 0.000$ ,  $P = .985$ .

As can be seen in Table 5, there was no significant difference between the male and female students on the extent to which they

would eat tofu in their schools,  $t(601) = -0.192$ ,  $P = .85$ , 95% CI:  $-0.04177$ ,  $0.03432$ . Specifically, all the items examining the consumption of tofu among the male and female students were not statistically significant ( $P$  values ranged from .18 to .94).

Results in Table 6 showed that gender did not significantly moderate the association between recognition of benefits of tofu and students' acceptability of tofu,  $t(599) = 0.0145$ ,  $P = .988$ , 95% CI:  $-0.3245$ ,  $0.3293$ . Thus, our results implied that the association between recognition of benefits of tofu and students' acceptance of tofu is not affected by gender.

Results in Table 7 showed that gender did not significantly moderate the association between recognition of benefits of tofu and consumption of tofu among students,  $t(599) = 1.3053$ ,  $P = .192$ , 95% CI:  $-0.0560$ ,  $0.2779$ . Thus, our results implied that the association between recognition of benefits of tofu and students' consumption of tofu is not affected by gender.

**Table 3****Correlations of students' acceptability and consumption of tofu with recognition of benefits of tofu.**

Recognition of tofu benefits. Measure	Acceptability of tofu (SATMAQ)						Consumption of tofu (SCTMAQ)	
	Steamed tofu		Boiled tofu		Fried tofu		$r$	$P$
	$r$	$P$	$r$	$P$	$r$	$P$		
RTBQ	0.025	.538	-0.021	.604	0.032	.435	0.019	.639

$P$  = significance,  $r$  = Pearson correlation coefficient, RTBQ = Recognition of Tofu Benefits Questionnaire, SATMAQ = Students' Acceptability of Tofu as a Meat Alternative Questionnaire, SCTMAQ = Students' Consumption of Tofu as a Meat Alternative Questionnaire.

**Table 4****Results of  $\chi^2$  analysis examining differences in the recognition of tofu benefits among students.**

Measure		Gender		Total	$\chi^2$	Significance
		Males, $f$ (%)	Females, $f$ (%)			
RTBQ	Yes	329 (94.5)	241 (94.5)	570 (94.5)	0.000	0.985
	No	19 (5.5)	14 (5.5)	33 (5.5)		

$\chi^2$  = chi-square,  $f$  = frequency, % = percentage, RTBQ = Recognition of Tofu Benefits Questionnaire.



**Table 5**

**Results of t test examining differences in consumption of tofu among students.**

No.	Items on consumption of tofu	Male students		Female students		Total <i>M<sub>t</sub></i> (SD)	Extent	<i>t</i>	<i>P</i>	95% CI	Dec.
		<i>M</i> (SD) %	%	<i>M</i> (SD) %	%						
1	Tofu can be served to students in my school	4.06 (0.77)	58.1%	3.99 (0.78)	41.9%	4.03 (0.78)	Very high extent	1.077	.28	-0.05707, 0.19554	NS
2	Tofu can serve as a meat alternative in my school	4.48 (0.67)	57.6%	4.49 (0.67)	42.4%	4.48 (0.67)	Very high extent	-0.380	.70	-0.12965, 0.08760	NS
3	Tofu can be served at dinner in my school	4.02 (0.73)	58.1%	3.95 (0.71)	41.9%	3.99 (0.73)	High extent	1.187	.24	-0.04652, 0.18871	NS
4	Students can enjoy having tofu in their breakfast	4.37 (0.66)	57.7%	4.38 (0.72)	42.3%	4.38 (0.68)	Very high extent	-0.121	.90	-0.11763, 0.10397	NS
5	Many students can eat tofu at the school	4.02 (0.66)	57.4%	4.07 (0.73)	42.6%	4.04 (0.69)	Very high extent	-0.953	.34	-0.16655, 0.05776	NS
6	Tofu could be eaten during the lunch period	3.64 (0.65)	57.2%	3.72 (0.69)	42.8%	3.68 (0.67)	High extent	-1.345	.18	-0.18197, 0.03403	NS
7	Students can eat tofu during school ceremonies	3.92 (0.76)	57.7%	3.93 (0.83)	42.3%	3.93 (0.79)	High extent	-0.079	.94	-0.13306, 0.12272	NS
8	Students can eat tofu without grudging	4.22 (0.85)	57.8%	4.21 (0.75)	42.2%	4.21 (0.81)	Very high extent	0.115	.91	-0.12354, 0.13889	NS
9	Tofu can be served alongside other meals	3.75 (0.82)	57.8%	3.75 (0.85)	42.2%	3.75 (0.84)	High extent	0.113	.91	-0.12775, 0.14330	NS
10	Students can enjoy eating tofu with their friends	4.01 (0.77)	57.5%	4.04 (0.77)	42.5%	4.02 (0.77)	Very high extent	-0.497	.62	-0.15667, 0.09339	NS
	Total	4.05 (0.23)	57.7%	4.05 (0.24)	42.3%	4.05 (0.23)	Very high extent	-0.192	.85	-0.04177, 0.03432	NS

