

Assessment of Environmental Sanitation, Food Safety Knowledge, Handling Practice among Food Handlers of Bukateria Complexes in Iju Town, Akure North of Ondo-State, Nigeria

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Abstract

Background: Food safety has become one of the ten threats to global health in 2019 and the outbreaks of foodborne diseases are major public health problems and had caused approximately 76 million illness, 325,000 hospitalizations and 5000 deaths yearly. However, 20 - 40% of such illness is associated with the consumption of contaminated food where bukateria premises are the most frequently cited sources of sporadic and outbreak foodborne infection including WASH related diseases. The problem is more noticeable in developing countries due to prevailing poor food handling and sanitation practices, tokenistic and inadequate food safety laws, weak regulatory systems, lack of financial resources to invest on safer equipment's, and lack of education for food handlers.

Objectives: This study assesses the environmental sanitation status of complexes in Iju offering public 'Bukataria' services, in Akure North Local Government Area of Ondo State, South-West Nigeria.

Materials and Method: Purposive sampling technique was used, 36 respondents from 16 bukarias was carried out from April 2013 to May 2013. Total number of bukateria was obtained from environmental health unit of Akure North Local Government. The proprietors and food handlers were selected by lottery method from each selected bukateria. Structured and pretested questionnaire was developed for the purpose of data collection after reviewing relevant literature and views of professionals in the area. Analyses was achieved with frequencies, Chi-square and other summary statistics, to assess food vendors knowledge on hygiene and environmental sanitation practices.

Results: Chi-square test ($P = 0.1, 0.01$) revealed that respondents with higher form of education (about 72%) and catering training (6%) had better knowledge about food hygiene. Results also revealed that while 61% of the food vendors did not use aprons, only about half of those that used (39%) were neat. 75% (12 out of 16) of the bukateria had facilities for safe storage of cooked food, while 56% kept neat kitchen and stores. Correspondingly, 31.3% of the bukateria were adequately ventilated while 75% kept neat restaurant. 46% have access to means of adequate sewage disposal. All Bukateria had access to both portable water and adequate refuse disposal system. Rodents (rats) and/or flies were absent in 75% of the bukateria visited. This study will have a significant input, in the formulation of appropriate strategy, to modify and facilitate the overall regulatory activity, for program planning and evaluation by environmental health officer.

Conclusion: More needs to be done in the area of supportive supervision training, education, medical screening for food handlers and monitoring in order to further improve the wellbeing of the community. These therefore demonstrate the need for targeted sanitation interventions in our Bukateria in order to address the current inadequate or lack of progress.

Keywords: Bukateria; Knowledge of Food Hygiene; Global Health Threat; Food Safety; Food Handling Practices; Sanitation Intervention; Monitoring; WASH

Introduction

The world is facing multiple health challenges, these range from excessive alcohol use; food safety; motor vehicle injuries; nutrition, physical activity, and obesity; healthcare-associated infections; prescription drug overdose; heart disease and stroke; teen pregnancy; HIV; and tobacco use. The status of public health policies and practices designed to address 10 important public health issues. Interestingly, food safety has become one of the ten threats to global health in 2019. An estimation of 2 million deaths occur annually due to food borne diseases in third world countries and worldwide about one third of the total population is estimated to be infected with intestinal parasites, majority being people living in middle and low-income countries of the world [1]. Epidemiological research has indicated that the majority of reported foodborne illness outbreaks originate in food service establishments [2,3], and case control studies have shown that eating meals outside the home is a risk factor for obtaining a foodborne illness [4-8]. In addition, research on foodborne illness risk factors has indicated that most outbreaks associated with food service establishments can be attributed to food workers' improper food preparation practices and observation studies have revealed that food workers frequently engage in unsafe food preparation practices [9-11]. Similarly, about 819 million people are infected with *Ascaris lumbricoides* (*A. lumbricoides*), 464.6 million people with *Trichuris trichiura* (*T. trichiura*), 438.9 million people with hookworm infection [12], 500 million people with *Entamoeba histolytica* (*E. histolytica*), and 2.8 million people are infected with *Giardia lamblia* (*G. lamblia*) [13]. Interestingly, the incidence of food-borne diseases has been on the increase, often associated with outbreaks, and threatens global public health security and raises both national and international concern [14]. The World Health Organization reported that 1.8 million deaths in 2005 alone resulted from diarrheal diseases, most of which were attributed to the ingestion of contaminated food and drinking water [15]. According to the Center for Disease Control and Prevention [16], 59% of foodborne disease outbreaks involved foodservice establishments.

Different Scholars indicate that Food borne diseases had significant public health risk, especially to young generation, the elderly and pregnant women in both developed and developing countries. As a result, food borne diseases may affect the consumers in different ways like causing health problems and loss of life and significant economic losses associated to cost related to medical treatments. Outbreaks of food poisoning have been reported in several food services sectors especially in restaurants and hotels [17]. Food workers play a critical role in ensuring food safety, those who do not practice proper personal hygiene, including hand washing at the appropriate times and using appropriate methods can contaminate food [18]. Moreover, good personal hygiene practices are an essential part of providing safe food to your customers [19].

