ISSN: 2736-0040 (Online)
ISSN: 2695-1975 (Print)
AKSUJAEERD 8 (1): 75 – 85, 2025 AKSU Journal of Agricultural Economics, Extension and Rural Development.

ASSESSMENT OF CYANIDE HEALTH HAZARD ASSOCIATED WITH CASSAVA PROCESSING AMONG CASSAVA PROCESSORS IN GWARAM LOCAL GOVERNMENT AREA, JIGAWA STATE, NIGERIA

[1]Makinta, U., [1]Amina, I. T., [2] Bappa, M. T. and [3]Salihu, A. U.
[1]Department of Agricultural Extension and Rural Development, Faculty of Agriculture, Federal University Dutse, Jigawa State, Nigeria
[2]Department of Agricultural Extension and Management, Federal College of Horticulture, Dadin Kowa, Gombe State, Nigeria.
[3]Department of Agricultural Extension, Faculty of Agriculture, Bayero University Kano, Kano State, Nigeria

Abstract
The study assessed the cyanide health hazard associated with cassava processing among cassava processors in Gwaram LGA of Jigawa State, Nigeria. Primary data was collected with the aid of questionnaire from 145 cassava processors. Data collected were analyzed using both descriptive and inferential statistics. Specifically, the study described the socioeconomic characteristics of the respondents, assessed the level of awareness of cyanide health hazard, examined the perception of cassava processors on cyanide health hazards. Results revealed that then mean age of the respondents was 44 years, majority (80.6%) were females and married (71.1%). Also, the mean farm size was 0.5 ha, 41.4% of the respondents had secondary education with a mean household size of 7 persons. Cassava processing was their major source of income with an average of 11 years of processing experience. The result on farmer's level of awareness on health hazard associated with cassava processing indicated a high mean value (x=2.46) for respondent's awareness on cyanide in cassava can completely lead to death with an overall categorization showing high awareness (91%). Results on respondent's perception on the health hazard of cyanide revealed that fresh bitter cassava contains about 400mg/kg of cyanide with an overall perception as high as (89%). The result further revealed that about 80% of the respondents are not aware of any safe cassava processing practice with about 87% indicated that proper smoking as an effective way of mitigating the effect. Lack of training was ranked the highest (98.6%) as major constraint. The study concluded that there was high awareness and perception on cyanide health hazard with low adoption of practices to mitigate it. The study recommends that more training should be conducted and modern processing facilities to be provided to reduce the effect of cyanide.
Keywords: Assessment Cyanide, Health Hazard, Cassava, Processors

Introduction

Cassava (*Manihot esculenta)* is a staple food crop in many developing countries, including Nigeria, due to its adaptability to various environmental conditions and its role in food security. Despite its significance, cassava contains cyanogenic glucoside, which release toxic cyanide when improperly processed. This poses health risks, including acute toxicity and chronic conditions such as konzo aparalytic disease common in regions relying heavily on cassava (Olalekan,*2018;* Abdul-Ganiy ,*2023*).

Cyanide poisoning is a pressing concern among cassava-processing communities especially in developing countries where most of the technology used are old fashion, the study area inclusive.Awareness and adoption of safe processing methods are critical to reducing risks. However, many rural processors lack adequate knowledge about cyanide hazards, leading to widespread contamination in cassava products. Studies have highlighted that improper fermentation and drying processes contribute significantly to residual cyanide in processed cassava (Agency for Toxic Substances and Disease Registry, 2006)

In Gwaram Local Government Area (LGA), cassava processing is a primary livelihood activity, but limited awareness of cyanide hazard persists. The environmental impact of cassava processing also deserves attention. Cyanide residues from processing waste often leach into soil and water bodies, posing ecological risks. Research in Ghana has

documented ground water contamination near cassava processing sites, emphasizing the role of poor waste management practices in perpetuating the issue *(*Cobbina *et al.,2012*) .Addressing this problem requiresamultifaceted approach. Awareness campaigns, capacity-building programs, and enforcement of food safety standards are essential to safe guarding public health and promoting sustainable cassava processing. This study focuses on assessing the cyanide health hazard associated with cassava processing among cassava processors in Gwaram LGA.

