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ASSESSMENT OF FOOD SAFETY PRACTICES AMONG CASSAVA PROCESSORS IN SELECTED RURAL COMMUNITIES OF OYO STATE, NIGERIA

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ABSTRACT

Food safety assessment is an effective means of discovering knowledge and data gaps that limit effective risk analysis and at the same time providing information to develop public policies on food safety management. The study assessed the cassava food safety practices among cassava processors in selected rural communities of Oyo State. Both qualitative and quantitative research designs were used to examine the following parameters: knowledge, attitude, sources of information and constraints to food safety practices. Focus Group Discussion, In-depth Interview, direct observation and interview schedule were the sources of primary data used. Multi-stage sampling technique was used to select one hundred and fifty-four (154) men and women involved in cassava processing from four Local Government Areas where there is concentration of cassava production and processing activities in the state, namely: Saki-West, Saki-East, Atisbo and Afijio. Data were analyzed using percentage, mean, Analysis of Variance and Chi square. The findings revealed that the mean income was ₦20,695, majority of the processors have low knowledge (71.4%) and unfavourable attitude (51.3%) towards cassava safety practices. Public sanitary officers ($\bar{x}$ = 2.61) and fellow processors ($\bar{x}$ = 2.11) were ranked as the most used sources of information about cassava safety practices. Constraints to food safety practices include: processing is time consuming, the cumbersome nature of the safety practices and inadequate access to clean water. Inferential analysis of results shows that income contributed significantly to the cassava food safety practices (p = 0.04) and safety practices do significantly differ among cassava processors across the selected cassava processors (p = 0.10). However, no significant relationship between sex (p = 0.42), age (p = 0.48), marital status (p = 0.67), educational level (p =0.53), processing experience (p = 0.92) and safety practices of the respondents. Training and effective monitoring by relevant stakeholders will further boost processors' knowledge and attitudinal change towards food safety and ultimately safe food for the consumers.

Key words: Assessment, Food, Safety, Practices, Processors, Cassava, Rural, Community

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INTRODUCTION

Food safety is a significant and growing public health problem in Nigeria. Inadequate food processing and food-borne disease are important contributors to the huge burden of sickness and death. Nigerian Television Authority (NTA) News line on the 16th September, 2012 reported of a family of five who died in Akure, Nigeria after a *fufu* meal due to related food safety practices. Cassava products are important food source in any rural household. Young leaves are eaten as vegetables in small quantities, after being boiled or steamed [1]. Roots are utilized for direct human consumption, and processed either for food or non-food products. As a staple food, cassava is largely consumed among low income groups living in rural areas as well as in urban slums [2]. The roots are processed to *gari*, *fufu*, *tapioca*, flour and starch for onward consumption and it appears to be a 'food of choice' even in the face of alternative food options in urban areas [1].

Food safety assessment involves articulating effective means for establishing relative risk of human disease at different stages of the overall safety systems in order to achieve the ultimate food safety system outcome required. Consequently, the process will help to develop information required for public policies on food safety risk management. Illness resulting from eating contaminated food is one of the most widespread health problems in the contemporary world and a significant factor in the reduction of productivity. There is some evidence that consumers think about the safety of the food they consume [3].

Quality processing of cassava roots is highly essential for the reduction of cyanide poisoning upon consumption. Meanwhile, cassava processing is said to reduce the levels of hydrogen cyanide before consumption [4]. Procedures such as peeling, grating, soaking, fermentation, pressing, roasting or drying, and exposure of cassava products to air have been determined to help allow the cyanide to dissipate out of the food matrix in order to present cassava products with safe cyanide levels. Research has shown that heap fermentation of cassava roots may reduce toxic compounds by up to 96% - 98% in grating (shredding) detoxification method [5]. Diet pattern also influences the risks involved in consuming cassava products [6]. When cassava is eaten or fortified with other foods that are rich in sulphuric amino acids, like soy bean, to balance the nutritional value, there is a limited risk of intoxication. Proper cassava processing ensures safer and more marketable products. It reduces cyanide content in the processed products, prolongs shelf life, reduces post-harvest losses, food contamination, environmental pollution and increases the nutritional value of cassava products [7].

