



PUBLIC HEALTH RISK KNOWLEDGE, AWARENESS AND HYGIENE PRACTICES OF PRODUCERS OF ARTISANAL DRINKS USING PREVIOUSLY DISPOSED PLASTIC BOTTLES IN CALABAR MUNICIPALITY, CROSS RIVER STATE, NIGERIA.

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ABSTRACT

Background: The magnitude of production and sales of unregulated beverages in Nigeria has significantly increased over the years. Several studies have found a high prevalence of pathogenic microorganisms in locally made drink samples which is a threat to public health. This study assessed the knowledge, awareness of public health risks associated with the use of previously disposed plastic bottles for packaging drinks and hygiene practices of producers of artisanal drinks in Calabar Municipality, Nigeria. **Methods:** The study adopted a descriptive cross-sectional design using a semi-structured questionnaire to elicit information from 166 producers of locally packaged drinks. Data collected were analyzed using SPSS version 25.0. Associations were tested using chi square statistics. **Results:** The study showed a high level of awareness of food borne diseases 120(73.2%). Majority of the respondents 83(50.8%) had a high level of knowledge on health risks associated with use of previously disposed bottles for packaging drinks. The level of hygiene practice was however not in tandem with Knowledge as the practice level was generally poor 99(60.3%). Majority 114(69.5%) also had a negative attitude towards safe use of previously disposed plastic bottles. There was an association between producers' duration in business and food hygiene practices ($X^2 = 5.153$, $P = 0.023$). There was also a significant association between producers' exposure to food hygiene training and food hygiene practice ($X^2 = 49.993$, $P = 0.0001$) **Conclusion:** There is an urgent need for planned regular food safety training sessions for artisanal drink producers and the regulation of sales of artisanal drinks to safeguard public health in Nigeria.

KEYWORDS: Public Health risk, Knowledge, hygiene practice, artisanal, drink, previously disposed bottle

INTRODUCTION

Food-borne diseases can result from several forms of contamination including pollution in water, soil or air, as well as unsafe production, food storage, processing or public sales of food or drinks (WHO, 2020; Omoleke et al., 2017). Over 200 diseases are caused by consuming food or drink contaminated with bacteria, viruses, parasites or chemical substances such as heavy metals (WHO, 2020). Since food-borne illness usually arise from improper handling, preparation or storage of food, good hygiene practices before, during and after food or drink preparation can reduce the chances of contracting a food-borne illness.

Unregulated beverages are commonly referred to as artisanal, unrecorded, illicit, or illegal drinks in a community. A common attribute of such products is that they are produced outside government regulation without any rules or regard to food safety guidelines. They could be homemade, surrogate and counterfeit alcoholic or non-alcoholic beverages that predispose people to hazardous substances (Okaru et al., 2019). A feature of unregulated beverages is that they are prone to food fraud (Ogueri et al., 2020). Beverages such as fruit juices, coffee, tea and alcoholic beverages are likely to be targets of food fraud by adulteration through practices that may involve mixing or substituting the original components (Ogueri et al., 2020).

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In Nigeria, there are several local unregulated drinks which are tied to the socio-economic lives of many people. A good number of families rely on homemade beverages and sell them in the streets to provide an additional source of income. Popular unregulated beverages produced in Nigeria include: alcoholic beverages like fermented palm wine, pito and burukutu; milk-based beverages like nono, local yoghurts, tiger nut milk and soymilk and; sugar-sweetened drinks produced mostly for their refreshing feature like kunu and zobo (Ogueri et al., 2020). Because the production of these drinks are not regulated, producers most a times do not pay attention to the source of bottles for packaging these drinks, thorough sterilization of the previously used bottles and even the safety of water used for production of such drinks.

The magnitude of the production and sales of unregulated beverages in Nigeria has reached the stage where significant regulation and food safety standards are required to safeguard public health (Ogueri et al., 2020). In a study carried out by Ikpoh et al. (2013), it was found that there was a high prevalence of pathogenic microbes in kunu samples including bacteria *E.coli*. In a similar study by Asuquo and Antai (2017), samples of soymilk were found to contain *Pseudomonas*, *Bacillus* and *Klebsiella* species while the fungi species were that of *Yeast* and *Aspergillus*, which are all known causes of pneumonia, food poisoning and diarrhea.

