

Assessment of Gender Knowledge and Attitude of Food Handlers in Preventing Microbial Contamination of Indigenous Fermented Food in Akure Metropolis, Ondo State, Nigeria

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ABSTRACT

Introduction: Fermented food plays a major role in many developing countries' cities and towns, both commercially and in terms of meeting the needs of those who produce it.

Methodology: A quantitative method and questionnaires were used for the collection of data from 120 households in Akure metropolis, Nigeria, using SPSS software.

Results: It was observed that female dominantly produced fermented food more than male. This confirms the public perception that the majority of males in Africa are not involved in food processing at house hold level.

Discussion: Finally, through formal or informal means, producers do not get enough information on food safety at schools, government bodies or home.

Conclusion: Outreach programmes should be encouraged in various communities where people are less likely to have proper knowledge food safety education. The study recommends that the government through the ministry of health and the Nigeria health service should undertake food safety education programmes.

Keywords: Gender; Indigenous; Fermented food; Food safety; Education

INTRODUCTION

Locally fermented food is a type of food processing in which microorganisms, such as Lactic Acid Bacteria (LAB), are used in the fermentation process to produce food. In food processing, fermentation is the anaerobic conversion of carbohydrates to alcohol, carbon dioxide, or organic acids using yeast and/or bacteria. Fermentation is a time honored method of food preservation. Microorganisms in foods normally have a minor impact, but they have a significant impact on the character of the food, particularly in terms of flavor and other organoleptic features.

Nigeria is made up of many ethnic groups, each with its own food processing tradition, making it impossible to pin down a single national meal. Depending on customs, tradition, and religion, each region has its own regional favorite meal. The fermentation procedures for these crops are a vital corpus of indigenous knowledge utilized for food preservation that has been passed down from generation to generation through

observation and experience. LAB extracted from these foods had been proven to be useful in treating gastroenteritis in men and animals, and possessed probiotic qualities such as hypolipidemic, hepatoprotective, and antibacterial. Fermentation techniques are frequently used on a small scale and in the home, and are characterized by the use of non sterile equipment or natural inoculums, unregulated conditions, sensory fluctuations, poor durability, and unattractive packaging of the processed products, resulting in food of variable quality. As the world becomes more industrialized and urbanized, efforts are being made to build large-scale factory manufacturing facilities for these meals, where the completed product's quality can be guaranteed [1-10].

Lactobacillus, *Leuconostoc*, *Enterococcus*, *Streptococcus*, *Penicillium*, and *Saccharomyces* are some of the microorganisms involved in fermentation.

The enhancement of organoleptic and preservation features, as well as the provision of nutritional quality, are some of the benefits of locally fermented foods. Temperature, water activity,

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pH, oxygen availability, and substrates utilized in the food fermentation process are some of the factors that influence the production of locally fermented foods. Some fermented foodstuffs, such as grains and fruits, have been found to have preservation function due to local fermentation. The creation of acid lowers the pH, which inhibits the growth of harmful organisms that cause food spoilage, food poisoning, and sickness, hence extending the shelf life of fermented foods. In addition, a variety of fungal toxins including as fumonisins, ochratoxin A, zearalenone, and aflatoxins are frequently found in food and feed. The use of LAB in the fermentation process aids in toxin detoxification while also preserving the nutritional content and flavor of foods.

Locally fermented foods are also used as food supplements, such as *ogi*, which is used as a weaning food to supplement breastfeeding in Southern Nigeria. Traditional fermented protein rich cuisine provides a high source of starch, vitamins, proteins, and minerals, which can help people in tropical areas improve their nutrition.

As a result, the study's goals were to gather information on food handling attitudes and knowledge, as well as to determine the risk factors for microbial contamination in fermented foods. The findings can be utilized to provide information to homes and food handlers in Ondo state, Nigeria, to raise awareness and reduce foodborne infections.

The specific objectives were to determine the socio-demographic characteristics of households that produce traditional fermented food, assess cultural practices in the preparation and storage of traditional fermented food, assess knowledge, attitude, and food handling practices among households that produce and those that do not produce traditional fermented food, and to determine the level of hygienic practice among households that produce fermented foods for consumption.

MATERIALS AND METHODS

Study area

Akure's unique location as a crossroads for people from across the state provides it a unique opportunity in terms of the country's social, economic, cultural, and political life. The city serves as an urban destination for individuals from practically all ethnic groups and regions in the country, thanks to its central location, dynamic market, and rich culture and history.