Acute food borne diseases are the second largest cause of morbidity in Europe, ranking after respiratory tract infectious [15]. For various reasons, only a small proportion of cases of food borne diseases are ever officially reported. At the consumer level, there is an increasing need for inspecting of retail and catering premises in order to sample food, make microbiologic examinations of equipment and utensils and give advice and instruction to the food handlers. It is expected that a significant contribution can be made by WHO surveillance programme for the control of food borne infections and intoxications, which is being initiated by WHO regional official for Europe. Even though the importance of sanitation is recognized, sanitation progress has not been as great as that of water supply. Today, about 1,115 million people are thought to lack an adequate and safe supply of water for their daily needs, including personal and domestic hygiene. Only an estimated 23.9% and 19.5% of the rural population are provided with safe water surly and adequate sanitation respectively [15], whereas, water supply and sanitation should go hand-in-hand with community improvement [20].

Throughout the developing world, millions of people lack access to improved sanitation. This problem affects some 228 million people and costs 1.0 - 6.3 percent of gross domestic product (GDP), a total of at least US\$10 billion a year. Interestingly, the economic impact of doing nothing is costly. Every US \$1 spent on sanitation brings a \$5.50 return by keeping people healthy and productive. The global economic gains from investing in sanitation and water are estimated at \$260 billion per year; poor sanitation, on the other hand, costs countries between 0.5 and 7.2 per cent of their GDP: \$3 billion/1.3 per cent of GDP in Nigeria, \$448 million/7.2 per cent of GDP in Cambodia, \$4.2 billion/6.3 per cent of GDP in Pakistan, \$53.8 billion/6.4 per cent of GDP in India, \$6.3 billion/2.3 per cent of GDP in Indonesia, \$17.5 million/2.0 per cent of GDP in Liberia [21].

In a July 2011 report published by Water and Sanitation Program (WSP), it was stated that Nigeria lost an estimated ₦455 billion or \$3 billion yearly to poor sanitation. According to the WSP report, the lost translated to the equivalent of 1.3% of the nation's Gross Domestic Product (GDP) [22]. A breakdown of economic impact of poor sanitation in Nigeria, according to the water and sanitation program (WSP) report \$2.5 billion was lost yearly to premature death from diarrhoea - 90% of which was directly attributed to poor water, sanitation and hygiene. Another \$13 million was lost yearly due to productivity losses arising from sickness or accessing healthcare services. Also, the WSP report estimated that about \$191 million was lost through healthcare expenditure [22].

The importance of food hygiene cannot be overemphasized. In a report to the American Public Health Association in 1975, it was stated that food borne disease is a preventable communicable disease. In view of the important role of bukateria as a major source

of cooked food to the community, this study aims at assessing the level of environmental sanitation, personal and food hygiene at the bukateria complexes in Iju, Akure North Local Government, Ondo-State. So therefore, the objective of this study is to assess the sanitary condition of the food premises and to assess the food hygiene knowledge and practices of the food vendors in the bukateria and make recommendations on how to sustain effectively and sustainably.

Statement of problem

The World Health Organization estimated that in developed countries, up to 30% of the populations suffer from food borne diseases each year, whereas in developing countries up to 2 million deaths are estimated per year [23]. Every day people all over the world get sick from the food they eat. This sickness is called food borne disease and is caused by dangerous microorganisms and/or toxic chemicals [24]. Millions of people become sick each year and thousands die after eating contaminated or mishandled foods [25]. Interestingly, about 75% of food borne illness outbreaks is assumed to be related to improper food handling practices by employees in food establishments like inappropriate handling of food, holding temperatures, and poor personal hygiene of food handlers, the safety of food handlers is therefore one of the most important health and safety issues facing most third world countries since it leads to both public health and social Problem [26]. Evidences show that approximately 10 to 20% of food borne diseases outbreaks are due to direct contamination by food handlers [27]. The transmission of food borne diseases aggravated by unsafe food handling practices made by food handlers and they even often continue to work with food borne related disease symptoms like diarrhea or vomiting and possibly pass the disease through the food they are serving. Others can be asymptomatic and unaware of the increased risk of passing infection to others via the food they handle [28]. Food safety practices and general requirements in food businesses and establishments of food handlers must have skills and knowledge in food safety and food hygiene for the work they do. Researchers have attributed these food safety handling errors to a lack of adequate food safety knowledge [29]. Many countries have not yet established adequate surveillance or reporting mechanisms to identify, and track food borne illness. Therefore, data on food borne diseases are extremely scarce and improvements are needed to better identify the causes of food borne diseases [28].