Many studies have shown that local beverages producers and street food vendors have sufficient information regarding hygiene and food safety principles and they are aware of the need to ensure safe practices in preparing foods for public consumption. For instance, in a study carried out by Iwu et al. (2017) in Owerri, Imo State, Nigeria, more than half of the respondents (55.5%) knew that diarrheal diseases were food borne and among those aware of food hygiene, majority (85.6%) knew that lack of good food hygiene practice could cause disease. Most of the participants had heard of food hygiene (87%) with more than one third of the respondents who were aware of food hygiene, indicating that their main sources of information were from television (38.5%), health workers (36.2%) and radio (35.1%). On the contrary, a study by Oridota et al. (2014) among food handlers in Lagos, Nigeria, found that more than a third (36%) of the food handlers were not aware that food contaminated by germs can cause serious damage to health, 38.3% did not know that they should wash their hands after using the toilet, while 25% did not know that they should wash their hands after handling money. Similarly, in a study carried out by Oladoyinbo et al. (2015) in Ijebu-Ode Local Government Area of Ogun State, it was observed that about half of the respondents (50.7%) had average knowledge of food borne infection; 41.6% had poor knowledge and only 7.6% had adequate knowledge.

The hygiene practices of producers of local drinks are questioned as micro-organisms which are indicators of poor hygiene have been found in these drinks (Ogueri et al., 2020). Producers and sellers of foods and drinks must make safe hygiene practices an integral part of their processes as their potential consumers may be

vulnerable to food borne illnesses. A study carried out by Kok (2014) in South Africa showed that a good number of local food processors and vendors practice hygiene and food safety principles to prevent contamination. Another study conducted in Kaduna, Nigeria, to survey the hygiene and sanitary practices of street food vendors, reported that the study subjects lacked training on hygiene and only 2.7% of them had received formal training on hygienic preparation of food, while 60% of them cooked in unclean environment with flies all over the place (Nurudeen et al., 2014). In another study however, regular washing of hands with soap and water after using the toilet and before handling food by local food handlers was observed in a tertiary educational institution in South-Western Nigeria (Faremi et al., 2018). A similar study carried out at local eateries of Orolu community in South-Western Nigeria observed that hygiene practices like washing of utensils before use when processing foods were the most commonly practiced form of hygiene (Bamidele et al., 2015).

According to Aluh and Aluh (2017), the local beverages vendors in his study carried out in a rural settlement in Nigeria in were unwilling to take part in Local Government organized workshops for food hygiene. Their reason was that time spent on workshops could be used in production and sales. A study carried out in Ouagadougou, Burkina Faso by Chukwuocha et al. (2009) indicates that majority of local beverages vendors and producers had not received hygiene training and hence lacked basic knowledge of risk perception, personal hygiene, cleanliness of the production and selling site. It was noticed that local beverages producers and vendors who had education about hygiene, practiced more sanitary methods while carrying out production of the local beverages. None of these studies actually focused knowledge and practice of producers and vendors of artisanal drinks with regards to previously disposed bottles. The present study therefore sought to determine the knowledge and awareness of public health risks and hygiene practices of producers of artisanal drinks using previously disposed plastic bottles in Calabar Municipality.

METHODOLOGY

Study area

Calabar Municipality is a Local Government Area in Cross River State with administrative headquarters located at Obame Ikoya Street, Leopard Town, Calabar. Calabar Municipality is located between latitude $04^{\circ}.15$ and 5° , and longitude $0^{\circ}.15$ and $8^{\circ}.25E$. It is situated in the Southern Senatorial District of Cross River State and it consists of ten wards. Calabar Municipal local government area is bounded in the North by Odukpani local government area, in the North-East by the great Kwa River, in the Southern shore by the Calabar River and Calabar South local government area. Calabar Municipal local government area covers an area of 142km^2 . The widely disputed result of the 2006 National population census put the population of Calabar Municipal local government area at 179,392. Calabar Municipal Local Government Area has 29 government-owned primary health care facilities comprising of three comprehensive health care centers, six health care centers, fourteen health posts and six outreach centers

which offers routine immunization services. The Local Government Area is a largely urban setting with pockets of rural/semi urban and riverine areas with a mixture of mainly ethnic groups but predominantly made up of the Quas, Efiks, Efuts, Ibibios and Yakkurs. The people are mostly Christians, among who are public servants, business men and artisans (Okeke et al., 2019).

Study design/ Study population

A descriptive cross-sectional design using a quantitative method of data collection was adopted for the study. The study population comprised of producers of locally packaged drinks in Calabar Municipality, Cross River State.

Sample size determination

Using the Lutz formula (1982), and assuming an alpha level corresponding to confidence level of 95% i.e. 1.96, desired precision of 0.08, a non-response rate of 10%, and a statistically conservative prevalence of 50% for producers of locally packaged drinks with unhygienic practices, a final sample size of 166 artisanal drink producers was obtained. The 50% prevalence for producers of locally packaged drinks with unhygienic practices was used to obtain an unbiased sample because previous studies were not focused on previously used bottles.