Research design

According to, this study used a cross-sectional design and a quantitative data collection approach to examine the knowledge and attitude of food handlers in preventing microbial contamination of indigenous fermented food. Food handlers who produced locally fermented food and were at least 18 years old at the time of the study were the study's target demographic.

Methods and instruments for data collection

To collect data, this study used the self-administered questionnaire approach with a link to the questioner. The goal of the study was described to potential volunteers, and they were then invited to fill out the questionnaire depending on their consent before doing so. The researcher advised participants who couldn't read the questionnaire.

The questionnaire was used to obtain primary data. The major data for the study came from the responses of the food handlers. The data was collected from 120 families using a quantitative method and questionnaires.

Data analysis

SPSS was used to analyze the data from the field survey (version 23). The software used in the study included both descriptive and inferential statistical methods (SPSS). The food handler's expertise and attitude were classified using the descriptive method. The association between food handlers' socio-demographic variables and food safety knowledge was evaluated using inferential statistics and the *chi-square* tool. The participants were given three options for assessing the food handlers' knowledge: (Yes), (No), and (I don't know).

RESULTS

Respondent socio-demographic characteristics

People's behavior and perceptions were heavily influenced by their socio-demographic backgrounds and socio-demographic characteristics such as age, gender, and marital status, level of education, religion, and tribe.

The statistics of the results revealed that majority of the respondents were women. As a result of this discovery, females are dominating in the creation of fermented foods, with females producing some fermented foods such as "Iru and Fufu" in particular. This also demonstrates that, due to their employment demands, women are heavily involved in the manufacture of fermented foods [11-15].

The data gathered in the field as well as the respondents who took part in the study and provided feedback on the topics rose. The majority of the responses were statistically between the ages of 26 and 30 (35.8%). Respondents between the ages of 16 and 40 were the youngest age group (8.3%). Most of the respondents that took part in the survey were largely young adults. The respondents' ages helped to distinguish between the various types of respondents. The study discovered that the manufacture of fermented foods has nothing to do with a certain age group of people, but that everyone, regardless of age, is involved in the process at various households and in the city at large.

The number of married, single, divorced, and widowed respondents, as well as their percentages. The bulk of the 120 respondents 85 (72%) were married, compared to only 24 who were single (20%).

The data is collected from the field and the respondents who participated in the study and responded to issues raised.

Statistically, the majority of the respondents were between the age ranges of 26-30 (35.8%). The least age group constituted respondents who were between the ages of 16-20 and 36-40 (8.3%). Overall, majority of the respondents who participated in the study were mostly young adults. The age of the respondents helped to differentiate between the different categories of respondents. The study revealed that production of fermented food has nothing to do with certain age category of people but all and sundry irrespective of age are involved in the production process at different household and in the city at large.

The frequencies and the corresponding percentages of married, single, divorced, and widowed respondents. Out of the 120 total respondents, majority of them were married 85 (72%) as against 24 (20%) who were single. In addition, ten divorced couples were uncovered in the survey (8%). Even though married

persons made up the majority of the sample, the presence of 85 married couples suggests that fermented food manufacturing is not limited to single women or divorced people.

The educational attainment of respondents revealed that the majority of them had completed primary school (48%) followed by the secondary school graduates 38 (32%). There were 20 (17%) respondents with no educational background, and 5 (4%) were post-secondary school graduates. The educational degree of a person impacts how well-informed they are on how they handle life. The inference is that producers with a higher degree of education are more likely to practice personal hygiene and food safety (Table 1) [16-18].

Table 1: Frequency distribution of age, marital status and education level of the respondents.

Frequency distribution of age of the respondents	Age group (years)	Frequency	Percentage	95% confidence level
	16-20	10	8.3	4.2-13.3
	21-25	11	9.2	4.2-15.0
	26-30	43	35.8	27.5-45.0
	31-35	19	15.8	10.0-23.3
	36-40	10	8.3	4.2-13.3
	41-45	12	10	5.0-15.0
	46 and above	15	12.5	6.7-18.3
	Total	120	100	

Frequency distribution of marital status of the respondents	Marital status	Frequency	Percentage	95% confidence level
	Single	24	20	13.3-26.7
	Married	85	71.7	64.2-80.0
	Divorced	10	8.3	4.2-13.3
	Total	120	100	

Frequency distribution of education status of the respondents	Education	Frequency	Percentage	95% Confidence level
	Primary	57	47.5	38.3-56.7
	Secondary	38	31.7	23.3-40.0
	Post-secondary	5	4.2	0.8-7.5
	Non-formal	20	16.7	10.0-23.3
	Total	120	100	

The majority of the respondents were Christian, on religion and tribe (54%). With followed by Islamic religion (35%). There were 13 traditional religious respondents out of 120 totals (10.8%).

