Research Article

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# Food neophobia among Nigerian consumers: a study on attitudes towards novel turmeric-fortified drinks

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## Abstract

**BACKGROUND: Knowledge on food neophobia among African consumers is scarce. Yet a good understanding in this area is essential to support the acceptance of new foods, for instance, when fortifying familiar foods to improve the health and nutritional status of the populace. In this paper, food neophobia among Nigerian consumers was assessed by their attitudes towards unfamiliar beverages, namely turmeric-fortified drinks. Turmeric was chosen as the Nigerian government is stimulating its production for income generation, but the spice is not commonly used in Nigerian foods and drinks.**

**RESULTS: Familiar street-vended drinks, i.e. soymilk and the hibiscus-based drink zobo, were fortified with turmeric. Respondents (483) were allowed to try both the familiar and unfamiliar (turmeric-fortified) drinks. Subjects also filled in a 20-item questionnaire concerning attitudes toward food and eating. Food neophobia was measured by the Food Attitude Survey (FAS) instrument ratings. Using the FAS, people who reported liking the fortified drinks ('likers') were compared with those who disliked the drinks ('dislikers') and those who were unwilling to try the drinks ('will not tryers'). Males were found to be more food neophobic than females. Middle-class income earners, the age group of 26–35 years and respondents with the highest education levels also showed a more food neophobic attitude towards turmeric-fortified drinks.**

**CONCLUSION: Practical insights are given regarding the introduction of novel foods to Nigerian consumers by paying attention to attitudes from respondents with different demographic characteristics. The use of influencers seems to be a promising approach to address food neophobia in Nigeria.**


**Keywords:** Food Attitude Survey; Food Neophobia Scale; *Curcuma longa*; consumer research; spice; zobo

## INTRODUCTION

The potential of turmeric (*Curcuma longa* L.) to boost the income of small-scale Nigerian farmers encouraged the government to financially support research on turmeric farming in Nigeria through the National Roots Crops Research Institute in Umudike[1] and its research locations across the country. Together these are piloting tests of turmeric accessions for official distribution to local farmers.[2] Turmeric is a globally used condiment and colouring agent.[3] The crop is also one of the most broadly investigated as a natural remedy against various illnesses. In Asian traditional medicine, turmeric is used to treat infectious diseases, throat infection, gynaecological ailments, hepatic disorders and other chronic diseases.[4] In Nigeria, turmeric is boiled (with or without other herbs) and sipped to treat malaria, yellow fever, gastric ulcer, high blood pressure, cold, convulsions, and rheumatoid and emotional disorders.[5] As turmeric is widely available, is relatively cheap and has health benefits, it is increasingly being added to existing foods such as bread,[6] biscuits,[7] chocolate,[8] cakes[9,10] and beverages.[11]

Humans vary substantially in their attitudes towards novel foods, with some displaying a strong interest in trying them and others displaying great apathy. Linked to the knowledge of acceptance of novel foods is the approach of food neophobia, which is the unwillingness to consume or the avoidance of novel foods.[12] Consequently, food neophobia can influence the acceptance of

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novel foods. Therefore, knowing its prevalence among specific groups of consumers is of concern to food product designers and industries. Food neophobia is considered to be a common property of omnivorous animals, including humans, but studies of food neophobia in people have shown large individual differences. Pliner and Hobden[13] developed the initial psychometric tool intended to test individual differences in food neophobia, namely the Food Neophobia Scale (FNS). An alternative method for the measurement of food neophobia, known as the Food Attitudes Scale (FAS), was developed by Frank *et al.*[14] Results of the FNS and FAS envisage individual differences in likings for new *versus* accustomed foods.[15]

Nutritionally desirable new foods are difficult to introduce in specific nations because of neophobia and variability in the diet. This has led to multicultural research in five nations in Europe and in the USA.[16] Moreover, food neophobia studies among young adults in Australia were initiated by uncertainties about food familiarity among various cultures and the impact of socio-economic status (SES).[17] MacNicol *et al.*[18] conducted related studies on the connection between behaviour, personal attitude and eating performance among Scottish adolescents. Choe *et al.*[19] made the first attempt to validate the Food Neophobia Scale in Asia. They studied the trend of food neophobia amid the Korean population. Another recent study in Asia[20] was done to reveal the situation of food neophobia among three population groups comprising Malay, Indian and Chinese studying in the higher institutions in Malaysia.

The influence of socio-economic features on the attitude of consumers in Brazil about innovative food technologies was studied to compare the familiarity and willingness to try new foods developed by conventional and non-convectional technologies.[21] It was recommended that consumers should be updated about the benefits of any new food derived from traditional food to successfully enter the market and reach a competitive stage. Similarly, the findings of Martins and Pliner,[22] on the basic reasons for acceptance or rejection of new and familiar food, suggested that one approach for limiting a food neophobic reaction to new foods was to actively highlight the positive characteristics of the products to reduce individual perception of the negative features of these foods. In general, exposure to unfamiliar foods decreases neophobic responses and this exposure in turn influences willingness to try new foods.[19,23–26]