*M*(SD)=mean (standard deviation), *M<sub>t</sub>*=mean total, %=percentage of total responses, *t*=t test value, *P*=significance, Dec.=decision, NS=not significant, CI=confidence interval.

**Table 6**

**Results on moderating effect of gender in the association between recognition of tofu benefits and students' acceptability of tofu.**

Interaction	Coefficient	<i>R</i> <sup>2</sup> change	<i>SE</i>	<i>t</i>	<i>F</i>	<i>ρ</i>	95% CI
RTBQ*Gender	0.0024	0.0000	0.1665	0.0145	0.0002	0.988	-0.3245, 0.3293

CI=confidence interval, RTBQ=Recognition of Tofu Benefits Questionnaire.

**4. Discussion**

This study revealed that students' acceptance of the 3 cooking options of tofu (steamed, boiled, and fried) did not significantly differ by gender. The study found that there is no significant difference between the male and female students on the extent to which they would eat tofu in school. The finding also revealed that the recognition of benefits of tofu is not significantly associated with acceptance of steamed, boiled, and fried tofu among the students. It was also found that the recognition of benefits of tofu is not significantly associated with consumption of tofu among the students. The finding further revealed that gender did not significantly moderate the association between recognition of benefits of tofu and students' acceptability of tofu. Also, it was found that gender did not significantly moderate the association between recognition of benefits of tofu and consumption of tofu among students. More importantly, it was found that 94.5% of the respondents recognized the benefits of tofu. Previous studies by Poysa and Woodrow,<sup>[21]</sup> indicated that the acceptance of tofu is due to the increasing recognition of its health benefits. Shokunbi et al<sup>[22]</sup> noted that tofu is now popular among the student population. According to Yakubu and Amuzat,<sup>[23]</sup> tofu as a soybean product is inexpensive and it serves as a high-quality protein source, which may explain why tofu is consumed among the students. Hou et al<sup>[24]</sup> showed that the consumption of tofu is increasing due to its low amount of

calories, being rich in essential amino acids, its beneficial amounts of iron, and the fact that it has no saturated fat or cholesterol. According to Majalo et al,<sup>[25]</sup> tofu is popularly consumed in Nigeria as a result of the awareness of the nutritional and health benefits associated with soybean products. Furthermore, research indicates that the level of tofu consumption in Nigeria may be due to animal diseases, such as mad cow disease, and the global shortage of animal protein, strong demand for healthy and religious food, and economic reasons.<sup>[26]</sup>

The present findings regarding the recognition of tofu benefits and its acceptability as a meat alternative have implications for nutritional counseling and regional health. In recent years, the call to action to promote healthy eating and interdisciplinary responses to patients' desire to eat healthy foods cannot be overemphasized. Nutritional counseling and education can provide the opportunity to inculcate a healthier eating habit in schooling adolescents. Students, nutritional counselors, home economists, and dieticians in Nigeria should be aware that tofu as a soybean product can be consumed in almost all diets, and that it contains virtually no cholesterol and is lactose-free.<sup>[27]</sup> In this respect, it would be helpful to conduct nutritional counseling and nutrition education seminars for students in Nigerian boarding secondary schools.