Most respondents were Yoruba tribe (64%), followed by Hausa (21%), and Igbo (15%). This demonstrates that the majority of fermented food producers in Ondo state are Yorubas. This is feasible because Yoruba is the majority tribe in Nigeria's Southwest, and Ondo state, where the study takes place.

Table 2 shows that the majority of the 120 total respondents produced "kunu" (a Nigerian millet-based fermented beverage), with 30 (25%), as opposed to 27 (23%) "Garri" (fermented cassava flakes), 22 (18%) of Fufu (fermented cassava based food), and 7 (6%) of Ogi (fermented cassava based food).

Table 2: Frequency distribution of religion status, tribe, and type of fermented foods of the respondents.

Frequency distribution of religion status of the respondents	Religion	Frequency	Percentage	95% confidence level
	Christianity	65	54.2	45.8-62.5
	Islamic	42	35	26.7-44.2
	Traditional	13	10.8	5.8-16.7
	Total	120	100	

Frequency distribution of tribe of the respondents	Tribe	Frequency	Percentage	95% Confidence level
	Yoruba	77	64.2	55.0-71.7
	Igbo	18	15	9.2-21.7
	Hausa	25	20.8	14.2-27.5
	Total	120	100	

Frequency distribution of fermented foods produced by the respondents	Fermented food	Frequency	Percentage	95% confidence level
	Iru	6	5	1.7-9.2
	Fufu	22	18.3	11.7-25.8
	Ogi	7	5.8	1.7-10.0
	Gaari	27	22.5	15.0-30.0
	Kuunu	30	25	17.5-33.3
	Others	28	23.3	15.8-30.8
	Total	120	100	

Respondents' levels of knowledge and attitude of fermented food producers in Ondo state in various aspects of preventing microbial contamination.

The level of knowledge and attitude (understanding) of fermented food producers in Ondo state in various aspects of preventing microbial contamination shows that 91 respondents (68%) strongly agreed, 36 respondents (30%) agreed, and three respondents (3%) strongly disagreed with the belief that food handlers play a crucial role in ensuring food safety and preventing food poisoning. Some people believe that preventing food poisoning is the responsibility of the government. In this example, 46 respondents (38%) strongly agreed, 53 percent agreed, and ten respondents (8%) were undecided that the government is responsible for food poisoning prevention.

In terms of personal hygiene, 15 (13%) highly agreed, 8 (7%) agreed, 73 (61%) unsure, 16 (13%) disagreed, and 8 (7%) strongly disagreed that food poisoning is not a big issue. Personal hygiene is the most effective technique to prevent food

poisoning, according to 31 (26%) who strongly agreed, 61 (51%) agreed, 17 (14% undecided), and 11 (9%) disagreed. Consumers are responsible for preventing food poisoning, according to 13 (11%) highly agreed, 29 (24%) agreed, 43 (36%) unsure, 22 (18%) disagreed, and 13 (11%) severely disagreed. Maintaining a clean cooking environment is an excellent approach to control food poisoning, according to 29 (24%) strongly agreed, 51 (43%) agreed, 32 (27%) unsure, 5 (4%) disagree, and 3 (3%) severely disagreed. 45 respondents (38%) strongly agreed, 56 respondents (47%) agreed, and 19 respondents (16%) were undecided that restaurants must do self-checking of food workers.

Personal hygiene activities such as hand washing before fermentation procedures and the usage of gloves. When it came to handling foods, the majority of the respondents had a favorable attitude. Seventy respondents (58%) wash their hands before contacting fermented food, while fifty respondents (42%) and others do not wash their hands after touching fermented

food. Only 32 (27%) of respondents said they use gloves when making fermented foods, while the rest said they don't use gloves when making fermented foods. Sixty-one percent (51%) and 59 percent (49%) of respondents use protective hair caps when making fermented food, respectively, whereas eighty six respondents (72%) and thirty-four respondents (28%) wash and sanitize the surroundings in which they make fermented food. Seventy six respondents (63%) and forty-four respondents (37%)

work when they are sick (flu, cold, diarrhea, coughing, etc.), respectively, whereas forty nine respondents (41%) and seventy one respondents (59%) are allergic to any of the basic materials used in food preparation (Tables 3 and 4).