Literature Review

Bukateria - a cafeteria, canteen or simply eating place (also known as buka, a West African 'hausa originated' word for Food stands - Etymological Note {Buka+cafeteria} (Microsoft, Encarta, 2009 Dictionary). Environmental sanitation is an age long practice introduced during the early period of human civilization and is the principle and practice of achieving healthy and hygienic conditions in the environment to promote public health and welfare, improve

quality of life and ensure a sustainable environment. In addition, environmental sanitation are processes which aims at detecting environmental nuisances and abate them, thereby promoting elements of survival and prolong life by dealing with problems prejudicial to health, also helps to prevent spreading of communicable diseases, promotes health and efficiency, prevent food poisoning, and provide safety, comfort and optimum physiological performances. A host of other diseases are related to poor disposal of human excreta, poorly constructed or managed latrines, poor solid waste management and drainage. Many of these latter diseases are vector-borne. If the toll on human health and human life of all of these poor sanitary conditions could be effectively added up, it would truly reveal a tragedy [20].

Food, a product that is rich in nutrients required by microorganisms and may be exposed to contamination with the major sources from water, air, dust, equipment, sewage, insects, rodents and employees. Due to the changes in food production, handling and preparation techniques as well as eating habits, the fact remains that food is the source for microorganisms that can cause illness. The US Centre's for Disease Control and Prevention [30] revealed that the outbreaks of foodborne diseases which resulted from foods of animal origin had caused approximately 76 million illness, 325,000 hospitalizations and 5000 deaths each year. In 2000, the U.S. Department of Agriculture (USDA) estimated the costs associated with five major bacterial foodborne pathogens to be \$6.9 billion. The Food and Drug Administration's (FDA's) 2005 Food Code states, "The estimated cost of foodborne illness is \$10-\$83 billion annually." These numbers show the large medical and financial burdens caused by foodborne disease in America. What the numbers do not show, however, is the pain and suffering of consumers and their families as a result of foodborne illness. Data obtained from UK and USA, suggest that 20-40% of such illness is associated with the consumption of contaminated food where catering establishments are the most frequently cited sources of sporadic and outbreak foodborne infection [31,32]. According to Mederios, *et al.* [33], the common food handling mistakes besides serving contaminated raw food also include inadequate cooking, heating, or re-heating of foods consumption of food from unsafe sources, cooling food inappropriately and allowing too much of a time lapse. However, adequate sanitation, together with good hygiene and safe water, are fundamental to good health and to social and economic development. That is why, in 2008, the Prime Minister of India quoted Mahatma Gandhi who said in 1923, "sanitation is more important than independence" [34]. Improvements in one or more of these three components of good health can substantially reduce the rates of morbidity and the severity of various diseases and improve the quality of life of huge numbers of people, particularly children, in developing countries [35,36]. Although linked, and often mutually supporting, these three components have different public health characteristics. Recent statistics collected by the WHO/UNICEF

joint monitoring programme imply that about 3 billion people in the developing world today lacks appropriate sanitation [37].

Moreover, poor WASH conditions are major causes of preventable illness and deaths throughout the developing world and are the leading causes of diarrhoeal deaths of children. Globally, 64.2 million disability-adjusted life years (DALYs) are attributed to unsafe water, poor sanitation and hygiene practices [38], of which 52.5 million (82 per cent) are in low-income countries. The burden of disease falls heavily on children, with children under 5 accounting for 88 per cent of the DALYs in low income countries (over 46 million DALYs). Regionally, the burden of disease due to unsafe water and poor sanitation falls heavily on sub-Saharan Africa (46 per cent of global DALYs) and South Asia (34 per cent of total DALYs). The burden of disease falls heavily on children; diarrhoea is the second biggest killer of children under 5 worldwide [39]. Each episode of diarrhoea in children contributes to malnutrition, reduced resistance to infections and when prolonged, to impaired physical and cognitive growth and development as well as school readiness and performance.

Food poisoning cases are on the rise; the incidence rate of 31.1 cases per 100,000 populations in 1997 which is a two-fold increase from the previous year [40]. Overall, unhygienic food handling practices and the inadequacy of a safe water supply, as well as poor environmental sanitation were some causes of foodborne illness outbreaks in Malaysia. In 2006, about 3,625 from 81,686 inspected food premises had been closed when recognized as unhygienic according to the regulations in Part II of Food Act 1983 [41]. Previous reports [42,43] indicated that poor food handling practices are a leading cause of food-borne diseases. Such improper practices have been well documented [44] and typically include cross contamination of raw and cooked food, inadequate cooking, and storage at inappropriate temperatures. Food handlers may also be asymptomatic carriers of food poisoning organisms [45], serving as a potential source of contamination to food. However, adequate training and transfer of such training to behaviour in particular can help limit such improper food handling practices and hence reduce the resulting effects of contamination on health and economy.

Some of the recent sanitation studies include: The sources of water supply, sanitation facilities and hygiene practices in an island community: Amassoma, Bayelsa State, Nigeria by Raimi., et al. [46]; The sources of water supply, sanitation facilities and hygiene practice in oil producing communities in central senatorial district of Bayelsa State, Nigeria by Olalekan., et al. [47]; A survey of hand washing behaviour and awareness among health care workers in health care facilities in Kubwa district of Bwari Area Council, F.C.T Abuja, Nigeria by Raimi., et al [48]; Water-related problems and health conditions in the oil producing communities in central sen-

atorial district of Bayelsa State by Raimi., et al [20], Bacteriological assessment of selected hand dug wells in students' residential Area: A Case Study of Osun State College of Health Technology, Ilesa, Nigeria by Henry., et al [49]. Sanitation was also studied in different areas of the world by Admasu and Kelbessa [50]. Interestingly, many sanitation programmes in Nigeria have been based on the assumption that improved hygiene and sanitation are fundamentals for improved health and quality of life. However, these projects have not always been as successful as expected. One of the reasons may be that many individuals do not share Western conceptions of hygiene and health, another reason could be that improvement in sanitation facilities and health education do not necessarily by themselves lead to significant impacts on health.