As yet, we know of no study on food neophobia in Africa. Such data would benefit researchers working to improve the nutritional status of the populace by developing novel foods for inclusion in the diet. Nigerian industries have been voluntarily fortifying staple foods since the 1990s. Mandatory fortification of wheat and maize flour, edible vegetable oil and sugar was enacted in February 2000 and enforcement began in September 2002.[27] Fortified foods turned out to be novel, though, and foods to be fortified must be consumed adequately by a large proportion of the target individuals in a population.[28] Sensory attributes that are most affected when fortifying food with turmeric are appearance (colour) and taste. These attributes may therefore impact on the overall acceptability of such turmeric-fortified foods. Since food neophobia can influence preferences towards novel foods, understanding its potential impact on consumers' food acceptance is an important issue for food researchers, product developers and marketers. Hence this study was carried out to assess the attitude of Nigerian consumers towards novel drinks and to gain insight into the prevailing level of food neophobia. For this purpose, turmeric-fortified drinks from two street-vended beverages, namely zobo and soymilk, were developed. Addition of turmeric to zobo and soymilk is novel in Nigeria. This root, indigenous to India, is currently gaining attention in the farming systems and research in Nigeria because of its bioactive properties and health benefits. Nwaekpe *et al.*[1] reported how farmers can tap into the potential of prevailing favourable soil and climatic conditions to increase turmeric production in Nigeria. Akpan *et al.*[29] also reported that turmeric incorporation into the farming scheme of Nigeria is mostly important for revenue and nutrition improvement. However, in a study conducted by Osawaru and Eholor,[30] the respondents (who belonged to nine different tribes in Nigeria) used turmeric only as spice and medicine. The fact that Nigerian food processors are not yet tapping into the potential of using turmeric for income generation and improve nutrition could be because the options for its inclusion in food products and their acceptance have not been properly studied.

Zobo is a refreshing, non-alcoholic street-vended beverage in Nigeria, produced by boiling water with the calyces of the roselle flower (*Hibiscus sabdariffa*) to obtain a dark-red coloured and sour-tasting beverage after filtration. Depending on the street-food processor and geopolitical location, sugar, and spices such as garlic and ginger or fruits, may be added according to taste.[31,32] The drink is a good source of vitamins and minerals.[33,34] Soymilk has good nutritional and health features. In many nations, soymilk is a vegetarian alternative for milk and for lactose intolerance.[35–38] Like zobo, soymilk is a common drink for Nigerians of all ages. Street food vendors – mainly local women – produce and sell both drinks on the street as a low-cost beverage to generate income and alleviate poverty.[31,36] Zobo and soymilk are consumed across diverse socio-economic classes and cultural groups in Nigeria.[39–41] Presently zobo is consumed by several million people in West African countries, particularly among the youth, who perceive zobo as a relatively cheap and soothing non-alcoholic drink in societal meetings.[41,42] Hence the second aim of this study was to assess the relationship between food neophobia levels and demographic factors such as age, gender, education, income and exposure to other cultures within Nigeria. This aim was designed to test the hypothesis that food neophobia scores would decrease with increasing education and exposure to other cultures but would increase with increasing income and age.

## MATERIAL AND METHODS

### Study design

Soymilk was prepared as described by Obadina *et al.*[35] The soymilk without turmeric was presented to respondents as SY (soymilk control). To produce turmeric-fortified soymilk, turmeric paste was added to soymilk. Chopped turmeric (40 g in 80 mL water) was blended in a Waring blender (blender 8011ES, model HGB2WTS3, Waring, TX, USA) until a fine paste was obtained. This paste was added as 5%, 7.5% and 10% w/v to the soymilk, boiled and allowed to cool. The choice of these concentrations was based on the usual intake of boiled turmeric milk to treat sore throat infection in India. The resulting drinks were presented to the respondents as STA, STB and STC, respectively. Zobo drink was prepared according to the method of Adesokan *et al.*[34] The drink without turmeric was presented to respondents as ZB (zobo control). Turmeric paste was added to zobo to produce turmeric-fortified zobo. Turmeric paste (as described above) was added as 2%, 6% or 10% w/v of zobo and presented as ZTA, ZTB and ZTC, respectively. Addition of turmeric to zobo is new. We hypothesized that the nutritional quality



  
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of zobo with 6% and 10% turmeric might be lower than for 2% turmeric due to aggregation or precipitation at higher concentrations.

### Measurement of food neophobia

A review of tools to test food neophobia and willingness to try unfamiliar foods suggested 13 instruments from 255 studies.[43] Out of these 13 instruments, the Food Attitude Scale (FAS) described by Frank *et al.*,[14] to measure individual attitudes to food and willingness to try novel foods was used in this study.

### Questionnaire

The questionnaire was written in English and comprised four sections. The first section contained questions on respondents' willingness to try turmeric-fortified drinks in stimulating and non-stimulating circumstances with questions on consumption of indigenous drinks, namely zobo (ZB) and soymilk (SY), and the respondents' feelings/reactions if they were presented with turmeric-fortified zobo and soymilk. Questions on two fictitious drinks – namely 'zokurma' and 'sokurma' – were also included to test the reaction of our respondents while trying an unknown drink based merely on its name.[44] Respondent answered yes or no to the first two questions asking if they drank soymilk and/or zobo, while the questions on willingness to try drinks in stimulating and non-stimulating circumstances were answered on a 5-point Likert scale,[45] with options ranging from 'very interested' to 'very disinterested'. Thereafter, respondents were presented with eight drinks, namely SY, STA, STB, STC, ZB, ZTA, ZTB and ZTC (codes as described in the 'Study design' section, above). The respondents were asked to taste and rate the drinks on a 9-point scale, labelled as follows: 1, Dislike extremely; 2, Dislike very much; 3, Dislike moderately; 4, Dislike slightly; 5, Neither like nor dislike; 6, Like slightly; 7, Like moderately; 8, Like very much; 9, Like extremely.[46,47] In the second part of the survey, the respondents were requested to judge all the drinks on 5-point scale ranging from 'like' to 'will not try'.[14] The detailed meaning of this 5-point 'like' to 'will not try' scale, as described by Frank and van der Klaauw,[14] were also made known to the respondents as follows:

**Like** = I really like this drink. I think it tastes good.
**Neutral** = I can take or leave this drink. It tastes OK.
**Dislike** = I dislike this drink. It tastes awful.
**Will try** = I've never tried this food, but would taste it if I had the opportunity.