Sampling procedure

Producers of artisanal drinks in Calabar Municipality, Cross River State were purposively selected until desired sample size was attained.

Instruments for/ Method of data collection

A semi-structured questionnaire comprising of five sections was administered. The sections included; Socio-demographic characteristics, public health risk knowledge and awareness of the use of previously disposed plastic bottles by producers of artisanal drinks, hygiene practices of producers of artisanal drinks and attitude of producers of artisanal drinks. Data collection was done using semi-structured questionnaire which were administered to each respondent. Informed consent was sought and obtained from each respondent

before commencement of data collection. Confidentiality and anonymity of information provided was assured by not obtaining names.

Method of data analysis

Data were analyzed using Statistical Package for Social Science (SPSS) software (Version 25). Result were presented in form of descriptive statistics. Associations between selected demographic characteristics of respondents and hygiene practices, and between food hygiene training and hygiene practices were also tested using chi square statistics. Knowledge levels of respondents on health risks associated with artisanal drinks prepared with previously disposed bottles were scored as: 0-2points (low), 3-4 (moderate), and 5-7 (high); Practice levels were scored as 0- 4points (poor), and 5-9 (good); attitude was categorized as: score of 0-2points (negative), and 3-5 (positive).

RESULTS

Socio-demographic characteristics of respondents

The total number of questionnaire distributed was 166 but 164 were returned, giving a response rate of 98.8%. Results from table 1 revealed that majority of the respondents were female 86(52.4%), while 78(47.6%) were male. Majority 72(43.9%) of the respondents were aged between 26-35 years, followed by 53(32.3%) persons who were aged between 17-25 years and 39(23.8%) between 36-45 years. The respondents were largely single 85(51.8%), 47(28.7%) were married while 32(19.5%) were divorced/separated. Majority of the respondents 98(59.8%) were Christians, 25(15.2%) were Muslims and 41(25.0%) were of other religions. Regarding the respondents' educational qualification, 56(34.1%) respondents had secondary education, 44(25.6%) had primary education and 22(13.4%) had tertiary education and 42(25.6%) had no formal education. A good number of the respondents 91(55.5%) indicated their duration in business was less than 5 years while 73(44.5%) persons had spent above 5 years in business.

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency n = 164	Percentage (%)
Age(years)		
17-25	53	32.3
26-35	72	43.9
36-45	39	23.8
≥46	-	-
Marital status		
Single	85	51.8
Married	47	28.7
Divorced/separated	32	19.5
Religion		
Christianity	98	59.8
Islam	25	15.2
Others	41	25.0
Education qualification		
No formal	42	25.6
Primary	44	26.8
Secondary	56	34.1
Tertiary	22	13.4
Duration of business		
Less than 5 years	91	55.5
Above 5 years	73	44.5

Producers' knowledge and awareness of health risk associated with use of previously disposed bottles for production of artisanal drinks

Table 2, indicates that most respondents 120(73.2) had heard of food borne disease while 44(26.8%) had not. Majority of the respondents 98(59.8%) who had knowledge about food borne disease heard about it from Radio/TV, 44(26.8%) from family and friends, 22(13.4%) read from posters and handbills, 72(43.9%) got to know about it from the internet while 32(21.3%) of them learnt about it from an organized training. Majority of the respondents strongly agreed that food borne diseases

can spread through drinks. Also, 61(37.2%) respondents strongly agreed that unsterilized previously disposed bottles could transmit disease, 77(47.0%) agreed, 18(11.0%) disagree and 8(4.9%) respondents strongly disagreed that unsterilized previously disposed bottles could transmit disease. Furthermore, 83(50.6%) strongly agreed, 40(24.4%) agreed that it was important to know the sources of plastic bottles while 17(10.4%) disagreed and 24(14.6%) strongly disagreed that it was necessary to know the source of plastic bottles. Also, 41(25.0%) respondents indicated they had experienced food borne disease before while 123(75.0%) persons had never.

Table 2: Producers' knowledge and awareness of health risk associated with use of previously disposed bottles for production of artisanal drinks

Variables	Frequency n=164	Percentage(%)
Heard of food borne disease		
Yes	120	73.2
No	44	26.8
Source of information		
Radio/TV	98	59.8
Family/friends	44	26.8
Poster/handbills	22	13.4
Internet	72	43.9
Organized training	32	19.5
Food borne diseases can be Contracted through drinks		
Strongly agree	63	38.4
Agree	52	31.7
Disagree	16	9.8
Strongly disagree	33	20.1
Unsterilized pre-disposed bottles can transmit disease		
Strongly agree	61	37.2
Agree	77	47.0
Disagree	18	11.0
Strongly disagree	8	4.9
It is important to know source of plastic bottles		
Strongly agree	83	50.6
Agree	40	24.4
Disagree	17	10.4
Strongly disagree	24	14.6
Experienced food borne disease before		
Yes	41	25.0
No	123	75.0

Knowledge levels of respondents on health risks associated with artisanal drinks prepared with previously disposed bottles

Figure 1 shows that 28(17.0%) respondents had low level of knowledge of health risks associated with artisanal drinks prepared with previously disposed bottles, 53(32.2%) persons had moderate health risk knowledge and 83(50.8%) respondents had high level of knowledge of health risks associated with artisanal drinks prepared with previously disposed bottles .