Table 3: Level of knowledge and attitude of respondent on food poisoning.

Attitude questions	Strongly agree N (%)	Agree N (%)	Undecided N (%)	Disagree N (%)	Strongly disagree N (%)
Food handlers play a paramount role in ensuring food safety and prevention of food poisoning	9 (67.5)	36 (30.0)	-	-	3 (2.5)
Government is responsible to prevent food poisoning	46 (38.3)	64 (53.3)	10 (8.3)	-	-
Food handlers' are responsible to prevent food poisoning	50 (41.7)	57 (47.5)	13 (10.8)	-	-
Food safety is important than taste	44 (36.7)	56 (45.8)	21 (17.5)	-	-
Food poisoning is not a serious matter	15 (12.5)	8 (6.7)	73 (60.8)	16 (13.3)	8 (6.7)
Personal hygiene is the major way to prevent food poisoning	31 (25.8)	61 (50.8)	17 (14.2)	11 (9.2)	-
Consumers are responsible to prevent food poisoning	13 (10.8)	29(24.2)	43 (35.8)	22 (18.3)	13 (10.8)
Maintaining a clean cooking environment is a good way to control food poisoning	29 (24.2)	51 (42.5)	32 (26.7)	5 (4.2)	3 (2.5)
Self-checking of food handlers is important to restaurants	45 (37.5)	56 (46.6)	19 (15.83)	-	-

Table 4: Level of personal hygiene of the respondent.

Questions	Yes (%)	No (%)
Do you wash your hands before touching fermented food?	70 (58.3)	50 (41.7)
Do you wash your hands after touching fermented food?	51 (42.5)	69 (57.5)

Do you use gloves when producing fermented food?	32 (26.7)	88 (73.3)
Do you use protective cloth (apron) when you are producing fermented food?	25 (20.8)	95 (79.2)
Do you use protective hair cap when producing fermented food?	61 (50.8)	59 (49.1)
Do you wash or sanitise the environment through which you produce the fermented food?	86 (71.7)	34 (28.3)
Do you work when you are sick (flu, cold, diarrhoea, coughing etc.)	76 (63.3)	44 (36.7)
Are you allergic to any of the raw materials using in the production?	49 (40.8)	71 (59.2)

Perceptions of food contamination caused by personal diseases among consumers

Respondents for the study were asked to answer questions about their health to determine the amount at which food becomes contaminated based on the ailments they had a week before being examined.

The following are the percentage of people who have one disease or the other in a week to the day of the examination. Twenty six respondents (22%) have diarrhea, whereas 94 (78%) do not; 31 (25.8%), 70 (58%), and 19 (16%) have, do not have, and do not know if they have fever, respectively. 7.5% vomit a week before the researcher examines them, 10.0% are unsure, and 54.2% are exhausted.

To examine fermented food producer’s attitude towards food contamination, respondents for the study were asked to answer

questions pertaining to their health to know the level through which food get contaminated based on some diseases they have a week before examine them.

The following are level of those that have one disease or the other in a week to the day of examine them, 26 (22%) have diarrhoea while 94 (78%) do not have, 31 (25.8%), 70 (58%) and 19 (16%) have, do not have and do not know if they have fever or not, 7.5% vomit a week before the researcher examine them while 10.0% do not know, 54.2% fatigue and 7.5% do not know, 41.7 have stomach ache while 45.0% did not and 13.3% do not know and finally 42.5% which is 51 in number have sneeze, 49.2% do not have and 10 (8.3%) do not know (Tables 5 and 6).

Table 5: Consumers’ attitude towards preventing food contamination through personal diseases.

Questions	Yes		No		Do not know	
	N	(%)	N	(%)	N	(%)
Diarrhea	26	-21.7	94	-78.3	0	0
Fever	31	-25.8	70	-58.3	19	-15.8
Vomiting	9	-7.5	99	-82.5	12	-10
Fatigue	65	-54.2	46	-38.3	9	-7.5
Stomach ache	50	-41.7	54	-45	16	-
Sneezing	51	-42.5	59	-49.2	10	-8.3

Table 6: Consumers' attitude towards preventing food contamination through processing technique.