The common concern is the risk related to the natural toxin that is in the edible cassava roots that are often categorized as either "sweet" or "bitter", which signifies absence or presence of toxic levels of cyanogenic glucosides. Cyanogenic glucosides on hydrolysis will release hydrocyanic acid (HCN) which can cause goiter and cretinism in humans and animals due to iodine deficiency; however, HCN content is significantly reduced during fermentation of cassava dough. Some of the clinical symptoms of acute cyanide poisoning include rapid breathing, drop in blood pressure, rapid pulse, headache, dizziness, vomiting, diarrhea, mental confusion, stupor, discoloration of the skin due to lack of oxygen (cyanosis), twitching, convulsion and death in severe cases [8, 9]. It is

against this background that the study assessed the cassava processors' safety practices among rural communities of Oyo State, Nigeria.

Objectives of the Study

The general objective of the study was to assess the food safety practices among cassava processors in rural communities of Oyo State, while the specific objectives were to:

1. determine the socio-economic characteristics of the cassava processors in the study area.
2. identify the cassava processors' information sources in the study area.
3. describe the cassava processors' safety practices in the study area.
4. investigate the cassava processors' knowledge of food safety practices in the study area.
5. examine the cassava processors' attitude to food safety practices in the study area.
6. determine the constraints to food safety practices in the study area.

MATERIALS AND METHODS

Materials

The study area was Oyo State. It is an agrarian community located within the derived savanna vegetation of Nigeria. The crops grown in this vegetation include cassava, maize, melon, groundnut, cocoa, kola, oil palm and cashew.

Methods

Sampling Procedure and Sample Size

Multi-stage sampling technique was used to collect sample for the study. The first stage involved the purposive selection of 4 Local Government Areas (LGAs) from the thirty-three LGAs in the study area where there is the concentration of cassava production and processing activities. These are Saki-West, Saki-East, Atisbo and Afijio. In the second stage, snowballing technique was used to generate the list of all the cassava processors in the 4 selected LGAs. In the third stage, cassava processors were stratified into gari, *fufu*, cassava flour and tapioca processors. Randomly, 11 respondents each were selected from gari, fufu, and cassava flour processors, while purposive sampling was used to select all the 22 respondents involved in tapioca to give a total of 154 respondents interviewed for the study.

Sources of data

The primary data for this study were collected through the use of both quantitative and qualitative techniques. Qualitative methods used included Focus Group Discussion (FGD), In-depth Interview (IDI) and direct observation, while the quantitative data were obtained using well-structured interview schedule with both open and close ended questions.

Measurement of Variables

Independent Variables

a) Information on the socio-economic characteristics of the cassava processors such as sex, marital status, educational level, ethnic background, processing experience (in

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years) were measured at nominal level of measurement while age, income per month (in naira) and processing experience (in years) were measured at the interval level.

b) Sources of information on cassava food safety practices were examined by presenting the list of the sources of information gathered from literature and personal experience to the respondents. Responses were assessed on a four point scale of 'Always', 'Occasionally', 'Rarely' and 'Never' with a score of 3,2,1,0, respectively.

c) Respondents' level of knowledge on cassava food safety was determined by presenting a list of cassava food safety practices to test their level of knowledge on the practices. Twenty-four statements were presented on a two point scale of 'Yes' and 'No'. A score of 1 was assigned to a correct response and 0 to an incorrect response.

d) Attitude of respondents towards cassava food safety practices was measured by presenting twenty attitudinal statements on a 5-point Likert scale of 'Strongly Agreed', Agreed', 'Undecided', 'Disagreed', 'Strongly Disagreed'. A score of 5,4,3,2,1 was assigned to positive statements , while a score of 1,2,3,4,5 was assigned to negative statements. Individual scores and mean were obtained. Attitudinal value of $\bar{x} \geq 34.0$ was used to categorize respondents into favourable, while value of $\bar{x} <$ 34.0 was considered unfavourable levels of attitude towards cassava food safety practices.

e) Constraint to cassava processing was measured by presenting a list of constraints gathered from personal experience, observations and literature to respondents. This was measured on a three point scale of 'Very severe', 'Severe' and 'Not severe' and they were assigned 2, 1 and 0, respectively.