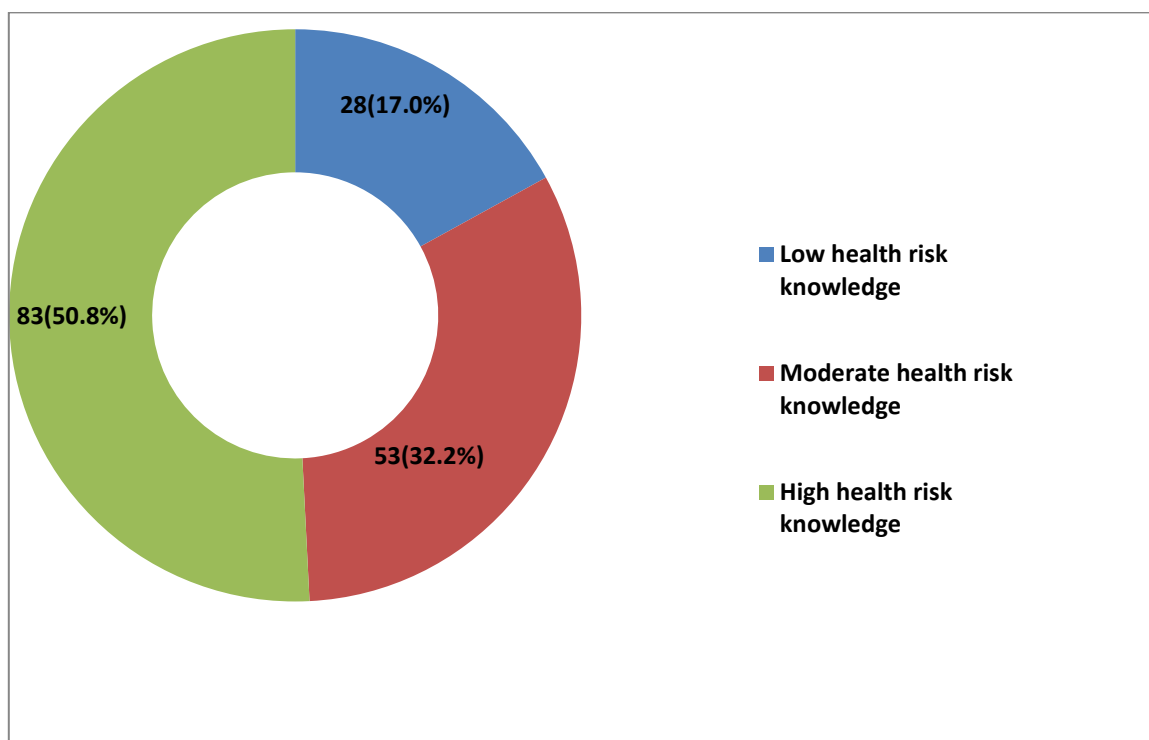


Fig. 1: Producers' Level of knowledge of health risk associated with artisanal drinks prepared with previously disposed bottles

Hygiene practices of producers of artisanal drinks

Table 3 shows that about 33(20.1%) respondents do not wash their hands before making drinks, 54(32.9%) wash their hands sometimes before making drinks and 77(43.0%) always wash their hands before making drinks. It is also evident from the table that 140(85.4%) respondents properly wash their bottles before use while 24(14.6%) of them do not. Also, out of the respondents who properly wash their bottles, 70(50%) indicated washing with soap and rinsing their bottles with warm or cold water while 70(50%) of them indicated that they just use water to rinse. Regarding respondents' frequency of boiling water; 65(39.6%) of them always boiled water before using, 35(21.3%) boil water sometimes while 19(11.6%) and 45(27.4%) persons indicated that they rarely and never boiled water for use in drink preparation. A good number of respondents 70(42.7%) indicated water board as their source of water for drink

production, followed by 45(27.4%) who indicated borehole as their source of water, 19(11.6%) indicated rain water as their source of water and 12(7.3%) indicated well water as their source of water for drink production. Regarding respondents' source of bottle for packaging drinks; about 69(42.1%) of them obtained their bottles from their household, 33(20.1%) obtained it from the market premises, 11(6.7%) obtained it from hospital premises while only 51(31.1%) of them got their bottles from refuse dumps. Regarding the reasons for choice of previously disposed bottles, 78(47.6%) persons indicated that previously used bottles were easy to get, followed by 35(21.3%) who indicated it was cheap to purchase and 11(6.7%) preferred using previously used bottles because they picked them at no cost; however 40(24.4%) persons indicated that all aforementioned were the reasons for choosing previously used bottles.