**Won't try** = I've never tried this food, and never intend to try it.

The third section of the survey concerned general data such as gender, age, level of education attained, the number of geopolitical zones visited and household income.[19] Geopolitical zones and household income were aligned with the data of the National Bureau of Statistics Office in Nigeria.[48] For ease of resource sharing, the 36 states in Nigeria are politically classified into six geopolitical zones, namely North-East (NE), North-Central (NC), North-West (NW), South-East (SE), South-West (SW) and South-South Zone. Consumption pattern, recipe and method of preparation of similar foods varies across these geopolitical zones.[49,50] Geographical differences across Nigeria led to Uwaifo and Uddin[51] proposing that the educational curricula should also vary from zone to zone. In Nigeria, the present system of education, whose curriculum is expected to meet the Millennium Development Goals (MDGs), is called the Universal Basic Education (UBE), otherwise known as the 9-3-4. This system was introduced in 1999 and had been expected to take off since 2006 to replace the 6-3-3-4 system of education. Household income was categorized into low, middle and high income, signifying a respondent's financial strength. The last part of the questionnaire contained a list of 20 statements concerning attitudes towards food and eating.[44] Each statement was scored on a 5-point category scale that ranged from 'strongly agree' through 'neutral' to 'strongly disagree'.[14] Responses to these statements were statistically compared for the groups of selected 'likers' and 'dislikers', the 'will not tryers' and the overall average.

### Respondents

This study was conducted in Akure, the capital town of Ondo State, in the South-West geopolitical zone of Nigeria. The respondents were 16–75 years old. Several challenges facing technology and educators in the implementation of 9-3-4 in primary schools[52] made both the young and old respondents in our study the beneficiaries of 6-3-3-4 system of education. Graduate students of the Federal University of Technology, Akure, were trained to administer the questionnaires to the participants. The respondents were not specially recruited as zobo and soymilk are hawked in the streets in Nigeria and consumed across all ages. The graduate students visited respondents in their various stores, houses, offices, along the streets, etc. with the questionnaire and the turmeric-fortified drink samples. The data were collected within 3 weeks in the fall/winter of 2018. It took 30–45 min for each respondent to complete the sensory test and accompanying FAS questionnaire.

### Data analysis

About 500 questionnaires were distributed, and 483 were returned for analysis. The FAS was analysed by using the XLSTAT version 2018.7 auto sum command to sum the number of responses in the five answer categories (i.e. from 'like' to 'will not try'), which reflected the general reactions to the turmeric-fortified drinks used in the survey. For the categories of 'likers' and 'dislikers', 60 respondents each were randomly selected for comparison of their responses to the 20-item statements on food-related attitude, in line with data analysis according to the FAS.[14] Randomization was conducted using the command 'RAND ()' in a Microsoft Excel 2016 spreadsheet. All the 'will not tryers' were included because they were few in number. Furthermore, a group of 'average' subjects ($n$ = 60) was selected for comparative analysis. Subjects selected for this group met the criterion of having less than 0.5 standard deviations from the sample mean in their number of 'like', 'neutral', 'dislike', 'will try' and 'will not try' responses.[14] Lastly, respondents who did not give a response (i.e. score zero) to one of the 20 questions were deleted from the group, leaving us with $n$ = 44, 47, 43 and 13 fully completed questionnaires for average, 'likers', 'dislikers' and 'will not tryers', respectively. Reliability of the selected group was tested based on percentage difference between the original mean and the randomized mean, i.e. original mean/randomized mean multiplied by 100, which gave 98% in this study. SPSS version 23.0 was used for the descriptive statistics of consumer awareness and willingness to try turmeric-fortified drinks in stimulating and non-stimulating conditions, as well as analysis of variance (ANOVA) to determine the differences in sensory attributes among the turmeric concentrations for the 402 respondents who consumed both



  
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turmeric-fortified zobo and soymilk,[46] and for the five measures ('like' to 'will not try') across the respondents' demographic information. Excel 365 was used for binomial analysis to also test whether there were differences in consumption of soymilk and zobo by all the respondents.

## RESULTS

### Respondents' profile

We distributed 500 questionnaires, and 483 were returned for analysis (96.6%). The study was conducted in the South-West (SW) geopolitical zone which is the predominant Yoruba ethnic region, yet 5.4% ($N = 26$) were Igbos (SE and SS), Hausas (NE, NC and NW) 3.1% ($N = 15$) and the rest of the respondents (91.5%) were Yorubas ($N = 442$). 35% ($N = 169$) of the respondents had not visited any geopolitical zone aside from their own, while 20.1% ($N = 97$), 16.8% ($N = 81$) and 28.2% ($N = 136$) had visited one, two and three or more geopolitical zones, respectively. Among 483 respondents, (55.9%, $N = 270$) were male, and 44.1% ($N = 213$) were female. $N = 217$ (44.9%) of the respondents had a university education. $N = 170$ (35.2%) of them were high school certificate holders, while 19.9% ($N = 96$) of the respondents were basic school certificate holders.

25.1% ($N = 121$) of the respondents belonged to the low-income group, 34.2% ($N = 165$) of the respondents belonged to the middle-income group, while 40.8% ($N = 197$) of the respondents belonged to the high-income group.

### Nigerian consumer attitudes towards turmeric-fortified drinks

Figure 1 presents the respondents' general attitudes to turmeric-fortified drinks used in this survey. Likers' scores decreased as the concentration of turmeric increased for all the samples used. The rate of dislike also increased as the turmeric concentration increased. However, the respondents were more neutral than liking the drinks with the lowest turmeric concentrations (5% turmeric soymilk and 2% zobo) in the drink.