Dependent variable

Cassava food safety practices were categorized into four in order to capture the level of use for each of the cassava products *gari*, *fufu*, cassava flour and *tapioca* processing practices. The extent of use was measured on a three point scale of 'Always', 'Occasionally' and 'Rarely' that were assigned 3, 2 and 1, respectively. Individual scores and mean were obtained, which were then used to categorize respondents into safe and unsafe practices.

Statistical Analysis

The data were analyzed with both descriptive and inferential statistics. The descriptive statistics used included frequency counts and percentages, while inferential statistics used for testing hypotheses were Chi-Square, and Analysis of Variance (ANOVA).

RESULTS

The socio-economic characteristics of respondents (Table 1) show that majority (95.6 %) were female and married (76.0%). About half (51.3%) were in their productive ages (31-40 years), processing experience of between 17 and 23 years were 43.5%. Majority (59.1%) had one form of formal education or the other. The mean income of the respondents was ₦20, 695, substantial (86.9%) were in low income earners category.

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Table 2 shows that majority ($\bar{x}$ = 2.61) public sanitary officers and fellow processors ($\bar{x}$ = 2.11) were ranked as the most used sources of information about cassava safety practices. Table 3a revealed that most(99.4%) of the respondents knew that cassava does not need to be processed immediately after harvesting, 92.9% recognized that immediate pressing out of water from cassava mash is not essential for cassava food safety practice and 93.9% considered the need to follow all the processing steps involved in the practice as unimportant. On the other hand, majority (99.4%) viewed fermentation period of 3-5 days as an unnecessary measure of reducing the cyanide content of cassava. Substantial respondents (92.9%) indicated that washing of peeled cassava roots may not necessarily enhance the quality and safety of its products. Table 3b shows the level of respondents' knowledge of safety practices. The mean score of the respondents' knowledge was 14.0 from the result of the analysis and this was used to categorize the respondents' knowledge into high and low levels. Respondents that score below the mean were categorized as having a low level of knowledge, while those with mean score and above as having a high level of knowledge. The table revealed that a huge number (71.4%) of the respondents has low knowledge of cassava safety practices; while very few (28.6%) have high knowledge of cassava food safety practices.

Table 4a shows that about 84.4% of the respondents strongly agreed that environmental sanitation was not an important part of their job responsibility; in the same vein, about 58.5% agreed that there is the accumulation of waste and debris in the surroundings of the processing house and 80.5% viewed the safety practices as a big task to be carried out to ensure food safety practices. Result shows a minimum score of 27.0, maximum score of 44.0 and a mean of approximately 34.0. A slight majority (51.3%) of the respondents had unfavourable attitude towards cassava food safety, while 48.7% of the respondents were favourably disposed (Table 4b) towards cassava food safety practices.

On constraints, individual scores and mean were calculated and result shows a minimum mean value of 0.47 and a maximum mean score of 1.75 with a weighted mean of constraint being approximately 1.06. Table 5 shows that cassava processing activity was considered as time-consuming ($\bar{x}$ = 1.75). Others include the cumbersome nature of the safety practices ($\bar{x}$ = 1.73) and inadequate access to clean water ($\bar{x}$ = 1.62).

Table 6 shows that *gari* processing practices, *fufu* processing practices, cassava flour processing practices and *tapioca* processing practices have means 34.0, 28.0, 21.0, and 37.0, respectively. The table further shows that all the processors: *gari* (52.3%) *fufu* (59.1%) cassava flour (56.8%) and *tapioca*(77.3%) do not comply with safe practices in the course of processing cassava products.

Table 7 summarizes and shows that there was a significant relationship between cassava food safety practices and the income (p = 0.04) of respondents. However, no significant relationship existed between sex (p = 0.42), age (p = 0.48), marital status (p = 0.67), educational level (p = 0.53) and processing experience (p = 0.92) of the respondents. Furthermore, Table 8 shows that there is no significant difference between the safety practices among cassava processors (p = 0.10).

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DISCUSSION

Respondents' socio-economic characteristics variable on sex was consistent with Kolawole *et al.* [10] who found that most cassava processing activities were carried out by women in the rural areas. An array of problems hinders cassava processors from effectively carrying out food safety practices. The result agrees with the assertion, which opined that using traditional methods of cassava processing unnecessarily prolonged processing time and makes it laborious [10]. Several studies have found that majority of the rural dwellers are married [11]. This implies that any processing interventions targeted at women in the quest for food safety practices will consequently impact positively on households to achieve reduction in processing related food contamination.