Table 3: Hygiene practices of producers of artisanal drinks

Variables	Frequency n = 164	Percentage(%)
Frequency of hand washing		
Never	33	20.1
Sometimes	54	32.9
Always	77	47.0
Bottle washing before use		
Yes	140	85.4
No	24	14.6
Sanitary measures before Using bottles`		
Wash with soap and rinse with warm/cold water	70	50.0
Rinse with warm/cold water	70	50.0
Frequency of boiling water used for preparation of drink		
Never	45	27.4
Rarely	19	11.6
Sometimes	35	21.3
Always	65	39.6
Source of water for drinks		
Water board	112	68.3
Borehole	97	59.1
Rain water	19	11.6
well water	12	7.3
Source of bottles		
Purchase from market/factory	0	0
Household	94	57.3
Market premises	112	68.3
Hospital premises	38	23.2
Refuse dumps	69	42.1
Reasons for choice of previously disposed bottles		
It is easy to get	78	47.6
Cheap to purchase	35	21.3
Picked from sites at no cost	11	6.7
All of the above	40	24.4

Hygiene practice levels of respondents

Figure 2 shows that 99(60.3%) producers of artisanal drinks had poor level of hygiene practice while 65(39.7%) had good level of hygiene practice.

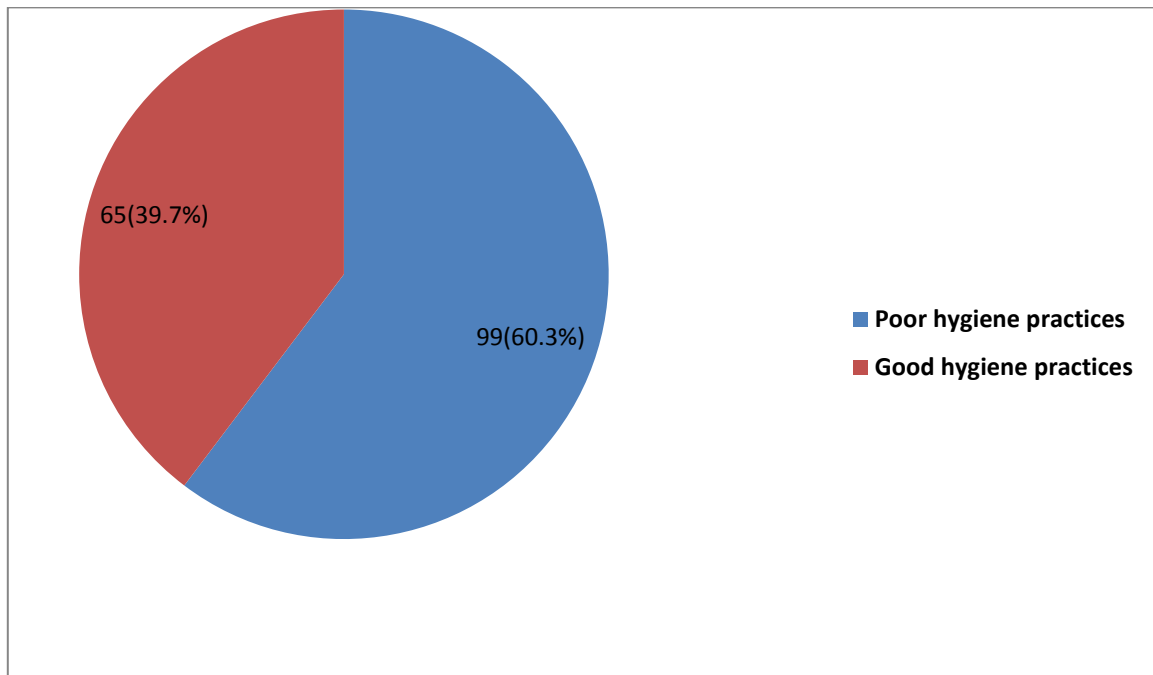


Fig. 2: Hygiene practices of artisanal drink producers.

Attitude of producers of artisanal drinks towards safe use of previously disposed plastic bottles for artisanal drinks.