### Food neophobia attitude of respondents in relation to demographic factors

In Nigeria, states with similar cultures, ethnic groups and common history are categorized into the same geopolitical zone. Aside from variation in the geopolitical zone, significant urban–rural differences also exist in the achievement of pupils at the elementary (primary) educational level in Nigeria.[53] The recipient of the 6-3-3-4 type of educational system would spend 6 years in elementary school, 3 years in junior secondary school, 3 years in senior secondary school and 4 years in the tertiary institutions such as colleges of education, polytechnics and universities. The 6-3-3-4 system of education in Nigeria is labour related. It is to provide the child with simple tools to prepare him or her for local craft at the elementary stage. Achievement of vocational skills is the focus at secondary stage, while the tertiary stage is professionally oriented. In brief, 6-3-3-4 is a purposeful education, which aids its beneficiaries to function morally, intelligently, economically, politically and socially.[51] Table 1 presents the results on the relation between food neophobia and two characteristics of our respondents, namely their level of education and the number of geopolitical zones they visited. This in-depth analysis was performed because the attitude of the highly educated group of respondents was classified as clearly neophobic, with scores of 21% 'dislike' and 5% 'will not try', as shown in Fig. 2(B). A significant difference ($P < 0.05$) was established between the respondents with elementary education and those with university

**Table 1.** Education level and geopolitical zone visited outside the geopolitical zone/area of respondents

| | *N* | Mean | SD |
|---|---|---|---|
| *Education level* | | | |
| Elementary | 33 | 1.61* | 0.75 |
| Secondary | 134 | 1.96 | 0.92 |
| University | 196 | 2.23* | 1.16 |
| *Geopolitical zones visited* | | | |
| 0 | 79 | 1.68* | 0.91 |
| 1 | 87 | 1.83* | 0.78 |
| 2 | 75 | 2.12* | 0.99 |
| 3 or more | 107 | 2.22* | 1.06 |

*Mean difference is significant at the 0.05 level.
Total *N* values of 363 and 348 respondents indicated educational level and geopolitical zone(s) visited, respectively.

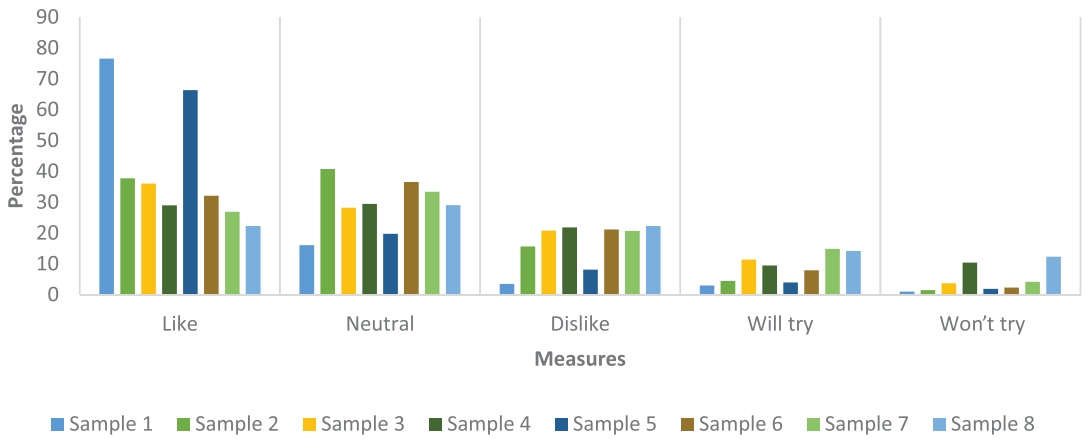


**Figure 1.** Responses of 483 Nigerian consumers to two familiar (sample 1 and 5) and six unfamiliar beverages (samples 2–4 and 6–8) according to the five answer categories of the Food Attitude Scale (FAS) developed by Frank and Van der Klaauw (1994). Key: Samples 1, 2, 3, 4, 5, 6, 7 and 8 represent SY, STA, STB, STC, ZB, ZTA, ZTB and ZTC, respectively.



  
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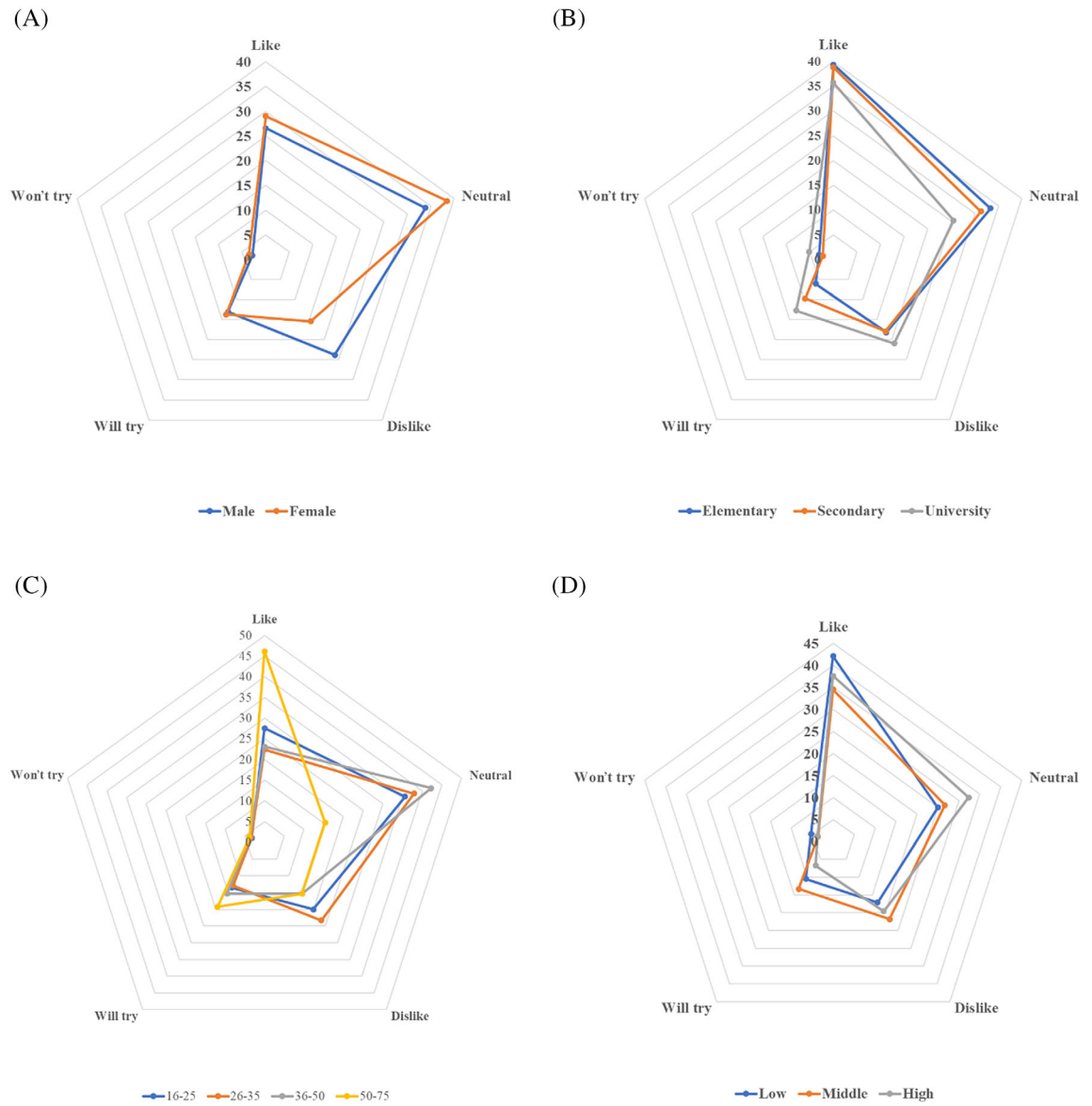