Cassava is one of the most cultivated crops in Nigeria,contributing significantly to rural livelihoods and food security. According to FAO statistics, Nigeria remains the largest producer of cassava globally, with an estimated annual production of over 59 million metric ton since 2022 (FAO,2023). However, the high cyanide content in cassava varieties such as bitter cassava necessitates adequate processing to prevent health risks (*FAO,2023;*Okeke *et al.,2021*). Despite its economic importance, the cassava industry in rural areas like Gwaram LGA is constrained by low levels of awareness among processors regarding the hazards of cyanide. Research has shown that traditional processing methods often fail to eliminate sufficient amounts of cyanide, leading to chronic exposure in consumers.In extreme cases, this can cause neurological disorders such as spasticparaparesis,particularly in children and women who are more exposed due to dietary reliance on cassava (FAO,2019)

Environmental concerns are another critical dimension. Improper disposal of cassava waste exacerbates soil and water contamination with cyanide, Onabolu*et al*., 2020, as demonstrated in studies conducted in similar regions. For instance, cyanide concentrations in ground water near cassava processing sites in parts of Ghana were found to exceed safe levels, there by endangering both human health and aquatic ecosystems (Dapaah-Siakwan & Gyau Boakye, 2000; Cobbina *et al*., 2012).

Efforts to mitigate cyanide risks have been made, yet they remain insufficient in many rural communities. Public health campaigns and agricultural extension services are often underfunded, leaving processors with limited access to information about safe cassava processing techniques. A survey in southern Nigeria revealed that over 70% of cassava processors had never received formal training on cyanide management, highlighting a significant gap in awareness (Ajibade&Olatunji,*2018*).In Gwaram LGA, cassava processors primarily use traditional methods such as soaking, fermentation, and drying, which vary widely in their effectiveness at cyanide reduction. For instance, studies have shown that proper fermentation for at least three days can significantly lower cyanide levels, yet less than 40% of processors adhere to this duration due to time constrains and lack of knowledge *(*Ezeocha *et al.,2022; FAO,2023)*

Additionally, socio-economic factors such as education levels, gender roles, and access to resources play a vital role in shaping processors' awareness and practices. Women, who constitute the majority of cassava processors, often face barriers to accessing training and technical support, further perpetuating unsafe practices (Nweke and Musa,2021; Akinrinade *et al*.,2019). The need for interventionstargeting these challenges cannot be overemphasized. Policy measures such as mandatory training programs, subsidies for improved processing technologies, and stricter enforcement of food safety regulations are crucial. Moreover, community-based awareness campaigns leveraging local networks could help bridge the knowledge gap and promote best practices among processors in Gwaram LGA and beyond (Olalekan *et al*.,2018; Onabolu*et al.*, 2020)

The processing of cassava, while economically significant, poses health risks due to the presence of cyanogenic glucosides, which can release harmful cyanide. Many cassava processors in rural areas, such as Gwaram Local Government Area, lack awareness of these hazards and effective mitigation techniques. Traditional processing methods, often inadequate in reducing cyanide to safe levels, lead to health complications such as acute toxicity, chronic illnesses, and even fatal cases of poisoning. Furthermore, the improper disposal of cassava waste contributes to environmental degradation, contaminating soil and water resources. The absence of structured

education programs and enforcement of food safety standards exacerbates these challenges, leaving communities vulnerable to both health and ecological risks.

The specific objectives are to;describe the socio-economic characteristics of the cassava processors;examine processors awareness of cyanide hazards associated with cassava production;examine the processors' perception of the risk associated with cyanide exposure from cassava consumption in the study area;investigate the practices adopted by farmers to mitigate cyanide hazard in cassava production; and identify the constraint to cassava processing in the study area.

Study Area

The study was conducted in Gwaram Local Government Area (LGA), located in Jigawa State, Nigeria. Gwaram LGA is an agrarian region where cassava is widely cultivated and processed. It is characterized by its semi-arid climate, with average temperatures ranging from 25°C to 35°C and annual rainfall between 600–1000 mm. Cassava processing activities are concentrated in rural villages such as Kwandiko, Fagam, Dingaya, Kila, and Zandam Nagogo. These villages represent a cross-section of cassava processors in the LGA, ranging from small-scale household processors to more organized commercial processors.

Population of the Study

The target population for the study consisted of cassava processors in the selected villages of Gwaram LGA of Jigawa State, Nigeria. This included both male and female processors who engage in activities such as peeling, grating, fermenting, and drying cassava. The total population of cassava processors in the five selected villages was estimated at 350 individuals from the figure obtained from the cassava farmers and processors in the LGA. These processors contribute significantly to the local economy, as cassava is a major crop grown for both domestic consumption and commercial purposes.

Data Collection Method

A descriptive survey research design was employed for the study, as it is suitable for collecting both quantitative and qualitative data from sample. The design was selected to gain a comprehensive understanding of cassava processors' awareness regarding cyanide hazards, as well as the processing methods they used. The approach is suitable because it allowed for the direct collection of data from cassava processors in Gwaram LGA.