Findings from table 4 reveal that about 54(32.9%) respondents would buy factory produced bottles than disposed ones while 110(67.1%) of them would not. Also, 93(56.7%) respondents were in support of the fact that government should be involved in monitoring artisanal drink production processes while 71(43.3%) were against it. About 103(62.8%) respondents indicated willingness to receive food hygiene training

while 61(37.2%) persons were not interested. Majority 87(53.0%) of respondents felt that there was nothing wrong with using previously disposed bottles. Concerning attitude of respondents towards sterilizing previously disposed bottles before use, 61(37.2%) indicated that sterilizing disposed bottles was very necessary, 77(47.0%) considered it necessary, 18(11.0%) were not sure, while 8(4.9%) respondents indicated that it was not necessary to sterilize previously disposed bottles before use.

Table 4: Attitude of producers of artisanal drinks towards safe use of previously disposed bottles for artisanal drinks

Variables	Frequency n=164	Percentage(%)
Would buy factory bottles than disposed ones		
Yes	54	32.9
No	110	67.1
Government should be involved in monitoring production process		
Yes	93	56.7
No	71	43.3
Willing to receive food safety and hygiene training		
Yes	103	62.8
No	61	37.2
Nothing is wrong with using disposed bottles		
Yes	87	53.0
No	77	47.0
Necessity of sterilizing disposed bottles before use		
Very necessary	61	37.2
Necessary	77	47.0
Not sure	18	11.0
Not necessary	8	4.9

Categorization of respondents' attitude towards safe use of predisposed plastic bottles

Figure 3 shows that 144(69.5%) producers of local beverages had negative attitude towards the safe use of previously disposed plastic bottles and 50(30.5%) producers of local beverages had positive attitude.

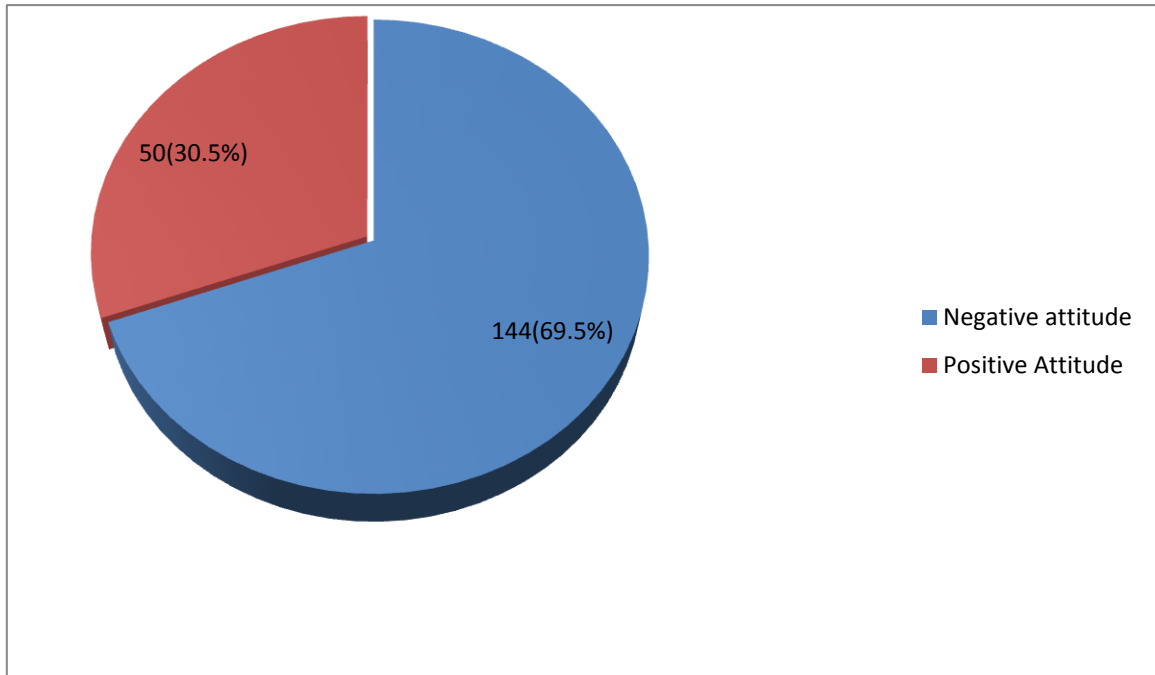


Fig. 3: Categorization of attitude of artisanal drink producers towards hygiene

Food hygiene training of respondents

Fig 4 revealed that 112(68.3%) respondents had undergone training on food safety and hygiene while 52(31.7%) had never undergone any training on food safety and hygiene.