The result shows that most processors unintentionally carry out activities that help remove the harmful content in cassava roots, but are not really aware of the presence of a poisonous substance called cyanide in cassava roots. Substantially low knowledge of cassava food safety among processors implies that their level of education did not really translate to high knowledge of food safety. Increasing knowledge of correct food safety and hygiene practices through awareness campaigns and sensitization will drive home the importance of food safety practices. Government and non government agencies' effort in this direction will advance cassava food safety in Nigeria. Also, training and re-training programmes will reinforce food safety knowledge and consequently bring about favourable and sustainable attitudes among cassava processors [12].

Cassava processors were in the low earners' category and thus, were poor. Efforts should be put in place by government and non-government organizations to strengthen farmers' involvement in cassava value chain. This will raise cassava processors' financial base and ultimately alleviate their poverty [13].

The unfavourable disposition by the respondents about cassava food safety practices is adduced to the views of the majority who considered food safety practices a big unnecessary task. This could be associated with the cumbersome nature and drudgery involved in cassava processing. This finding also stemmed from the low knowledge of the respondents about food safety (Table 3b). Provision of necessary modern technology for the processors could be a means to reduce this problem [14]. The result shows high education level amongst selected processors, thus education campaign will likely advance knowledge, attitudes and practice of cassava processors. Knowledge acquired through education has a significant impact on people's attitude on food safety practices [15]. The knowledge of respondents on the transfer of harmful substances to cassava products through cross contamination was high. This is consistent with a study that found that contamination of foods is inimical to food safety, and should therefore be avoided [15]. Public sanitary officers, fellow processors and family were the most preferred information sources. This implies that extension messages on cassava processing and its safety channeled through these preferred sources will definitely bridge the information gap among the processors.

The accumulation of waste and debris in the surrounding area of the processing house as observed during the study is suggestive of the respondents' poor attitude towards food

safety practices. Most of the processing areas do not have drainage for easy flow of effluents and where there are drainages; they are either blocked or left unattended to. It can be inferred from the findings that most of the processors do not follow safety practices. This further corroborates an assertion in a study conducted on attitudes of food industry towards safety regulations; where producers and processors were found to oppose food safety practices and regulations [16]. Efforts geared towards training, re-training (reinforced training) and enforcing safety practices through the use of the public sanitation officers will engender social interaction and ensure cassava food safety among processors, knowing well that most (63.0%) of the respondents are in ages that can respond to change (31 and 50 years). This finding is consistent with a study conducted to facilitate adequate hand washing and changing/washing chopping boards between preparation of raw chicken through the use of a social marketing intervention (leaflets, posters, TV documentary, and newspaper articles). The intervention was effective immediately after the implementation, but food safety behaviour decreased during the follow-up period of 4-6 weeks [17].

Non-compliance with the cassava food safety practices by processors could be adduced to low level of knowledge (as reported in Table 3b) and unfavourable attitude towards cassava food safety. This had earlier been proven that awareness of the knowledge of proper food handling practices is an antidote to food safety practices [18]. The implication of this finding is that products consumed from this kind of practice can cause different kinds of ailments or even death. Consistent with this report is an earlier study that posited that the largest predictor of attitude towards food safety practice and regulation is the processors' own belief about the safety of food [16]. Focus Group Discussion conducted corroborated this assertion, as one of the discussants put it: "*we don't consider those safety practices important even though we know them*". In essence, cassava processors do not follow all the steps required for food safety thereby predisposing consumers to poison related ailments. Adequate training and awareness campaign that will alter the traditional beliefs of food processors on the issue of food safety should be embarked upon by relevant agencies.

Income level of respondents is significantly related to food safety practices. This explains the importance of deliberate effort at raising the processors' income. In essence, processors will be able to afford simple machines and use adequate technology that will reduce drudgery. This will ensure safe practices that will help reduce the toxicants in cassava roots among processors. The Table 8 shows that there was no significant difference between the safety practices among cassava processors. It implies that the safety practices employed do not differ among the processors across the selected cassava products (*gari*, *fufu*, cassava flour and *tapioca*). Improved processing, quality control, packaging and food safety practices are expected to spur increase in the demand for cassava and its acceptance as a food source [19, 20].