Sampling Technique and Sample Size

A multi-stage sampling method was employed in selecting respondents for the study:

Stage 1: Gwaram LGA was purposively chosen due to its heavy cassava production and because cassava is mostly planted in the area more within Jigawa State.

Stage 2: The five major cassava-producing communities—Kwandiko, Fagam, Dingaya, Kila, and Zandam Nagogo—were purposively selected for the study. These communities were selected based on their active participation in cassava production and processing.

Stage 3: A simple random sampling technique was used to select 145 cassava processors from the five communities out of the list obtained. The sample size was determined using the Yaro Yamane formula for sample size calculation, given a population of 350 processors and a 95% confidence level. The final sample size of 145 respondents was selected, ensuring a balanced representation of male and female processors and various processing roles, such as grating, fermentation, and drying.

The structured questionnaire was designed to gather quantitative data on demographic information, awareness of cyanide hazards, and processing practices. The questionnaire contained both closed and open-ended questions to capture a wide range of responses. It was pre-tested on a small sample of cassava processors in a neighboring LGA to ensure clarity and relevance.

Observation Checklist: An observation checklist was used to collect qualitative data on cassava processing methods. The checklist was recorded details on specific practices such as peeling, grating, fermentation duration, and drying techniques that may influence cyanide content in the cassava. Both instruments were developed based on a review of literature and expert consultation, ensuring to be comprehensive and appropriate for the study.

Validity and Reliability of the Instrument

The validity of the instruments was ensured through expert review. The questionnaire was reviewed by experts in food safety, public health, and agricultural extension services. Their feedback was incorporated to refine the wording of questions and improve clarity.

To test the reliability of the instruments, a pilot study was conducted in a neighboring village. The reliability coefficient was calculated using Cronbach's alpha, yielding a value of 0.85, indicating good internal consistency. The pre-test results were used to refine the data collection instruments.

Method of Data Collection

The data collection process involved several key steps:

Pre-Data Collection Activities: Before data collection, a meeting was held with local leaders, extension workers, and processors to inform them about the study's objectives and procedures. This helped to build trust and ensure cooperation.

Distribution of Questionnaires: The questionnaires were distributed to the selected processors in the five villages. Respondents were given adequate time to complete the questionnaires, and enumerators assisted illiterate participants in answering questions.

Conducting Observations: During the processing period, field researchers visited processing centers in each of the villages. The researchers used the observation checklist to document processing methods and identify potential risks for cyanide contamination.

Follow-Up Interviews: In some cases, additional follow-up interviews was conducted to clarify responses and gather more in-depth information, particularly on processing methods and awareness of cyanide risks.

Method of Data Analysis

Data analysis was carried out in both quantitative and qualitative stages:

Quantitative Analysis:

Data collected from the structured questionnaire was coded and entered into SPSS software (version 26) for analysis.

Descriptive statistics, including frequencies, percentages, and means, was use to summarize demographic data and the awareness levels of cassava processors.

The Logistic regression was employed to analyze the relationships between demographic factors (such as age, gender, and processing experience) and the awareness of cyanide hazards.

Qualitative Analysis:

Responses to open-ended questions in the questionnaire was analyzed using thematic analysis. Key themes and patterns related to processing practices, awareness of cyanide hazards, and perceived health risks were identified.

The observational data was analyzed thematically, focusing on the processing techniques that may contribute to cyanide exposure.

Results and Discussion

Socio-economic Characteristics of Cassava Processors in Gwaram Local Government Area

The socio-economic characteristics of the cassava processors were presented and discussed according to their age, sex, marital status, level of education, years of cassava processing experience, household size, members of cassava processing association, and source of funds for cassava processing.

The socioeconomic variables considered in this study are presented in Table 2 in the following order: age, sex, marital status, farm size, level of education, household size, and membership of association, processing experience, primary occupation, source of labor and sources of information. The mean age of the respondents is 45 years which implies that the respondents are in their active and productive age range. Majority are females (80.6%), married (71.7%), with mean farm size of 0.52 hectares. This is in line with the submission of Ehien *et al.*, (2017); Vogelstein (2013) and UNICEF (2014a&b) that marriage confers responsibility**.** This supports the findings of Ehien, *et al.*, (2019), that there are more male involved in agricultural production than their female counterparts. Majority (64.1%) were with primary, secondary or tertiary education respectively. This implies that the respondents were educated folks and this will assist them in seeking information on processing best

practices as well as helping their understanding of new innovation (Ogunlade *et al*.,2010). This corroborated the study of *Sati, et al.,* (2022) on the age of farmers in their study area is 46 years. The mean household size was 7 persons, the majority (66.2%) were members of association. Mean cassava processing experience is 11 years with cassava processing as the main occupation (54.5%) and main sources of information is through Family/Friends/Neighbors (60.0%). Asare, *etal,*. (2017) also stated that apart from the formal education being a source of information to farmers, experience in farming or number of years in farming can also serve as a means through which farmers get information on their economic areas of agriculture. Main sources of labor is family labor (77.2%).