**Figure 2.** Respondents' demographic factors *versus* their responses (%) to the question of whether or not they would try turmeric-fortified drinks: (A) gender; (B) level of education; (C) age; (D) class of income.

education. This indicates that only 6 years primary education limits the social attitude and interaction of its recipients. Nigerians with this level of education are moderately functional economically and politically than socially and intellectually. Moreover, significant differences ($P < 0.05$) were found for people who had visited two, three or more geopolitical zones in Nigeria and those who had not travelled outside their geopolitical zone. Another significant difference ($P < 0.05$) existed between people who had visited one zone outside their own and those who had been to three or more places, i.e. had had more contact with people from other areas with different living styles, culture and probably slight taste differences in familiar foods due to variations in preparation and recipe. This result indicated that the cultural diversity of Nigeria has implications for the attitude of the populace towards novel food. The attitudes of the 483 respondents as related to the other demographic characteristics in our study, i.e. gender, age and income, are also shown in Fig. 2(A, C, D) respectively.

### Respondents willingness to try and overall acceptability of turmeric-fortified drinks

Of our respondents, 83.2% ($N = 402$) consume soymilk whereas 16.8% ($N = 81$) do not; and 90.5% ($N = 437$) consume zobo whereas 9.5% ($N = 46$) do not. This result indicates that both soymilk and zobo are familiar drinks in Nigeria. However, the difference in their consumption rate was significant at $t(964) = 1.96$, $P = 0.00$ (one tailed). Table 2 shows the willingness to try novel foods in general, as well as in stimulating and non-stimulating circumstances. The most positive answer was for 'If your favourite actor/actress or clergyman offers you *sokurma*, how will you feel about trying it?' ($M = 2.27$, SD = 0.96), and the lowest score for 'If refreshment at your friend's house is zobo with turmeric flavour, how will you feel about drinking that type of drink?' ($M = 1.89$, SD = 0.79). This result indicated that the respondents were more willing to take unknown drinks irrespective of the name given to the drink (like *sokurma*, which is a fictitious name and the drink was



  
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**Table 2.** Respondents' willingness to try turmeric-fortified drinks in stimulating and non-stimulating circumstances

| Item | | Mean | SD |
|---|---|---|---|
| 1 | Assuming you attended a friends' feast and you were served *zokurma*,[a] how will you feel about drinking it? | 2.22 | 0.97 |
| 2 | If your favourite actor/actress or clergyman offers you *sokurma*,[a] how will you feel about trying it? | 2.27 | 0.96 |
| 3 | If a refreshment at your friend's house is zobo with turmeric flavour, how will you feel about drinking that type of drink? | 1.89 | 0.79 |
| 4 | If a refreshment at your favourite uncle's house is soymilk with turmeric flavour, how will you feel about trying that type of drink? | 1.96 | 0.98 |
| 5 | If your family member brought soymilk with a colour you have never seen before, how will you feel about trying it? | 2.19 | 1.02 |

All questions were scored on scored on 5-point Likert scale; very interested, interested, indifferent, disinterested, very disinterested.
[a] *Zokurma* and *sokurma* are fictitious names given to turmeric-fortified zobo and soymilk, respectively.

not included in the study) if their favourite actor/actress or clergyman offered it to them rather than their families and friends. The result is also an indication that public figures could be a social influencer for acceptability of unfamiliar drinks in Nigeria.

Table 3 shows the scores of the sensory attributes for turmeric-fortified street-vended zobo and soymilk. The control street-vended drinks were liked much more than the unfamiliar turmeric-fortified street-vended drinks. However, turmeric-fortified drinks were liked slightly to moderately for appearance, mouthfeel and overall acceptability for all the turmeric concentrations of zobo and soymilk by the 402 respondents who consumed both drinks in this study.

### Responses to the 20-item FAS questions by average and extreme groups

The outcome of the selected respondents to the 20-item FAS questions is presented in Table 4. Responses of the 'average' and 'will not tryers' groups differ for some general FAS questions. The responses of the 'dislikers' were similar to those of the 'will not tryers' group, as were the responses of the 'likers' and the 'average'. Table 5 also shows the results of additional checks on respondents with the highest level of education for some selected questions from the general FAS questions. This group of respondents agreed that even though they love to drink they will not try to drink if they do not know what it is.