In Africa poverty is the underlying cause of consumption of unsafe food. Lack of access to potable water, poor government structural arrangement, communicable diseases, trade pressure, and inconvenient environmental conditions are notable reasons. High incidence of diarrheal diseases among children are an indication of the food hygiene situation in the African region [51]. There are many factors associated with food handling practices. A study done in Ankara, Turkey, Mekelle town, and Bahir Dar town, Ethiopia indicated that knowledge of food handling is significantly related with food handling practices [52,53], whereas, a study done on central India, Bangladesh, and Nigeria indicated that food handling practices was related with educational status of food handlers [54,55]. More over, a study done in Nigeria and Kenya in 2009 showed that type of premise, unclean equipment and work responsibility was factors affecting food handling practices [23,56]. Gender was also found to be associated with food handling practices of vendors of street foods in Nairobi, Kenya [56]. In addition to socio demographic factors, environmental factors such as temperature, solid waste storage, solid waste disposal, latrine condition and hand washing facilities of the food and drink establishment were associated with food handling practices [23,57,58]. Food borne diseases are common in developing countries including Nigeria because of the prevailing poor food handling and sanitation practices, tokenistic and inadequate food safety laws, weak regulatory systems, lack of financial resources to invest safer equipment's, and lack of education for food handlers.

Research Methods

Description of the study area

Akure North Local Government Area of Ondo State in the South Western part of Nigeria, its headquarters is in the town of Iju/ Itaogbolu. It has an area of 660 km² and a population of 131,587 at the 2006 census; it has about 150 towns and villages with Itaogbolu, Iju, Oba-Ile, Ayede-Ogbese and Ilu-Abo as the major towns. The Local Government shares boundaries with Ikere (Ekiti-State) in the North, Owo and Ose Local Government in the West and South West, Ifedore Local government in the East and Akure South Local government in the southern part.

Iju, a major town in Akure North Local Government has 3 wards among the 12 wards in the Local Government, she has major streets and several minor streets among which College road, Ifofin, Mofere, Oke Agunla, Afuye, Oke-Iju, Oke-Agbe, Ajipowo, Ikere road, Aiyetoro, Araromi, Ojugbese, Ayedun quarters, Owoseeni, Atapara, Aiyetoro, Ara-Oyinbo, Iseeri, Surulere etc. And here is some list of names of Bukateria and their location in the town, they are: Abegbe (College road), Blue-Blue (Omoleewo), Abimbola (Roundabout, Centre of Town), Adamolekun (Ikere road), Eyeloye (Okeagunla), Julie (Ikere road), Ayi (College road), Olororo (Atapara), Iya Ajisola (Mofere) etc.

1. Food vendors' interview schedule to assess the food hygiene knowledge and practices of the food handlers.
2. An observational checklist to assess personal hygiene and environmental sanitation of the food premises through spot checks of each premise for a minimum of 15minutes. To avoid bias, an unheralded and unscheduled visit was paid to collect the required information.

Data analysis

The data collected was subsequently analysed manually by choosing specific indicators relating to the objectives of the study. Discreet data were presented as charts, frequencies and percentages. Where needed, relationships between proportions were tested using Chi-square test. The overall assessment of food hygiene knowledge was based on a scoring system totalling 20 marks. The system tested correct definition of food hygiene, and four ways food hygiene can be maintained in their premise. A score of ≥ 12 was taken as good, 9-11 was fair while ≤ 8 was poor. Also, the overall assessment of practise of food hygiene was based on a scoring system totalling 10 marks. This assessed the appearance, practise, personal hygiene, clothing and habits of the food vendors. A mark of ≥ 7 was taken to be good; 4-6 was fair, while ≤ 3 was taken to be poor.

Results

Response rate/completeness of data

The response rate was 100%, however, the study was conducted on 36 participants that incorporated proprietors and food handlers, of 16 food establishments located in Iju.

Socio-Demographic Characteristics of the participants

Among the age brackets, about 53% of the respondents were aged 21-40 years, followed by ≤ 20 (25%) and 41- 50 (19.4%). The sample of respondents with the highest percentage (27.8%) are within the age brackets of 21-30 and the age bracket of ≤ 20 and 31-40 is 25% respectively, however it was evident that majority (77.8%) of the respondents are young people.

Figure 1: Map of Akure North Local Government Area.