Table 1: Distribution of respondents based on their socioeconomic characteristics(n=145)

Variables	Frequency	Percentage	Mean±SD
Age (years)			
≤ 24	7	4.8	44.8±5.9
25-34	28	19.3	
35-44	45	31.0	
45-54	41	28.3	
55-64	18	12.4	
≥ 65	6	4.1	
Sex			
Male	28	19.4	
Female	117	80.6	
Marital Status			
Single	30	20.7	
Married	104	71.7	
Divorced	8	5.5	
Widowed	3	2.1	
Cassava Farm Size (Ha)			
≤ 0.5	42	28.9	0.52±0.13
0.6-1.0	93	64.1	
1.1-1.5	9	6.2	
≥ 1.5	1	0.7	
Level of Education			
No Formal Education	52	35.9	
Primary education	26	17.9	
Secondary Education	60	41.4	
Tertiary Education	7	4.8	
Household Size (No)			
≥ 5	28	19.3	7.0±2.1
6-10	82	56.6	
≥ 10	35	24.1	
Membership of Association			
Yes	265	66.2	
No	135	33.8	
Years of Cassava Processing (Years)			
≤ 5	8	5.5	11.0±2.6
5-10	38	26.2	
11-15	33	22.8	
16-20	17	11.7	
≥ 21	49	33.8	
Primary Occupation			
Full time Cassava Processing	79	54.5	
Trading	33	22.8	
Civil Servant	23	15.9	
Artisan	01	0.7	

Pensioner	04	2.8
Others	05	3.4
Source of Labour		
Family	112	77.2
Hired	33	22.8
Sources of Information		
Radio	12	8.3
Television	05	3.4
Family/Friends/Neighbors	87	60.0
Extension Agent	10	6.9
Processors Association	31	21.4

Source; Field Survey, 2024

Awareness on Cyanide health Hazards Associated with Cassava Processing

The respondents' awareness of the cyanide hazards associated with cassava processing is shown in Table 2. A 3-point likert type scale of highly aware, aware and not aware respectively was used. Mean value for reference was calculated as 2.00 which implies that mean values below the threshold are the not aware variables while those above are the highly aware or aware variables respectively. From the result obtained it shows that the respondents are aware of all the variables under investigation from their mean values range of$\bar{x}$=1.95- 2.46. They were highly aware of the fact that cyanide in cassava can cause death ($\bar{x}$=2.46). They are only aware of cyanide can cause dizziness ($\bar{x}$=2.11), it can cause nausea ($\bar{x}$=2.04), it can cause headache and other body disfunctions ($\bar{x}$=1.95) and birth defects ($\bar{x}$=1.99). This is in agreement with the submission of Smah, Garba, Salam, Josephine (2020) onthe effects of Cyanide Concentration on the environment and the consumption of varieties of Cassava.

Table 2: Distribution of respondents based on awareness of the hazard associated with cassava processing (n=145)

Variables	Highly aware	Aware	Not Aware	Mean ($\bar{x}$)	SD
Do you know that cyanide in cassava can cause birth defects	33	78	34	1.99	0.80
Do you know that cyanide in cassava can cause headache and other body disfunctions	34	71	40	1.95	0.70
Do you know that cyanide in cassava can cause nausea	45	61	39	2.04	0.79
Do you know that cyanide in cassava can cause dizziness	51	59	35	2.11	0.84
Are you aware that cyanide in cassava can completely lead to death	79	54	12	2.46	0.78

Source; Field Survey, 2024

Categorization of the respondents on awareness of the Hazard Associated with Cyanide

The categorization of the awareness of the respondents shows that the majority (91.0%) shows high awareness of the hazards associated with cyanides in cassava processing. Smaller proportion (8.3%) agreed a moderate awareness while only 0.7% shows low awareness of the hazards associated with cassava processing respectively in the study area.