CONCLUSION

The study concludes that respondents exhibited low knowledge and unfavourable attitude towards cassava safety practices. Major constraints to cassava processing activities included: safety practices were considered to be time-consuming and cumbersome and

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weak institutional support services by extension agents. Income contributed significantly to the cassava food safety practices.

RECOMMENDATIONS

Training on food safety should have a follow- up and effective monitoring component. This will guarantee that processors' knowledge is translated to food safety practices. Government and non-governmental organizations' participation in cassava value chain should be institutionalized to promote a better food safety practice among processors. Adequate provision of modern processing technology that will make processing less cumbersome and less time- consuming should be made available for the processors by relevant stakeholders in order to ensure cassava food safety practices. Sensitization and enlightenment campaigns on cassava food safety should be embarked on towards sustaining a favourable attitude to cassava food safety by relevant regulatory authorities.

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Table 1: Respondents' socio-economic characteristics (n=154)

Characteristics	Frequency	Percent (%)
Sex		
Male	7	4.45
Female	147	95.55
Ages (Years)		
≤ 20	14	9.1
21-30	14	9.1
31-40	79	51.3
41-50	18	11.7
51-60	19	12.3
> 60	10	6.5
Educational level		
no formal	63	40.9
Adult	1	0.6
Primary	61	39.6
Secondary	28	18.2
post-secondary	1	0.6
Marital Status		
Single	18	11.7
Married	117	76.0
Widowed	19	12.3
Income in naira (₦)		
12000 – 15000	15	9.7
16000 – 19000	21	13.6
20000 – 23000	98	63.6
24000 – 27000	13	8.4
28000 – 31000	3	1.9
32000 – 35000	4	2.6
Processing experience in years		
≤ 9	4	2.6
10-16	44	28.6
17-23	67	43.5
24-30	32	20.8
≥ 31	7	4.5

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Table 2: Respondents' sources of information about cassava food safety

Sources	Yes	No	If Yes, to what extent				Weighted mean	Rank
			Always (3)	Occasionally (2)	Rarely (1)	Never (0)		
Public Sanitary Officers	152(98.7)*	2(1.3)*	100(64.9)*	50(32.5)*	2(1.3)*	2(1.3)*	2.61	1st
Fellow Processors	150(97.4)	4(2.6)	30(19.5)	115(74.7)	5(3.2)	4(2.6)	2.11	2nd
Family	117(76.0)	37(24.0)	83(53.9)	24(15.6)	40(26.0)	37(24.0)	1.37	3rd
Extension agents	136(88.3)	18(11.7)	2(1.3)	56(36.4)	78(50.6)	18(11.7)	1.27	4th
Radio	92(59.7)	62(40.3)	2(1.3)	63(40.9)	27(17.5)	62(40.3)	1.03	5th
Television	28(18.2)	126(81.8)	1(0.6)	22(14.3)	5(3.2)	126(81.8)	0.78	6th
Newspaper	7(4.5)	147(95.5)	2(1.3)	1(0.6)	4(2.6)	147(95.5)	0.34	7th

*values in parentheses are percentages

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Table 3a: Respondents' knowledge of cassava food safety practices