Research Methodology

1. **Study Location:** The bukateria complexes in Iju, Akure North Local Government, Ondo-State, Southwest, Nigeria.
2. **Study Design:** Community based quantitative cross - sectional study on environmental sanitation and associated factors among food handlers of Bukateria was conducted in Iju town, Akure North Local Government Area from April 2013 to May 2013.
3. **Study Population:** The source populations for the study includes the all proprietors and food handlers working in these bukateria complexes of Iju town.
4. **Sampling Technique:** A descriptive and purposive sampling method of choosing every other stall canteen or restaurant was employed.

Observational check list

Total number of Bukateria = 16

Data collection instruments

Data were collected with:

Figure 2: Showing the age distribution of the study participants.

The sex distribution shows a preponderance of female (80.6%) while 19.4% are males, showing female predominance in the popu-

lation. This can be explained by the fact that most chores relating to bukateria services and environmental sanitation including water, sanitation and hygiene are carried out by females.

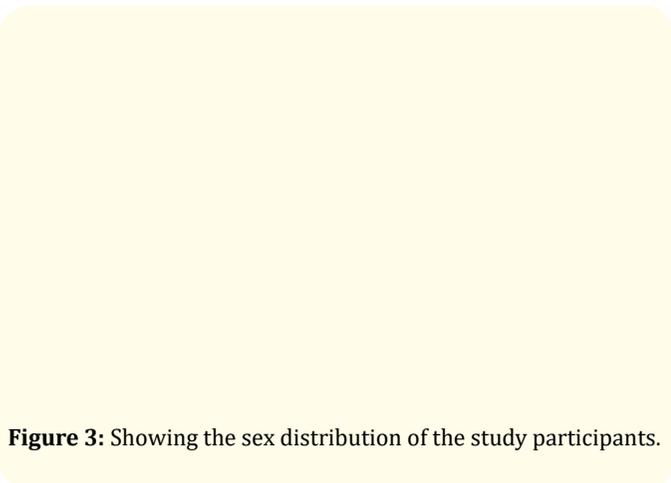


Figure 3: Showing the sex distribution of the study participants.

The marital status was grouped into single, married, divorced and widow/widower. 47.3% of the respondents are single, 44.4% are married, and 8.3% widow/widower as at the time of the study. However, the study discovered that over two-thirds of the participants are either single or married.

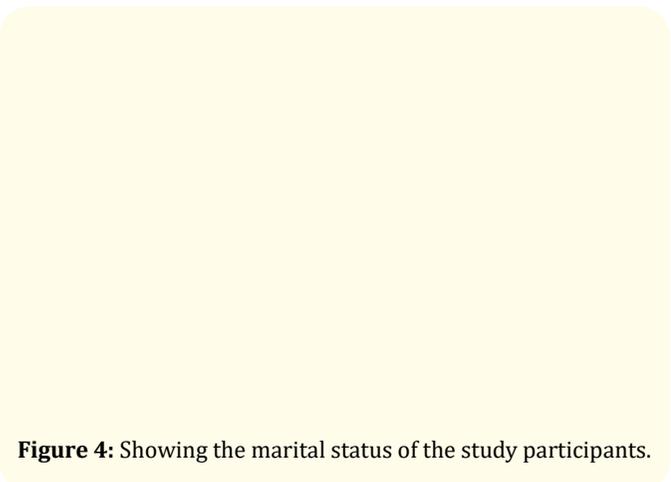


Figure 4: Showing the marital status of the study participants.

In the respondents' level of education, the highest in the sample survey is the no formal education and primary school leavers (primary level) with 27.8% respectively followed by secondary school leavers with (25%). Thus, educational status of the respondents revealed that about 66.7% had varying degree of formal educations, while only 2 respondents (6%) had attended catering school.

Concerning their medical screening, it reveals that about 11.1% of the respondents were screened before starting their jobs while 88.9% of the respondents were not screened.

Out of 36 food vendors that were interviewed, results in figure 7 shows that only 16 (44.4%) of them had previously attended food vendor's training programme while 55.6% were not trained.

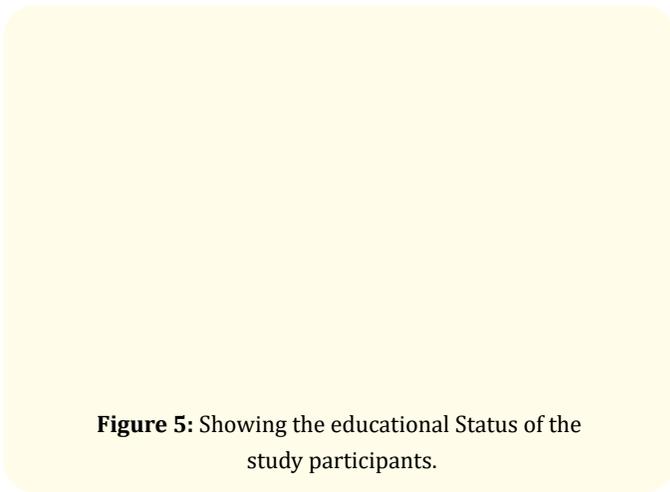


Figure 5: Showing the educational Status of the study participants.