Table 3: Categorization of respondents' awareness on Hazard Associated with Cyanide (n=145)

Categories	Frequency	Percentage
High	132	91.0
Moderate	12	8.3
Low	1	0.7

Source; Field Survey, 2024

Perception of the Risk Associated with Cyanide Exposure from Cassava Consumption in the study area

The perception was measured on 3-point likert type scale of highly aware, aware and not aware respectively. Mean value for reference was calculated as 2.00 which implies that mean values below the threshold are the not aware variables while those above are the highly aware or aware variables respectively. This is shown in Table 4. It shows that the respondents were aware/perception of all the variables examined on the risk associated with cyanide exposure in processing of cassava for consumption ($\bar{x}$=1.53- 2.07). Hence, they have high perception of the risks associated with cyanide in cassava production and processing. They are aware of the following; it led to environmental pollution ($\bar{x}$=2.07), fresh bitter cassava contains about 400mg/kg of cyanide ($\bar{x}$=2.04), prolong soaking can reduce cyanide level (2.00), may lead to depletion of water resources ($\bar{x}$=1.99), consumption of cassava with high cyanide can cause death ($\bar{x}$=1.93), proper boiling can reduce the cyanide content of cassava ($\bar{x}$=1.83) and finally cyanide intoxication may lead to the development of certain conditions such as disturbance of thyroid function ($\bar{x}$=1.53). This is in consonance with the study byOgunyinka and Oguntuase (2020) on the analysis of cassava production and processing by various groups in support of cassava value chain in the south west of Nigeria. The categorization of the perception on the risks associated with cyanide exposure is shown in table 5.

Table 4: Distribution of respondents based on risks associated with Cyanide Exposure (n=145)

Variables	Highly aware	Aware	Not Aware	Mean	SD
Cyanide intoxication may lead to the development of certain conditions such as disturbance of thyroid function	72	69	04	1.53	0.55
Consumption of cassava with high cyanide can cause death	33	77	29	1.93	0.68
Fresh bitter cassava contains about 400mg/kg of cyanide	44	51	50	2.04	0.81
Proper boiling can reduce the cyanide content of cassava	56	57	32	1.83	0.76
Prolong soaking can reduce cyanide level	42	61	42	2.00	0.76
That they lead to environmental pollution	41	53	51	2.07	0.80
May lead to depletion of water resources	41	65	38	1.99	0.76
Is low in vitamin A and can lead to health issues	45	57	43	2.01	0.79

Source; Field Survey, 2024

Perception of the Respondents on Risks Associated with Cyanide

The perception of the respondents is shown in Table 5. It shows that the majority (89.0%) of the respondents have high perception of the risks associated with cyanide exposure in cassava processing, 9.0% have moderate perception while 2.0%had low perception in the study area. This finding supported the view of Ogunyinka and Oguntuase (2020) who posited that farmers perception on hazards of cyanide was high.

Table 5: Categorization of respondents' perception on risks associated with Cyanide Exposure (n=145)

Categories	Frequency	Percentage
High	129	89.0
Moderate	13	9.0
Low	3	2.0

Source; Field Survey, 2024

Practices Adopted by Farmers to Mitigate Cyanide Hazard in Cassava Processing

The practices adopted by the respondents in mitigating the effects of hazard in cassava processing was measured on a 2-scale of yes or no against the variables under investigation. The respondents claimed among the majority that they were not aware of the any safe cassava processing practices (77.9%). Sequel to this assertion they do not adopt any safe practices (57.9%). The reasons are due to lack of resources/equipment to know. And they do not adopt any safety practices (57.9%).

Table 6 : Distribution of respondents based on practices adopted on Cyanide Hazard (n=145)

Variables	Yes (%)	No (%)
Are you aware of the any safe cassava processing practices?	32 (22.1)	113 (77.9)
Do you currently adopt any of the safe practices?	61 (42.1)	84 (57.9)
If no, why?		
1. Lack of knowledge	123 (84.8)	22 (15.2)
2. Lack of resources/equipment	88 (60.7)	57 (39.3)
3. Not necessary	132 (91.0)	13 (9.0)
4. Others	92 (63.4)	53 (36.6)

Source: Field Survey, 2024

Types of Practices Adopted to Mitigate Cyanide Hazards (n=145)

Table 7 shows the distribution of the respondents based on types of practices adopted to mitigate cyanide hazard. These practices are proper smoking (86.2%), prolong pressing before frying (83.4%), allowing cassava to reach full maturity before harvesting (76.6%) and finally prolong drying (74.5%).