Questions	Yes (%)	No (%)
Do you need direct sun light to produce the food	24 (20.0)	96 (100.0)
Do you add any flavor to the products	28 (23.3)	92 (76.7)
Do you separate the product from any other particles	84 (70.0)	36 (30.0)
Is fermentation a means of preservation	39 (32.5)	81 (67.5)
Did your children help you in the production process	51 (43.5)	66 (55.0)
Did your children help you in the marketing of production?	59 (49.2)	58 (48.3)
Question	Frequency	Percentage
What is the source of water to produce the food?		
well water	111	92.5
borehole	9	7.5
What is the source of raw materials for the production of the fermented food		
Market	41	34.2
directly from the farm	79	65.8
For how long have you been producing the fermented food		
1-5 years	90	75
6-10 years	17	14.2
11 years and above	13	10.8
For how long have you been eaten the product		
1-5 years	34	28.3
6-10 years	28	23.3
11 years and above	58	48.3
The fermentation take up to how many days to arrive at the final product		
1-3 years	69	57.5
4-6 years	37	30.8
7 years and above	14	11.7

DISCUSSION

From this study, it was observed that females are majorly the producers of the fermented food in South-West of Nigeria than males based on the fact that majority of the men respondents

revealed that the cannot withstand the stress of producing fermented food.

The mean age of the respondents was 43 (36%). The data obtained from this study shows that, nearly half of the participants were youth and also involved in the production

process of fermented food. This is in accordance with national data, which show that the bulk of the population is made up of young individuals.

Food handlers may be aware of the food safety attitudes they should have, according to Clayton, et al., yet 63.0 respondents indicated that they rarely apply such good attitudes. This demonstrated that, even though the majority of food handlers in this study gave positive responses, they may not practice it when handling foods. According to Toh and Birch enough, there was a strong link between food handling knowledge and practices. Food safety knowledge seems to develop with age and experience, according to previous adult research.

When food workers do not exercise appropriate personal hygiene or adequate handling, they might become a vector for microbe development through their hands, cuts, lips, skins, and hairs. Because bacteria and intestinal parasites can be transported from hands to foods, the majority of research has concluded that practicing self-hygiene, particularly hand cleanliness, is extremely important. According to, food and beverage service employees should have a clean, tidy, and professional appearance, be free of skin infections, have good dental hygiene, have short finger nails and are not in the habit of biting nails, wear no jewelry except a wedding ring, work in clean shoes and uniforms, and adhere to good hygiene practices.

Some of these qualities were shared by the majority of the respondents in the study. According to Askarian, et al., the use of gloves is mostly impacted by the age of the employees, with younger workers being more motivated to avoid risky actions than older workers. In terms of food safety, the respondents' responses indicated that their practices were on par with the average. According to a study conducted in the United States, improper food handling procedures are responsible for 97.0 percent of foodborne illnesses.

According to the current study, the bulk of the population (85%) is made up of married women, and the majority of the population (54%) is christian, accounting for more than half of the population. According to the findings of the study, nearly half of the population (57.5%) had completed primary school.

This shows that most of the women that are involved in production of fermented food were illiterate. The reasons for the low educational status in the study location has been linked to ignorance, poverty and early marriages; majority are Yoruba's with 77 (64%) which shows that Yoruba are the major producer of fermented food which can be linked to the fact that the location is Southwest and Yoruba's are the dominant tribe in Southwest.

Majority of households in the study location clustered around the lower and middle wealth class with a few households in the higher wealth index. Though these fermented foods are likely to be contaminated through sneezing, coughing and contamination using various processing utensils, technique and also contamination may occur from raw materials or semi-finished food, direct sunlight or through the source of water for the production of the food. It was observed that some of the fermented food producers lack trainings and most of them were

illiterate. There was no adequate orientation about food poisoning.

CONCLUSION

Females predominated in the production of fermented foods in Nigeria, according to the study. This supports the popular belief that men do not cook at home. In terms of age, the study reveals that consumers between the ages of 26 and 30 were frequently involved in the manufacture of fermented foods. The study discovered that individuals with higher marital status are more likely to be responsible for fermented food production than those with lower marital status.

Finally, producers do not receive adequate safety training from school, government agencies, or their families, whether through formal or informal means.

To limit the danger of food contamination, the study concludes that raw and cooked fermented foods should be stored separately. The study also found that poor personal hygiene can lead to significant levels of microbial food contamination.

RECOMMENDATIONS

According to the survey, manufacturers that have received food safety training are well versed in food safety. As a result, the government must step up existing programs targeted at educating producers about food safety, because boosting citizen health will enhance the human resource and, in turn, increase production. Broadening education to enlighten farmers on producing techniques should be a priority.

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