## DISCUSSION

### Food neophobia studies across the globe

Research on food neophobia is common among Europeans.[54] Study aims, outcomes and relation between food neophobia and socio-economic factors, gender, age education and urbanization in Asia, Australia, Europe and South America as examined by the various researcher are reported in Table 6.

### Food neophobia among Nigerian consumers

Food neophobia among Nigerian consumers was measured using the validated instrument developed by Frank *et al.*[14] to measure individual attitudes to food and willingness to try novel foods. As inclusion of turmeric to street-vended food is novel in Nigeria, the main and most appropriate tool for this study is FAS to test consumer attitudes and preferences for turmeric-fortified drinks. This method was chosen because of its excellent internal and test–retest reliability[15] and its ability to provide useful suggestions regarding individual differences in food likings and attitudes.[44] The logic of the rating is the classification of both 'dislikers' and 'will not tryers' as food neophobic. Familiar street-vended drinks, i.e. soymilk and the hibiscus-based drink zobo, were fortified with turmeric. Turmeric was chosen because the Nigerian government

**Table 3.** Sensory scores of turmeric-fortified zobo and soymilk

| Sample | Appearance | Aroma | Taste | Mouthfeel | Overall acceptability |
|---|---|---|---|---|---|
| *Zobo* | | | | | |
| Zobo control | 7.89 ± 1.34a | 7.78 ± 1.40a | 7.87 ± 1.62a | 8.01 ± 1.32a | 7.80 ± 1.48a |
| 2% turmeric | 7.12 ± 1.40b | 7.00 ± 1.49b | 7.09 ± 1.77b | 7.31 ± 1.33b | 7.05 ± 1.56b |
| 6% turmeric | 6.45 ± 1.78c | 6.68 ± 1.80c | 6.61 ± 2.11c | 6.87 ± 1.81c | 6.47 ± 1.94c |
| 10% turmeric | 6.41 ± 2.14c | 5.89 ± 2.13d | 5.78 ± 2.36d | 6.16 ± 2.12d | 6.32 ± 2.22c |
| *Soymilk* | | | | | |
| Soymilk control | 8.14 ± 1.04a | 8.04 ± 1.06a | 7.99 ± 1.39a | 8.06 ± 1.14a | 8.10 ± 1.07a |
| 5% turmeric | 7.30 ± 1.30b | 7.38 ± 1.35b | 7.02 ± 1.72b | 7.38 ± 1.35b | 7.39 ± 1.27b |
| 7.5% turmeric | 6.84 ± 1.66c | 6.85 ± 1.67c | 7.14 ± 1.84b | 6.83 ± 1.80c | 7.00 ± 1.63c |
| 10% turmeric | 6.34 ± 2.02d | 6.61 ± 1.90c | 6.53 ± 2.14c | 6.49 ± 2.16d | 6.72 ± 2.34c |

Means in the same column with a different letter are significantly different at $P < 0.05$ for each type of product.
Values are means of scores of 402 Nigerian respondents.



  
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**Table 4.** Mean responses of 'likers', 'dislikers', 'will not tryers' and 'average' groups to the general FAS questions

| Statement | Likers ($n$ = 47) | Dislikers ($n$ = 43) | Won't tryers ($n$ = 13) | Average ($n$ = 44) |
|---|---|---|---|---|
| **i**. I enjoy trying new drinks | 2.5 | 2.4 | 1.8 | 2.8 |
| **ii**. I like different ethnic drinks | 3.3* | 3.2* | 1.9* | 3.1* |
| **iii**. I find many drinks distasteful | 3.0* | 3.6 | 2.8 | 3.6* |
| **iv**. I only drink because I have to drink | 3.2 | 3.4 | 3.7 | 3.4 |
| **v**. I like to try new restaurants | 2.7 | 3.2* | 2.1* | 3.3* |
| **vi**. Most of the time I can take or leave a drink | 3.1 | 3.2 | 2.7 | 3.0 |
| **vii**. I enjoy trying unusual drinks | 3.7* | 3.0* | 3.2 | 3.4 |
| **viii**. Having to drink is a bother | 3.0 | 3.4 | 3.0 | 3.3 |
| **ix**. I like to stick to the drinks I know | 2.7 | 2.2* | 2.7 | 3.0* |
| **x**. I like sugary drinks | 2.7 | 2.4 | 2.5 | 2.7 |
| **xi**. I find that many drinks I like are sweet | 3.2* | 2.4* | 2.7 | 2.4* |
| **xii**. I'm not likely to try new drinks in a bar/restaurant | 2.8 | 2.6* | 3.2 | 3.3* |
| **xiii**. I love to drink | 3.0 | 2.9 | 3.2 | 2.8 |
| **xiv**. I will not try drinks if I do not know what it is | 2.5 | 2.2 | 1.7 | 2.5 |
| **xv**. A bad experience would keep me from trying a drink again | 2.5 | 3.3 | 2.5 | 2.5 |
| **xvi**. I think that many drinks are disgusting | 3.4* | 3.7* | 3.0 | 3.4* |
| **xvii**. As a child, I was encouraged to try new drinks | 2.7 | 3.0 | 3.2 | 3.2 |
| **xviii**. I'll try a new drink even though one of its ingredients is something I do not like | 3.2 | 3.4 | 3.1 | 3.5 |
| **xix**. I have been called a selective drinker | 2.8 | 3.2 | 2.5 | 3.0 |
| **xx**. I consider myself a selective drinker | 2.5 | 2.6 | 2.3 | 2.7 |

*The mean difference is significant at the 0.05 level. All questions were scored on a 5-point category scale that ranged from strongly agree through neutral to strongly disagree.
Values are means of responses of 147 Nigerian respondents.

is stimulating its production for income generation, but the spice is not commonly used in Nigerian foods and drinks.