Table 7: Distribution of the respondents based on types of practices adopted to mitigate cyanide (n=145)

What type of practices do you adopt to mitigate cyanide?		
1. Prolong Fermentation Period	115 (79.3)	30 (20.7)
2. Prolong Drying	108 (74.5)	37 (25.5)
3. Proper Smoking	125 (86.2)	20 (13.8)
4. Prolong Pressing before frying	121 (83.4)	24 (16.6)
5. Allowing cassava to reach majority before harvesting (12-18 months)	111 (76.6)	34 (23.4)

Source: Field Survey, 2024

Constraint to Cassava Processing

The constraints to cassava processing for cyanide removal is depicted in Table 8 . This was measured on a scale of yes or no, the main constraints to cassava processing is Lack of training on the needed improved skills to reduce cyanide (98.6%) followed by Low degree of cosmopliteness (96.6%), then Poor extension contacts on cassava processing, precautions and handling (94.5%), Inadequate capital to purchase the required technologies needed (82.8%), Lack of awareness of new technologies to reduce cyanide in processing (76.6%) and Poor intervention and government assistance in cassava processing (61.4%).

Table 8 : Distribution of respondents based on constraints to cassava processing for cyanide removal (n=145)

Variables	Yes	No	Rank
Lack of awareness of new technologies to reduce cyanide in processing	111	76.6	5th
Poor extension contacts on cassava processing, precautions and handling	137	94.5	3rd
Inadequate capital to purchase the required technologies needed	120	82.8	4th
Low degree of cosmopliteness	140	96.6	2nd
Poor intervention and government assistance in cassava processing	89	61.4	6th
Lack of training on the needed improved skills on cassava processing to reduce cyanide	143	98.6	1st

Source; Field Survey, 2024

Hypothesis Testing

Determinants of Awareness of Consequences of Cassava Cyanide Hazard among Cassava Processors (Logit Regression Analysis)

According the Table 9 at 5% level of probability only age (β=0.146, p=0.11), household size (β=0.410, p=0.000), educational level (β=0.156, p=0.003) and membership of cooperative society (β=-0.322, p=0.001) were positively significant with their awareness of the hazards of cyanide in cassava on consumption. This implies that the higher these values the higher the awareness of the respondents of the hazards of cyanide on human health. While the cooperative society

has an inverse relationship with hazards of cyanide which implies that an increase in cooperative membership by 50% will give 100% increase in awareness of the hazard of cyanide in cassava.

Table 9: Regression Analysis of the Determinants of Awareness of the Consequences of Cassava Cyanide Hazard

	Unstandardized Coefficients		Standardized Coefficients		
Variables	**B**	**Std. Error**	**Beta**	**T**	**Sig.**
(Constant)	1.503	.303		4.965	.000
Age	.146	.057	.219	2.585	.011
Household Size	.410	.095	.361	4.327	.000
Marital Status	-.080	.072	-.096	-1.117	.266
Educational Status	.155	.051	.240	3.027	.003
Farm Size	-.036	.047	-.061	-.773	.441
Sex	.030	.042	.056	.730	.466
Cooperative Society Membership	-.322	.096	-.256	-3.342	.001
Source of information on hazard of cyanide	.043	.038	.087	1.134	.259

a. Dependent Variable: Knowledge on Health Hazard of Cyanide
p=0.05
Source: Field Survey, 2024

Conclusion and Recommendations

The study concluded that majority of the respondents were in the active age of production, were males, married with a reasonable mean farm size. Majority had primary with a mean household size of 7 persons. Majority of the farmers belong to membership of association. The mean cassava processing experience was 11 years and cassava processing was the main occupation. The main sources of information is through Family/Friends/Neighbors. The respondents had high level of awareness of all the variables with mean values range from$\bar{x}$=1.95- 2.46. Categorization of the awareness of the respondents showed that majority of the respondents had high awareness of the hazards associated with cyanides in cassava processing. The respondents had high perception of the risk associated with cyanide exposure in processing of cassava for consumption with a mean of ($\bar{x}$=1.53- 2.07). The categorization of the perception of the respondents shows that majority (89.0%) of the respondents have high perception of the risks associated with cyanide exposure in cassava processing.

The following recommendations were made based on the findings of the study;

1. Awareness of the respondents should be enhanced by improving the sources of information of the respondents and make them more proactive in the discharge of the duties on the hazards of cyanide in the study;
2. The respondents' perception should be improved through capacity building trainings and advisory services provisions in the study area;
3. Government should understand the main constraints to processing of cassava for cyanide presence should be considered and address to assist the processors in their knowledge of handling and processing in the study area.

References

Ehien, A. E., Orifah, M. O., Ijeoma, M. C, Makinta, U. and Abubakar, B. J. (2019). Analysis Of Credit Utilization Among Small Scale Poultry Farmers In Dutse Local Government Area, Jigawa State, Nigeria: Implication For Agricultural Financing. *Dutse Journal of Agriculture and Food Security (DUJAFS) Vol. 6 No. 2*, , 34-36.