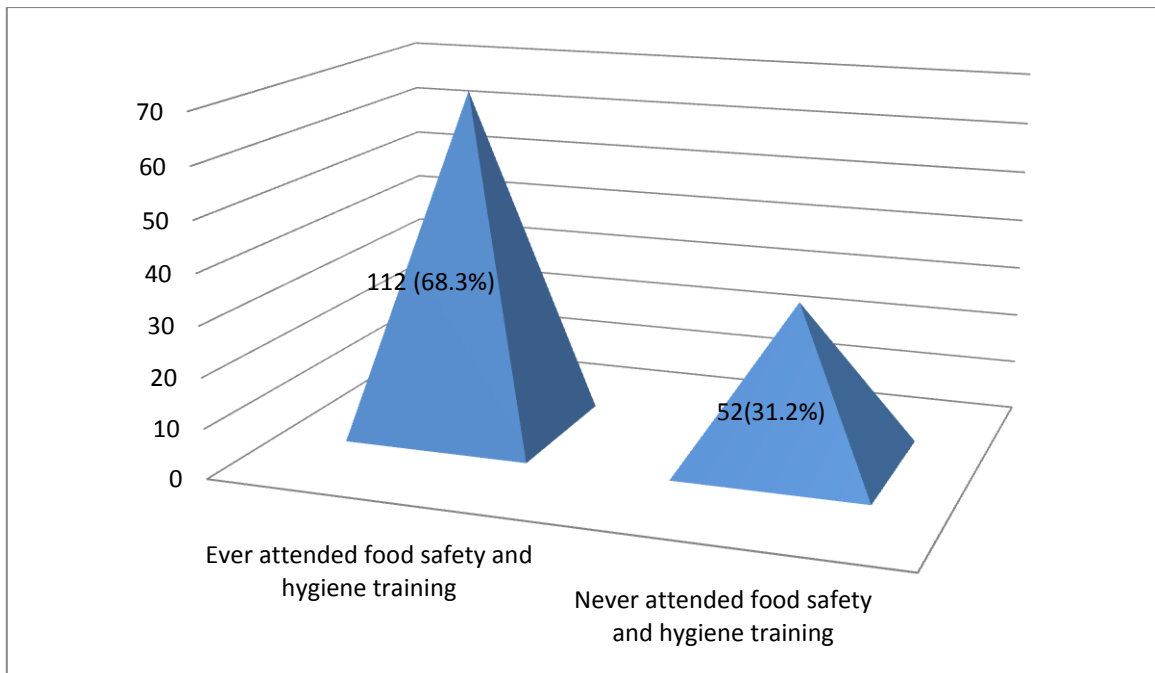


Fig. 4: Food hygiene training of respondents

Association between socio-demographic features of respondents and food hygiene practices

As shown in Table 5, Good hygiene practice was higher among the females than the male respondents (40.2 versus 39.0%). The difference was however not significant ($P=0.873$). The test of association between food hygiene practices and educational level of respondents showed that good hygiene practice was

more prevalent among respondents with secondary education compared with other educational levels. This difference was not statistically significant ($P=0.278$). The proportion of respondents who had good hygiene practice was higher among those who had spent above five years in the business compared with those who spent less than five years (49.3% versus 31.9%), and the difference was statistically significant ($p=0.023$).

TABLE 5: Association between selected demographic characteristics of respondents and hygiene practices (n=164)

Test variables	Hygiene practices		df	Chi-square (X^2)	P value
	Good	Poor			
Gender					
Male	32(39.0)	50(61.0)	1	0.025	0.873
Female	33(40.2)	49(59.8)			
Level of education					
No formal	14(33.3)	28(66.7)	3	3.8555	0.278
Primary	14(31.8)	30(68.2)			
Secondary	27(48.2)	29(51.8)			
Tertiary	10(45.5)	12(54.5)			
Duration in business					
Less than 5 years	29(31.9)	62(68.1)	1	5.153	0.023
Above 5 years	36(49.3)	37(50.7)			

Figures in parenthesis represent percentages. *Statistical significance based on $p<0.05$

Association between food hygiene training and hygiene practices

Table 6 below shows the association between food hygiene practices of artisanal drink producers and being trained on food hygiene. The proportion who had good

hygiene practice was higher among those who had ever been trained on food hygiene compared with those who had not been trained (57.1% versus 1.92%), and the difference was statistically significant ($p=0.0001$).

TABLE 6: Association between being food hygiene training and hygiene practices (n =164)

Test variables	Hygiene practices		df	Chi-square (X^2)	P value
	Good	Poor			
Ever been trained on food safety and hygiene					
Yes	64(57.1)	48(42.9)	1	49.993	0.0001
No	1(1.92)	51(98.1)			

Figures in parenthesis represent percentages.