Available evidence suggests that general practitioners, in alliance with dietitians, can help individuals achieve significant

**Table 7**

**Results on moderating effect of gender in the association between recognition of tofu benefits and consumption of tofu among students.**

Interaction	Coefficient	<i>R</i> <sup>2</sup> change	<i>SE</i>	<i>t</i>	<i>F</i>	<i>ρ</i>	95% CI
RTBQ*Gender	0.1109	0.0028	0.0850	1.3053	1.7037	0.192	-0.0560, 0.2779

CI=confidence interval, RTBQ=Recognition of Tofu Benefits Questionnaire.

weight and blood pressure improvement by providing nutritional counseling.<sup>[28]</sup> Thus, patients should not be reluctant in seeking nutritional counseling from relevant professionals. This is also because previous studies indicated that physicians can provide behaviorally-focused diet counseling services.<sup>[29]</sup> As a way of providing nutritional counseling, we would like to assert that care must be taken regarding the consumption frequency of tofu among adolescents as they grow into adults. Adolescents also need to avail themselves of information about dietary factors associated with ageing. These cautions are required because study have reported that higher midlife tofu consumption was separately related to indicators of cognitive dysfunction and brain atrophy in late life.<sup>[30]</sup>

On another note, nutritional counseling and education can provide opportunity to learn about the appropriate techniques for processing tofu without altering the required nutrients. As researchers have noted, the processing techniques of tofu have to be optimized, so that the final products will contain the nutrient and nutraceutical content of the starting material as much as possible.<sup>[31]</sup>

Furthermore, the finding that male and female adolescents were not significantly different in recognition of the potential benefits of tofu implies that nutritional counseling services for the Nigerian adolescent students have to be gender-transformative. Nutritional counseling and education is therefore necessary to promote healthy eating of tofu as a meat alternative among male and female adolescent students. Nutritional counseling should be used to promote a healthy diet and to improve the nutritional status of individuals, including women and those in undernourished populations.<sup>[32]</sup> Nutritional counseling and education on ways of accessing Soybean products like tofu should be made available to the Nigerian adolescent students since nutritional intake among these students in boarding schools could be dependent on such factors as availability of money to purchase snacks, availability of food in the adolescents' lockers, school regulations regarding school meals, the quality of the food served, and the adolescents' attitude toward certain foods.<sup>[14]</sup>

Despite our findings, the present study has some limitations. First, some nutritionists might argue that the consideration of a few variables (i.e., gender and age) limits the contribution made by the current study. In addition, demographic characteristics, such as participants' location, allergies, socioeconomic status, and cultural background, were not included, which might affect the generalizability of the results. Further limitations involve the lack of data on such variables as level of study and number of years that a student has lived in the boarding school hostel, which could have provided a broader description and explanation regarding the recognition of tofu benefits, tofu acceptability and consumption among adolescent students living in boarding schools in Nigeria. Future studies should endeavor to examine these sociodemographic characteristics of adolescent students in boarding schools while assessing their level of recognition of benefits, acceptability and consumption of tofu, both in Nigeria and in other countries.

## 5. Conclusions

It is concluded that 94.5% of the sampled students in boarding secondary schools in the study area recognized the benefits of tofu. Also, there is no significant difference between the male and female students in their acceptability of steamed, boiled, and fried tofu. The extent to which students in boarding schools would consume tofu is not influenced by gender. Students' recognition of benefits of tofu is not significantly related to their acceptability

of steamed, boiled, and fried tofu. Furthermore, students' recognition of benefits of tofu is not significantly related to their consumption of tofu. Gender is not a moderator in the relationship between recognition of benefits of tofu and students' acceptability of tofu. In addition, the relationship between recognition of benefits of tofu and consumption of tofu is not moderated by students' gender. In view of these conclusions, further research is needed to identify the level of tofu acceptability and consumption among students in boarding secondary schools in other states of Nigeria. Further research is also needed to identify factors influencing how recognition of tofu benefits is associated with tofu acceptability in Nigeria. Further research on factors influencing how recognition of potential benefits of tofu is associated with its acceptability among the Nigerian student population can have implications for nutritional counseling and regional health.

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## Author contributions

**Conceptualization:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Helen A. Njoku, Amaka B Ezeanwu.

**Data curation:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Amaka B Ezeanwu.

**Formal analysis:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Funding acquisition:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Investigation:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Methodology:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Project administration:** Ukamaka G Okwume, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Resources:** Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu.

**Software:** Chiedu Eseadi, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue.

**Supervision:** Ngozi M Eze, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Validation:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Visualization:** Ukamaka G Okwume, Chiedu Eseadi, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Writing – original draft:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

**Writing – review & editing:** Ngozi M Eze, Ukamaka G Okwume, Chiedu Eseadi, Elizabeth A Udentia, Nkechi G Onyeke, Elizabeth N Ugwu, Benedette N. Akubue, Helen A. Njoku, Amaka B Ezeanwu.

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