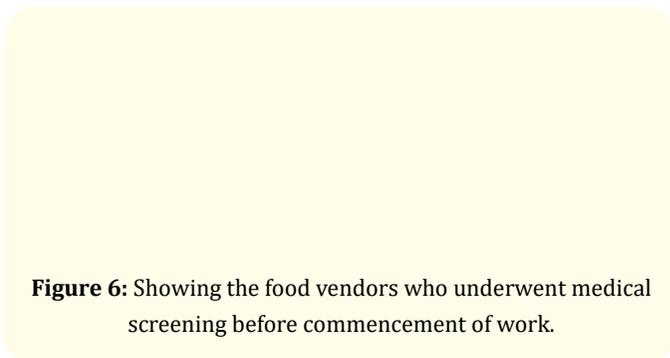


Figure 6: Showing the food vendors who underwent medical screening before commencement of work.

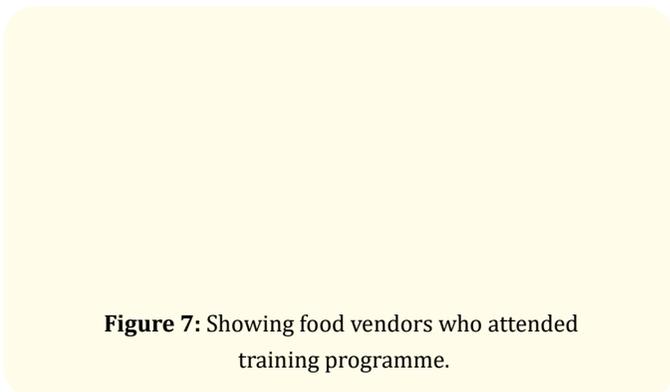


Figure 7: Showing food vendors who attended training programme.

About half (50.0%) of the respondents had good knowledge while the remaining 17% had poor knowledge.

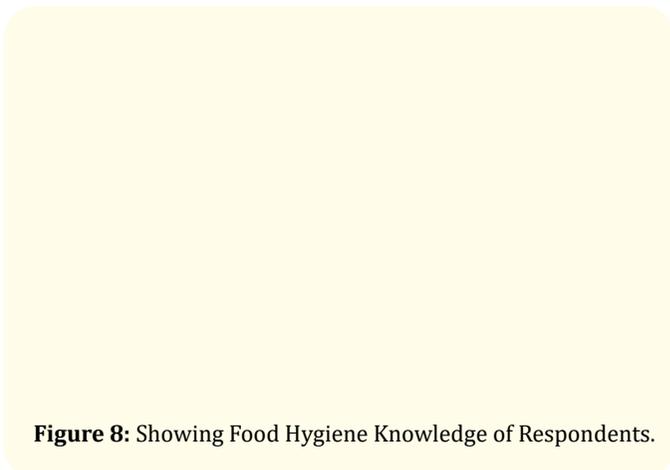


Figure 8: Showing Food Hygiene Knowledge of Respondents.

Amongst the 30 respondents (83.4%) had at least fair hygiene practices.

Table 2 shows a trend in the table that respondents with training tended to have good knowledge, and then the validity of the trend was tested as above. It was found to be statistically significant at P = 0.01.

Table 3 reveals that about 61.2% of the respondents did not put on aprons and only 19.4% wore neat aprons while the other half of the 19.4% that had aprons on wore dirty aprons.

Concerning their methods of storing perishable food items in iju town shows that half of the bukateria had no facility for storing perishable food items (50%) while the other half either used refrigerator or deep freezers.

Figure 9: Showing food hygiene practice of respondents.

Table 1 shows an apparent trend that respondents with secondary and post-secondary education, tended to have good knowledge of food hygiene representing about 56% of food handlers with very good practices. Those with poor practices fell in no formal education and primary level of education. The validity of this trend was tested using chi-square test and was found not to be statistically significant with P value = 0.1.

Figure 10: Showing methods of storing perishable food items in Bukaterias in Iju.

Educational status	Good Knowledge	Fair Knowledge	Poor Knowledge	Total
No Formal Education	2(11.1%)	5(41.7%)	3(50%)	10
Primary	4(22.2%)	4(33.3%)	2(33.3%)	10
Secondary	5(27.8%)	3(25%)	1(16.7%)	9
Post-Secondary	5(27.8%)	0	0	5
Catering School	2(11.1%)	0	0	2
Total	18	12	6	36

Table 1: Relation between Educational Status and the Knowledge of Food Hygiene of the Respondents.

$$\chi^2 = 12.6086, \delta f = 8, P = 0.1$$

Source: Field Survey, 2013

Training Status	Good Knowledge	Fair Knowledge	Poor Knowledge	Total
Trained	14(77.8%)	2(16.7%)	-	16
Not Trained	4(22.2%)	10(83.3%)	6	20
Total	18	12	6	36

Table 2: Relationship between Food Vendors Training and Food Hygiene Knowledge of the Respondents.

$$\chi^2 = 15.6326, \delta f = 2, P = 0.01$$

Source: Field Survey, 2013

Clothing	Frequency	Percentage (%)
No Apron worn	20	61.2
Apron worn		
Neat	8	19.4
Dirty	8	19.4
Total	36	100.0

Table 3: Clothing of Food Vendors

Source: Field Survey, 2013

Concerning the methods of storing cooked foods before serving at the bukateria complexes in Iju. Only 1 bukateria (6.3%) store cooked foods uncovered and not put in box with net.