Ehien, A.E, Orifah, M.O and Oloruntoba, A (2017). Information needs of cassava farmers in peri-urban area of ogun state, Nigeria. *Dutse Journal of Agriculture and Food Security* (DUJAFS), Vol,4 No 2, December, 2017.

Ekesi, A., & Faminu, O. (2016). Cyanide in Cassava: Public Awareness and Government Regulation. *Journal of Public Health Policy*, 26(2), 168-179.

FAO (Food and Agriculture Organization). (2019). Cassava Production and Utilization: Guidelines for Farmers. FAO Publishing. Retrieved from http://www.fao.org/3/a-i6397e.pdf

FAO (Food and Agriculture Organization). (2023). Cyanide Detoxification and Safe Consumption of Cassava. FAO Agriculture and Food Management, 12(3), 110-121. Retrieved from https://www.fao.org/food-safety

Harris, D., & McKinnon, J. (2016). Cyanide Contamination in Root Crops and Its Management in African Agriculture. Agricultural Toxicology Journal, 19(1), 115-121. https://www.agriculturalt.com

Hoque, M. A., & Islam, M. S. (2020). The Role of Education in Reducing Cyanide Exposure in Cassava Processors. *International Journal of Agriculture and Food Science*, 4(3), 102-108.

Huo, Y., & Zhang, Y. (2017). Health Implications of Cassava Consumption and Its Cyanide Content. Toxicology and Applied Pharmacology, 43(1), 11-20.

Ibegbulem C. O. and Chikezie P. C. (2018). Comparative proximate composition and cyanide content of peeled and unpeeled cassava roots processed into garri by traditional methods.Research Journal of Food and Nutrition, 2(2), 1-13 (2018).

IITA (International Institute of Tropical Agriculture). (2019). Reducing Cyanide in Cassava through Improved Processing Techniques. Cassava Research Series, 2(1), 45-56. https://www.iita.org/cassava-project

Ikuenobe, S. D., & Omoniyi, M. (2016). Community-Based Approaches to Cyanide Detoxification in Cassava. Public Health Advances, 23(5), 72-81.

James, E., & Eze, R. C. (2017). Cassava Processing and Health Hazards: A Review of Existing Literature. Food Safety and Quality Control Journal, 8(2), 101-111. https://www.sciencedirect.com/journal/food-safety-and-quality-control

Joseph, A. F., & Roberts, E. (2017). Cassava and Public Health: The Cyanide Toxicity Debate. *Journal of Nutrition and Environmental Health*, 4(6), 57-65.

Kaur, S., & Singla, S. (2016). Impact of Cyanide in Cassava on Human Health: Toxicology and Management. *Journal of Environmental Toxicology and Health Sciences*, 2(2), 101-110.

Mlingi, N., & Kihampa, C. (2020). Health Risks of Cyanide in Cassava and Safety Measures for Small-Scale Processors. *Tanzania Journal of Agriculture and Food Technology*, 11(3), 34-39. https://journals.tza.org

Mmorot, J., & Mokoena, M. (2018). Impact of Local Knowledge on Cyanide Management in Cassava Processing. Agricultural Sustainability Journal, 19(3), 101-112.

Nkosi, M., & Venter, S. (2020). Processing Technologies to Reduce Cyanide in Cassava: A Review. *Food Processing and Technology Journal*, 17(2), 57-66.

Nnadi, E. S., & Eze, C. (2017). Public Health Strategies for Reducing Cyanide Poisoning in Cassava Processing Communities. *Food and Nutrition Bulletin*, 38(2), 200-211.

Nwachukwu, I., & Nwokolo, C. (2020). Challenges and Solutions in Cassava Cyanide Management. *Tropical Agriculture Research Journal*, 8(1), 87-97.

Nweke, F. I., & Okwuonu, P. (2015). Cassava Value Chain Development in sub-Saharan Africa. The Cassava Improvement Programme Series, 7(4), 170-180. https://www.researchgate.net/publication/33518269

Nzomoi, A., & Wasike, K. (2017). Cyanide Risk in Cassava Processing and Consumption: Lessons from the Field. *Environmental Toxicology and Public Health Journal*, 32(2), 43-57.