This research aimed to measure the attitude of Nigerian consumers towards novel foods. To date, information in this area is lacking in West Africa. We found consumer groups that were reluctant to try novel foods, i.e. exhibiting a degree of food neophobia. Initially, it was difficult to pinpoint the exact population group that exhibited food neophobia because we wanted to limit our classification to the group with highest scores of both 'dislike' and 'will not try' as described by Frank *et al.*[14] The highest scores for 'dislikers' were found for males, respondents aged 26–35 years and people with a middle-class income. However, the group of respondents that really stood out consisted of those with a university degree. This group of respondents with the highest level of education showed distinct food neophobia in the food attitude survey (i.e. the highest percentages for both 'dislike' and 'will not try' of 21% and 5%, respectively).

Each geopolitical zone in Nigeria has a unique culture Hence travelling from the south to the north of Nigeria exposes people to different cultures. Consumption pattern, recipe and method of preparation of similar foods also vary across these geopolitical zones.[49,50] For these reasons, and as reported in previous studies,[19,25] education and travelling may decrease or even extinguish food neophobia. Therefore, we did not expect the group with the highest level of education to be neophobic. Subsequently, we checked whether there was a significant relation with respect to education and geopolitical zones visited by our respondents, but we found none. The area of residence could be a significant factor that led to the food neophobic attitude of the highly educated respondents in our studies. University students living in Akure can be categorized as students living in a semi-urban

**Table 5.** Responses of 158 respondents with the highest level of education to some questions from 20-item questions

| Question | Strongly agree (%) | Agree (%) | Neutral (%) | Disagree (%) | Strongly disagree (%) |
|---|---|---|---|---|---|
| I enjoy new drinks | 24.1 | 41.1 | 8.9 | 16.5 | 9.5 |
| I love to drink | 17.1 | 38.0 | 21.5 | 13.3 | 9.5 |
| As a child, I was encouraged to try new drinks | 15.2 | 30.4 | 23.4 | 17.7 | 13.3 |
| Having to drink is a bother | 12.7 | 27.8 | 29.1 | 18.4 | 12.0 |
| I will not try drink if I do not know what it is | 32.3 | 43.7 | 8.9 | 11.4 | 3.8 |
| A bad experience would keep me from trying a drink again | 32.9 | 19.6 | 16.5 | 19.6 | 11.4 |
| I consider myself a selective drinker | 20.9 | 38.0 | 25.9 | 8.9 | 6.3 |



  
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**Table 6.** Reports of food neophobia studies in various countries

| Food neophobia study by country and author(s) | Study characteristics | Outcomes |
|---|---|---|
| France, Germany, Britain, Italy, Switzerland and the UA[16] | Telephone interviews with adults from Europe and the USA to study their attitude to variety in food intake and choice | The Americans, and the British to a certain level, centred on providing individual choices that were based on specific traits of food products. However, people from France, Germany, Britain, Italy and Switzerland stayed committed to collective eating traditions |
| Australia[17] | Questionnaire answers of Australian high school students from rural and urban locations to the food neophobia scale, familiarity with certain foods and willingness to try those foods | More significant contact with cultural diversity and higher SES has some effect on responses to unfamiliar foods. Urban respondents were more willing to try unfamiliar foods |
| Scotland[18] | Dietary knowledge, behaviours, attitudes and personality were surveyed in a group of 451 Scottish students | The lower socio-economic level was linked to an increasing trend to have a picky attitude to food and a higher level of food neophobia |
| Korea[19] | Description of Korean consumer responses to several non-ethnic foods | Food neophobia among the Koreans was found to be higher than in Western nations. Even though the authors could not find significant differences in the level of food neophobia regarding Korean domestic proceeds, the study indicated that individuals who spent additional money appeared to be more neophilic than individuals who spent less money. Moreover, individuals who were exposed to new and exotic foods were less neophobic |
| Malaysia, India and China[20] | Examining the connection between food neophobia and demographic characteristics (gender, age, marital status, education, race, living area and monthly income) | The study indicated that demographic factors are significantly related to the degree of neophobia. Malay scholars were more neophobic than Chinese and Indian scholars. Respondents living in semi-urban areas were more neophobic compared to those living in an urban environment. The authors concluded that the demographics and upbringing of an individual influence the neophobia level. Demographic factors with no exception of age and income significantly relate to food neophobia level |
| Brazil[21] | Studies on the influence of socio-economic features on the attitude of consumers in Brazil about innovative food technologies to compare the familiarity and willingness to try new foods developed by conventional and non-convectional technologies | A direct connection between familiarity with technologies and food neophobia was expected, but this was not confirmed. Instead, food neophobia was found to be influenced by socio-economic factors. The authors concluded that neophobia might be associated with an absence of information on new technologies. |
| Finland[25] | A representative sample of the Finns ($n = 1083$) rated the familiarity of 20 foods designated to be 'familiar' or 'unfamiliar' and willingness to try them. Respondents also administered a 10-item questionnaire measuring their food neophobia | Men were more neophobic than women, and the elderly ($66 \pm 80$ years) were more neophobic than the other age groups. Food neophobia scores decreased with increasing education and with the degree of urbanization |
| Lebanon and the USA[56] | Assessment of food neophobia levels between American and Lebanese students ($n = 1122$). Determination of the effect of individual variables such as country of residence, SES on food neophobia levels. Examination of the effect of food neophobia levels on the familiarity and willingness to try ratings of familiar and novel foods | Differences in FNS scores were found between American (29.8) and Lebanese (36.4) students ($P < 0.05$). Number of countries visited, rate of eating ethnic foods and record of sickness after eating anew food were significant ($P < 0.05$) |

part of Nigeria when comparing Akure residents to residents of large cities like Lagos and Ibadan in South-West Nigeria. Food neophobic attitude of this group with the highest level of education in relation to living area supported the findings that students living in semi-urban areas were more neophobic than those living in an urban environment.[20]