Figure 11: Showing methods of storing cooked foods before serving to customers.

Source: Field Survey, 2013

Concerning hygiene status of food premises in Iju-Akure. 12 (75%) of the stalls visited had facilities for safe storage of cooked food and 56.3% kept neat kitchen and stores. Also, 31.3% of the bukateria were adequately ventilated while 75% kept neat restaurant. However, 43.8% have access to means of adequate sewage disposal. All Bukateria had access to both portable water and adequate refuse disposal. There was absence of rats and/or flies in 75% of the bukateria visited.

Figure 12: Hygiene Status of Food Premises in Iju.

Discussion

This study was undertaken to establish the baseline characteristics of bukateria complexes, to elicit information from the subjects regarding some variables in relation to environmental sanitation in line with sustainable development goals establishing the current situation of the WHO recommended essential steps for implementation of environmental sanitation at bukateria complexes.

Demographic characteristics of respondents

This study revealed that the majority (78%) of food handlers were within the aged bracket ≤ 20 and 21-40 years and are young people. Among the food handlers interviewed 80.6% were female and males were 19.4% showing female predominance in the population. This can be explained by the fact that most chores relating to bukateria services and environmental sanitation including water, sanitation and hygiene are carried out by females. This is similar to the study done by Getachew [59] on the assessment of hygienic practices in selected hospitals in Ethiopia where 100% were female and another study done by Zain and Isara [54] on knowledge and practices of food hygiene and safety among food handlers in fast foods in Benine found that the majority were females (69.5%). From these studies it is clear that the majority of food handlers in food establishments are female and this could be attributed to the number of factors which include the nature of the job and mostly female employees are known to maintain proper personal and food hygiene. These two studies were different from the study done by Kasturwar and Mohd on knowledge and practices among food handlers found that the majority of food handlers 52 (62.7%) were males and 31 (37.3%) were females. With the difficult, harsh economic environment especially in Nigeria and other third world countries, food vending business is rapidly expanding and serving as a common, accessible and complementing source of family income and employment especially for women, which is probably due to the existing cultural orientation and gender bias. The marital status was grouped into single, married, divorced and widow/widower. 47.3% of the respondents are single, 44.4% are married, and 8.3% widow/widower as at the time of the study. However, the study discovered that over two-thirds of the participants are either single or married.

The study also revealed that (27.8%) is the highest in the sample survey with the no formal education and primary school leavers (primary level) respectively followed by secondary school leavers with (25%). Thus, educational status of the respondents revealed that about 66.7% had varying degree of formal educations, while only 2 respondents (6%) had attended catering school. Similarly, this is contrary to a Chinese study, which show the level of education for food handlers was 75% up to secondary level and the hygiene levels were also high among the food handlers. Hence, educational status revealed that most of them, as a result of lack

of attainment of adequate educational status may have resorted to engaging themselves in a relatively cheaper means self-employment to sustain a livelihood. Also, of importance is the fact that only about a tenth food vendors interviewed were actually screened medically before commencing the job. The implication of this was that majority of the vendors could be a potential carrier of faecally transmissible infections and tuberculosis.

Food vendor medical screening

The study found out that majority of the respondents 32(88.9%) did not do the required initial medical examination before commencing the food vending business. Only 4(11.1%) reported to have done medical screening before commencing the food vending business. Probably the lack of awareness, additional costs or associated inconveniences, especially when they feel healthy, may have contributed to why the majority of the respondents did not do medical examinations. Though, Abdussalam and Kaferstein [60], is of the opinion that medical examination of food vendors prior to commencement or at periodic intervals, thereafter, should not be mandatory, because it does not significantly ensure food safety. Notwithstanding, there is always a possibility of food vendors, being healthy carriers of disease and infecting consumers and as such, it is in the best interest of the consumer that all food vendors be examined. Similarly, food handlers who were examined of their health status tend to have better understanding about safe food handling, in addition to this they get professional advice during medical screening which help to enhance their overall performance in safe food handling practice.

Food vendor medical screening

More than half of the respondents never attended a food vendors' training, little wonder then that only half of them had a good knowledge of food hygiene. This may be related to lack of training facilities as well as lack of awareness towards the risk of the practice. Majority of the respondents were found talking while preparing food. This shows that there is a casual attitude to the upholding of the rule of food hygiene on the part of the respondents. Half of them had a good knowledge of food hygiene despite a poor attendance at training programme. Also, they may have been able to attain this probably from the knowledge of food hygiene and may be attributed to the calibre of people that come to eat at their bukateria and more so; the environment where they sell foods (i.e. Street and shop location). Majority of the food handlers without food safety training had poor knowledge in most aspects of the questions asked. Most of them (55.6%) did not know what the term hazard analysis and critical control points (HACCP) meant and only 44.4% were aware, in addition 44% proportions of trained foodservice workers demonstrating excellent and acceptable knowledge than those without training. Food handlers with food safety training showed good knowledge in most aspects This