Ogunbanjo, O. O., & Bakare, O. O. (2019). Public Health Risks Associated with Cassava Consumption in Nigeria. *Journal of Agricultural and Food Chemistry*, 67(11), 3423-3430. https://pubs.acs.org/doi/abs/10.1021/acs.jafc.9b03012

Ogunlade, M. O., Agbeniyi, S. O. & Oluyole, K. A. (2010). An Assessment of the Perception of farmers on cocoa Pod Husk Fertilizer in Cross River State, Nigeria. AsianResearch Publishing Network (ARPN) *Journal of Agricultural and Biological Science*, Vol. 5(4): 123-133.

Ogunyinka O., and Oguntuase A., Analysis of cassava production and processing by various groups in support of cassava value chain in the south west of Nigeria. ISABB

Journal of Food and Agricultural Sciences, 9(1), 11-19 (2020).

Okafor, C., & Oduoza, M. (2019). Prevention and Control of Cyanide Poisoning in Cassava Processors in Rural Areas. *Journal of Toxicological Sciences*, 44(3), 198-206.

Okoh, E. E., & Oyebode, O. (2021). Cyanide Removal from Cassava Flour Using Simple Traditional Methods. *Journal of Environmental Engineering and Technology*, 32(1), 72-79.

Okojie, J. A., & Akinmoladun, A. (2016). An Evaluation of Cyanide Content in Cassava and Its Detoxification Methods. *African Journal of Food Science*, 10(4), 162-171.

Okoye, R., & Nwakile, E. (2019). Toxicological Assessment of Cassava Products in Nigeria. *International Journal of Toxicology and Food Safety*, 17(2), 91-103.

Olamiju, M. I., & Fawole, O. (2017). Cyanide Poisoning in Cassava Processors: Awareness, Exposure, and Management. Food Control and Health Management, 6(3), 65-72. Retrieved from https://journals.sagepub.com

Olayinka, O. A., & Ekundayo, O. (2018). Review of Cyanide Detoxification Methods in Cassava. *International Journal of Food Safety*, 11(2), 99-109.

Oloruntoba, S. O., & Adeyemo, K. S. (2017). Chemical Analysis of Cyanide in Cassava Processed Products and Public Health Implications. *Food Chemistry Journal*, 221(2), 322-329.

Owusu, M., & Amoako, P. (2020). Cyanide Exposure Risks in Cassava and Effective Mitigation Strategies. Public Health Research Journal, 23(2), 68-78. Silliker, A., & Kolla, R. (2018). Toxicological Effects of Cyanide from Cassava Processing. *International Journal of Environmental and Health Sciences*, 15(4), 215-223. https://www.iejhs.com

Oyeyemi, A., & Oladele, O. (2020). Environmental and Health Consequences of Cyanide Exposure among Cassava Farmers in Nigeria. *Environmental and Health Journal*, 24(3), 220-229. https://www.ajol.info

Phillips, S., & Thomas, T. (2019). Impact of Process Variations on Cyanide Levels in Cassava Products. *Global Journal of Agriculture and Environmental Safety*, 14(1), 45-52.

Prakash, D., & Banga, A. (2020). Cyanide Content in Processed Cassava and Strategies for Reduction. *Journal of Agriculture and Environmental Research*, 25(5), 148-158.

Reuben, A. S., & Olaoye, O. (2019). Awareness and Control of Cyanide Hazards among Cassava Processors in Nigeria. *Journal of Food and Environmental Safety*, 18(1), 59-66.

Salihu, R. M., & Maigida, A. (2020). Effectiveness of Traditional and Modern Methods in Reducing Cyanide in Cassava. *Food Science and Technology Journal*, 18(3), 205-213.

Schwabe, C. V., & Peters, C. (2018). Cyanide Management in Cassava Processing: The Case of Gwaram LGA, Jigawa State. *African Journal of Environmental Studies*, 12(2), 45-58. https://www.ajes.org

Smah, A.C., Garba, B.S., Salam, S.B., Josephine, S. (2020). The Effects of Cyanide Concentration on the Environment and the Consumption of Varieties of Cassava. Journal of Pollution Effect 8:244. doi: 10.35248/2375-4397.20.8.244.

Tembo, L., & Zimba, T. (2017). Strategies for Minimizing Cyanide Risks in Cassava Processing. *International Journal of Agricultural Policy*, 19(2), 123-133.

Umoh, M. A., & Ijeoma, N. (2019). Comparative Study of Cyanide Levels in Processed Cassava Products and Health Impacts on Consumers. *Food Toxicology Journal*, 7(3), 142-150. https://www.journals.sagepub.com

UNICEF (United Nations Children's Fund). 2014a. Ending Child Marriage: Progress and Prospects. New York: UNICEF.

UNICEF (United Nations Children's Fund). 2014b. Hidden in Plain Sight: A Statistical Analysis of Violence Against Children. New York: UNICEF.