Knowledge Statement on Cassava Safety Practices	Yes	No
Cassava roots may not be necessarily processed immediately after harvesting	1(0.6)*	153(99.4)*
Will you process harvested cassava roots after 10-12 months of planting	13(8.4)	141(91.6)
Consuming raw cassava without any processing is not a big deal	2(1.3)	152(98.7)
Cassava contains a poisonous substance called Cyanide	12(7.8)	142(92.2)
Processing non-fibrous cassava roots is not necessary	153(99.4)	1(0.6)
Washing of peeled cassava enhances the quality and ensures safety	11(7.1)	143(92.9)
Grating might not play any major role in reducing the Cyanide content of cassava	152(98.7)	2(1.3)
Non rusty knives and grater can help prevent cross contamination	13(8.4)	141(91.6)
Fermentation may not necessarily help in reducing the cyanide content of cassava	153(99.4)	1(0.6)
Fermentation of mash should be for a minimum of 3 days and a maximum of 5 days	11(7.1)	143(92.9)
Immediate pressing of cassava mash after grating is not essential	153(99.4)	1(0.6)
Pressing out water from cassava mash is a good food safety practice	11(7.1)	143(92.9)
Sieving is not an enhancer of quality of cassava products	152(98.7)	2(1.3)
Roasting/drying/cooking is a means of making cassava products safe for consumption	12(7.8)	142(92.2)
Drying of mash on a raised platform does not aid prevention of product contamination	151(98.1)	3(1.9)
Commencing drying of chips and/or mash immediately after chipping/grating can improve quality.	61(39.6)	93(60.4)
Products can be packed and stored after processing in any place, neat or not neat.	153(99.4)	1(0.6)
Personal and environmental hygiene should be strictly observed during processing	12(7.8)	142(92.2)
Washing/cleaning of processing equipment before and after use does affect the safety of cassava products.	153(99.4)	1(0.6)
Ethnic background influences the processing practices	105(68.2)	49(31.8)
There is no need to follow all the processing steps	153(99.4)	1(0.6)
Improperly processed cassava can be hazardous	13(8.4)	141(91.6)
Cross contamination does not transfer any harmful substance to cassava food products	151(98.1)	3(1.9)
Following all the processing procedure will help reduce risk of food borne illnesses	10(6.5)	144(93.9)

*values in parentheses are percentages

Table 3b: Respondents' knowledge of cassava food safety

Level of knowledge	Frequency	Percentage
High ($\bar{x} \geq 14.0$)	44.0	28.6
Low ($\bar{x}$ <14.0)	110.0	71.4
Total	154.0	100.0

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Table 4a: Cassava processors' attitude to cassava food safety practices

Attitudinal statements cassava food safety practices	SA	A	U	D	SD
Good processing hygiene can prevent food borne illness	127(82.5)*	26(16.98)*	2(1.3)*	-	-
Environmental sanitation is not an important part of my job responsibilities.	130(84.4)	20(13.0)	2(1.3)	2(1.3)	-
I believe that good processor hygiene can prevent food borne illness.	1(0.6)	3(1.9)	25(16.29)	61(39.6)	64(41.6)
It is a big task for the food processors to ensure that food is safe to serve.	124(80.5)	23(14.9)	3(1.9)	4(2.6)	124(80.5)
I am willing to change my food processing behaviors when I know they are incorrect.	-	2(1.3)	7(4.5)	58(37.7)	87(56.5)
Obtaining more knowledge on cassava safety is not a solution to food safety problems.	100(64.9)	37(24.0)	9(5.8)	7(4.5)	1(0.6)
Food safety knowledge not only benefits my work but also my personal life.	3(1.9)	5(3.2)	-	45(29.2)	101(65.6)
It is more important to have tasty food rather than safe food	123(79.9)	24(15.6)	3(1.9)	4(2.6)	-
I am willing to attend a food safety training course.	-	2(1.3)	2(1.3)	28(18.2)	122(79.2)
It is not very interesting to learn about food safety.	77(50.0)	40(26.0)	29(18.8)	7(4.5)	1(0.6)
Food safety knowledge would make me more confident about my work	2(1.3)	2(1.3)	3(1.9)	45(29.2)	102(66.2)
I process anyhow I like because my customers do not demand thorough assurances about the safety of my products before they buy.	34(22.1)	106(68.8)	1(0.6)	8(5.2)	5(3.2)
Government should do more to assure safe food.	88(57.1)	48(31.2)	-	6(3.9)	12(7.8)
Removal of poisonous substance in food is not of concern to me because I do sell them	1(0.6)	8(5.2)	4(2.6)	60(39.0)	81(52.6)
Sneezing or coughing over unprotected products should be avoided during processing	92(59.7)	59(38.3)	3(1.9)	-	-
Safe processing practices are excessively burdensome.	106(68.8)	37(24.0)	-	6(3.9)	5(3.2)
Provision of appropriate, suitable, clean and protective clothing is necessary during processing	1(0.6)	2(1.3)	-	54(35.1)	97(63.0)
The design and layout of my processing facility do not enhance effective maintenance, cleaning and disinfection.	63(40.9)	62(40.3)	26(16.9)	3(1.9)	-
I ensure no activity is carried out near processing facility that could compromise food safety.	-	5(3.2)	1(0.6)	87(56.5)	61(39.6)
There is the accumulation of waste and debris in the surrounding of the processing house.	61(39.6)	90(58.5)	-	3(1.9)	-