*Statistical significance based on $p<0.05$

DISCUSSION

The findings from this study indicate that majority of the producers of locally packaged drinks are aware of health risks associated with locally packaged drinks. Consistent with the present findings are many studies which have shown that local beverages producers and street food vendors have sufficient information regarding hygiene and food safety principles and they are aware of the need to ensure safe practices while preparing foods for public consumption (Iwu et al., 2017; Oladoyinbo et al., 2015). Oridota et al. (2014) in contrast however,

reported that more than a third (36%) of food handlers in Lagos, Nigeria, were not aware that food contaminated by germs can pose serious risk to health, 38.3% did not know that they should wash their hands after using the toilet, while 25% did not know that they should wash their hands after handling money. The high level of awareness in the present study may be due to exposure of majority of respondents to food safety training. Hygiene practices with regard to preparation of local drinks were found to be largely poor. This finding reveals

a gap between knowledge and practice as respondents seemed to be knowledgeable about the health risks that may be associated with locally packaged drinks but still had poor practices. For those who practiced frequent hand-washing, it may have been due to their exposure to food safety training or the fact that some of them had experienced food borne disease before, as indicated in their responses. They, possibly as a result of such previous experience, take necessary measures to ensure that their drinks are packaged hygienically by washing hands frequently and ensuring to know the source of plastic bottles for packaging drinks. This affirms the association found between good practice and years of experience as respondents who had spent more years in the business seemed to have better hygiene practices than those who had spent less. Experience thus seemed to have played a part in improvement of practice. Ogueri et al. (2020), had reported that micro-organisms which are indicators of poor hygiene have been found in artisanal drinks. Some of the respondents in the present study reported using unimproved sources of drinking water for production of drinks and also sourced for bottles for packaging their drinks from hospital premises and refuse dumps. Okon et al. (2018) and Okon et al. (2022), have reported the presence of pathogenic microorganisms in water from unimproved sources. The need for using improved source(s) of drinking water for food preparation cannot be overemphasized owing to the fact that use of unimproved water sources predispose individuals to water-borne diseases (including cholera, diarrhea and typhoid fever). The use of plastic bottles from around hospitals may constitute sources of infection as most of these bottles may have contained infectious substances. Hence, using these bottles, especially without sterilizing them may pose health threats to consumers and the general public. Safe hygiene practices must be an integral part of food and drink production processes to prevent health risks especially to vulnerable groups.

The preference of previously disposed bottles to buying factory produced ones by majority of respondents due, indication that there was nothing wrong with using previously disposed bottles for packaging locally made drinks for sale, use of bottles from market places, hospitals and dumpsites for drinks and poor disposition sterilization of such bottles indicated a general trend of negative attitude toward safe use of previously disposed plastic bottles among the artisanal drink producers. Akabanda et al. (2017) from their study on food safety knowledge, attitudes and practices of institutional food handlers in Ghana, however reported a general satisfactory attitude of food handlers toward food safety. A soothing aspect of this findings however was that most respondents felt government involvement in monitoring production processes was necessary and were also willing to receive food hygiene training. Aluh and Aluh (2017), in contrast reported that producers of local beverages in a rural settlement in Nigeria were unwilling to take part in local Government organized workshops for food hygiene with reasons being that time spent on workshops could be used in production and sales. The study of Walker et al. (2013), also reported that 57% of local food and drinks handlers thought that

they could tell if food was contaminated with food poisoning bacteria by sight, smell and taste and hence did not feel the need to be trained on food handling hygiene practices. The present study found a relationship between exposure to food hygiene training and hygiene practice as majority of those who had attended a food hygiene training had good hygiene practices with regard to artisanal drink production. These trainings could present these artisanal drink producers with the opportunity to be properly educated on the risks associated with use of unsterilized bottles and unimproved water sources for production of locally made drinks and hence helpful to improve attitude and hygiene practice regarding locally packaged drinks production.

CONCLUSION

The study showed a high level of awareness of food borne diseases. Level of knowledge on health risks associated with use of previously disposed bottles for locally packaged drinks among producers were found to be generally high but did not correspond with levels of hygiene practice which was generally poor. Respondents' attitude towards safe use of previously disposed plastic bottles for packaging drinks were largely negative. There was an association between the duration of local producers in business and their food hygiene practices. A significant association between exposure to food hygiene and safety training and food hygiene practice was also observed. There is therefore an urgent need for the regulation of sales of artisanal drinks in Nigeria and consequently, a mandatory requirement of regular food safety training for food vendors, to safeguard public health.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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