The attitude of the 26- to 35-year-old age group showed food neophobicity with a dislike of 23%. Hence the striking outcome






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of a score of 46% 'like' for 50- to 75-year-old Nigerian respondents for turmeric-fortified drinks could have been caused by the fact that people of this age group have more traditional knowledge about the health benefits of turmeric. These health benefits were corroborated by studies on the neuropharmacological profile and chemical analysis of the essential oils of fresh rhizomes of turmeric cultivated in South-West Nigeria, which described that turmeric, if boiled and sipped with or without other ingredients, can act as a herbal medicine to heal various diseases.[5,30] Nigerians generally believe that herbal medicine, which is commonly known in South-West Nigeria as '*agbo*', is bitter and disgusting by nature. Therefore children, youth and learned people sometimes avoid it. The rejection of '*agbo*' by learned people is also due to fear of microbial contamination during preparation as a result of poor sanitary conditions at the local producers.

The results of demographic variables other than education and age showed that the attitude of middle-class income earners in this study tends towards food neophobia. In Nigeria, 92% of people in the middle-income class have a post-secondary education.[55] Apart from the educational factor, the attitude of Nigerian middle-income earners towards food neophobia is supported by the finding that SES influences the opportunity for exposure. A lower SES can be linked to an increased tendency for a picky attitude to food and food neophobia.[17,18] The results indicated that male respondents were more food neophobic (23.7% 'dislike') than female respondents, which is in agreement with Tuorila *et al.*[25]

### Addressing food neophobia in Nigeria

Our study showed that food neophobia among Nigerians is most apparent among people who are characterized by two demographic factors, namely gender (male) and education (high). National Bureau of Statistics[48] data show that the youth literacy (15–24 years) rate in Nigeria is 76.1%, with males being more literate than females. The adult literacy rate, i.e. for 15 years and above, was 65.7% for males and 23.3% for females. Thus, in general, the literacy rate is high among men in Nigeria. We studied the highly educated group further with the 20-item statements. It was apparent that respondents with a university degree had in common that they agreed to enjoy trying new drinks (65.2%) and love to drink (55.1%) because they were encouraged as a child to try new drinks (45.6). Finally, 58.9% of this group considered themselves to be selective drinkers, which is in line with the statement of Frank *et al.*[14] that 'it is not accurate to characterize "won't tryers" and "dislikers" as uninterested in drinking or food generally'.

To address food neophobia, Choe *et al.*[19] suggested introducing new ingredients into familiar foods as this may be easier than introducing completely unfamiliar foods. Similarly, food neophobia can be addressed by introducing new ingredients to street-vended food in Nigeria. Our respondents were not specially recruited, as zobo and soymilk are hawked in the streets in Nigeria. The respondents were visited (like the street vendors) in their various stores, houses, offices, along the streets, etc. with the questionnaire and the turmeric-fortified drink samples. The overall acceptability of all concentrations of turmeric-fortified zobo and soymilk (6.32–7.05 and 6.72–7.39, respectively) indicate that healthy food can be promoted in Nigeria by fortification of familiar street-vended foods because of the existing familiar relationship between street vendors and consumers in terms of consumers' ease of accessibility to street-vended foods.

Another study on food neophobia[56] recommended addressing food neophobia with extra sales promotions, such as giving out free samples and free coupons. Free sampling points for new foods may be located within the university campus for easy access to obtain free samples by the students. Popular Nigerian musicians, comedians, actors and actresses are nowadays used for advertising food and herbal medicinal products across the country.[57,58] In our study, respondents were asked to imagine, while rating the samples, that they were in a social gathering and a popular actor/actress offered them a new drink. A public figure could also be used to distribute the free samples and introduce new foods to Nigerians, as the most positive answer was for 'If your favourite actor/actress or clergyman offers you *sokurma*, how will you feel about trying it?' ($M = 2.27$, SD = 0.96) when respondents' willingness to try turmeric-fortified drinks in stimulating and non-stimulating circumstances was tested.

The introduction of foods with added turmeric in Nigeria might also be facilitated by addressing the perception[59,60] among the Nigerian youth that perceives turmeric as an '*agbo*' herb, which they consider to be disgusting. Health consciousness can also be a positive influencer[61] for acceptance of turmeric-fortified drinks in Nigeria. We found this in the likeness attitude of the elderly (50–75 years) Nigerian respondents, who have more traditional knowledge about the health benefits of turmeric. This age group could be identified as important in encouraging consumption of turmeric-fortified drinks.

## CONCLUSION

This research serves as a starting point for understanding food neophobia among Nigerian consumers in relation to their attitude towards the fortification of familiar street-vended drinks. In this study, Nigerian male university graduates were the most food neophobic. Various instruments are available to measure food neophobia among diverse target groups. The choice of an instrument depends on the scope of the research. The research may be to support the development of plans for the upgrading of foods and to support the introduction of new food products in markets. We recommend further studies in Nigeria to obtain more in-depth knowledge using other instruments such as the Food Eating Questionnaire (FEQ), Food Situation Questionnaire (FSQ), Food Neophobia Scale (FNS), Food Technology Neophobia Scale (FTNS) and Variety Seeking Tendency Scale (VARSEEK).

Specific insights were provided in this study by paying attention to responses from respondents with different demographic characteristics such as age, gender and income. These insights, such as the 46% *vs*. 22% likeness of the turmeric-fortified drinks by 50- to 75-year-old *versus* 26- to 35-year-old respondents, can be of help for African researchers and product developers. In our case, the distinction seems to be due to traditional knowledge of health benefits of turmeric by the group of senior respondents and perception of the disgusting properties of herbal medicine ('*agbo*') by the junior respondents. Hence novel food researchers and developers are recommended to study not merely the foods themselves but also the acceptance by their target population.

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## CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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