*values in parentheses are percentages
SA: Strongly Agreed, A: Agreed, U: Undecided, D: Disagreed, SD: Strongly Disagreed

Table 4b: Respondents' attitudinal level towards cassava food safety

Attitudinal level	Frequency	Percentage
Favourable ($\bar{x} \geq 34.0$)	75.0	48.7
Unfavourable ($\bar{x} < 34.0$)	79.0	51.3
Total	154.0	100

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Table 5: Cassava processors' constraints to cassava food safety practices

Constraints	Very Severe	Severe	Not Severe	Weighted mean	Overall rating	Rank
Processing activity is time consuming	117(76.0)*	36(23.4)*	1(0.6)*	1.75	Severe	1st
Cumbersome nature of the safety practices	117(76.0)	32(20.8)	5(3.2)	1.73	Severe	2nd
Inadequate access to clean water	101(65.6)	47(30.5)	6(3.9)	1.62	Severe	3rd
Inadequate finance for use to purchase modern equipment	60(39.0)	86(55.8)	8(5.2)	1.34	Severe	4th
Weak institutional support services by Extension workers or Public Officers	66(42.9)	72(46.7)	16(10.4)	1.32	Severe	5th
Non availability of freshly harvested roots	32(20.8)	110(71.4)	12(7.8)	1.13	Severe	6th
High cost of cassava roots	19(12.3)	126(81.9)	9(5.8)	1.06	Severe	7th
Lack of disposal facility	16(10.4)	90(58.4)	48(31.2)	0.86	Not Severe	8th
Non-availability of processing facilities	6(3.9)	101(65.6)	47(30.5)	0.73	Not Severe	9th
Fluctuation in market prices	11(7.1)	79(51.3)	64(41.6)	0.66	Not Severe	10th
Investments costs for the more efficient technologies are high	7(4.5)	85(55.2)	62(40.3)	0.64	Not Severe	11th
Skilled labor not readily available	6(3.9)	61(39.6)	87(56.5)	0.47	Not Severe	12th
Competitive prices of similar products such as cereal Cassava Flours in the market	2(1.3)	69(44.8)	83(53.9)	0.47	Not Severe	13th

*values in parentheses are percentages

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Table 6: Respondents' level of cassava food safety practices

Cassava food safety practice among processors	Frequency	Percentage
Gari processors		
Safe practice(Mean score 34 and above)	21.0	47.7
Unsafe practice (Below mean score 34)	23.0	52.3
Total	44.0	100.0
Fufu processors		
Safe practice (Mean score 28 and above)	18.0	40.9
Unsafe practice (Below mean score 28)	26.0	59.1
Total	44.0	100.0
Cassava flour processors		
Safe practice (Mean score 21 and above)	19.0	43.2
Unsafe practice (Below mean score 21)	25.0	56.8
Total	44.0	100.0
Tapioca processors		
Safe practice (Mean score 37 and above)	5.0	22.7
Unsafe practice (Below mean score 37)	17.0	77.3
Total	22.0	100.0
Total	154.0	100.0

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Table 7: Chi Square analysis between socio-economic characteristics of the respondents and cassava food safety practices

Variables	χ^2	Contingency Coefficient Value	Degree of freedom	p-value	Decision
Sex	2.789	0.133	3	0.42	Not Sig.
Age	134.877	0.683	135	0.48	Not Sig.
Marital Status	3.999	0.159	6	0.67	Not Sig.
Educational Level	11.027	0.258	12	0.53	Not Sig.
Income (in naira)	76.910	0.577	57	0.04	Sig.
Processing Experience (in years)	58.473	0. 525	75	0.92	Not Sig.

Table 8: Two-way ANOVA of the difference between the safety practices among respondents

	Sum of Squares	**df**	**Mean Square**	**F**	**P**
Between Groups	4493.88	3	1497.96	229.96	0.100
Within Groups	682.02	150	0.23		
Total	5176.90	153	4.55		

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