therefore suggests that food safety training courses should focus specifically on the area of work or need of each food handler rather than subjecting every food handler to various training areas that might not be relevant to their ultimate improved performance. More so, the needs of individual food handlers are likely to vary considerably in what they need to be trained on. This finding is consistent with previous observations [61-63] which indicated that many people perceived accredited basic or foundation level food hygiene training as not being relevant to the whole food industry. In addition, focusing food safety training on the specific need or work area of food handlers would save time, money, and resources. However, when food handlers were properly trained, they can take the necessary precautions to avoid malpractice in food handling. Therefore, food handlers should attend proper training in the basic principle of food safety and rules of personal hygiene in order to improve their practices in food handling. Previous training on food hygiene influenced the likelihood of medical examination among food establishments.

Knowledge on food hygiene

Generally, the food handler's knowledge levels were high. They demonstrated good knowledge in the areas of hygiene knowledge. All respondents indicated that hands should be washed before food preparation and serving to customers. Despite exhibiting good knowledge in these areas, it was found that only 44.4% of the food handlers were trained in food hygiene and the rest indicated that they came to know about food hygiene practices through environmental health officers/inspectors who go around to inspect the food premises or during integrated supportive supervision (ISS). However, some observational studies found that although the food handlers have good knowledge towards food hygiene, but they do not always put the knowledge into practice [64]. Manning and Snider [11] reported that 81% of their respondents are aware of the importance of hand washing, but only 2% observe washing their hands thoroughly. More than half of the respondents (73.9%) answered with the correct option which indicates that they realized food prepared without proper handling may contribute to the risk of food-borne illnesses. A similar study was done in small and micro enterprises, to assess food handlers' knowledge on food hygiene in South Africa and found that the average correct answers were at 46% low compared to this study that found an average of 50% to be knowledgeable in food hygiene practices. The results, however, indicate that Knowledge on food hygiene is crucial because poor practices has been shown to be contributory factors to food borne illnesses in various food retailers [65]. Similarly, according to Kalua [66], knowledge, positively influences attitude formation and in other words, attitude can be said to be a reflection of knowledge which is linked to personal beliefs and previous personal experiences and this probably could explain the observation in the present study where a majority of the respondents had a good level of knowledge and also an accompanying good level of

positive attitude towards food hygiene. This pattern was similarly observed in previous studies done in Nigeria [67,68] where the majority of the respondents had a good level of both knowledge and attitude and in a study in Malaysia and Nigeria [69] where the majority of the respondents had a poor level of both knowledge and attitude.

Practices of food hygiene

Availability of health facilities is a pre-requisite for putting health knowledge into action. Thus, knowledge is reinforced by practice. According to Aiken., *et al.* [70], practices refer to the ways in which people demonstrate their knowledge and attitude through their actions. Health facilities include toilets, water supply, refuse bins, hand washing facilities etc. With regards to practices, Hand hygiene and food hygiene practices are the two most critical factors in ensuring food safety. When food handlers did not practice good personnel hygiene or proper handling, they can be the vector for growth of microorganisms through hands, cuts, mouths, skins and hairs [71]. 55.6% respondents in this study showed good food hygiene practices while 27.8% had fair hygiene practice before handling foods. Many of the previous studies proved that it is crucial to practice self-hygiene especially hand hygiene because hand is the major agent that transmit microorganisms and intestinal parasites to foods [72]. Approximately 83.4% of the respondents produced good personnel hygiene practices. According to Bas., *et al.* [57], the staff employed in food and beverages services should have a clean, tidy and proper appearance, without any skin infections, good dental hygiene, have short finger nails and are not in the habit of biting nails, do not wear jewellery except wedding ring, wearing no make-up, work in clean shoes and uniform, and stick to good hygiene practices. Data for the risk factors showed that majority of the cases were due to improper food handling practices [9]. A study in USA proposed that inappropriate food handling practices lead to 97.0% of foodborne diseases [10]. This is contrary to the study done by Safee in 2010 where all respondents were taking baths daily and changing clothes before starting to work. In addition, this finding was consistent with studies in Malaysia and Nigeria, which had safety food handling practices of 54.7% and 54.7% [23,54] respectively. It was greater than findings in Turkey which had prevalence of 48.4% [57]. But this finding is lower than the finding in Mekelle town, Ethiopia, in which a practices of food handlers on food hygiene was found to be 63.9% [52]. The probable reasons for the differences might be due to difference in sociodemographic and environmental factors difference in the two study groups.

Educational status/training and food hygiene knowledge/clothing of food vendors

The fact that their educational status may not have any significant effect on their knowledge of hygiene may be due to the relatively small numbers of respondents involved in the study.

Meanwhile, it was found that food vendors training programme by environmental health officer resident at the local government may have significant positive effect on knowledge of food hygiene, which serve as a means of disseminating hygiene information which should have been provided in a catering school. However, according to the former Prime Minister of Britain. Benjamin Disraeli (1804-1881) "the health of the people is really the foundation upon which all their happiness and all their powers as a state depend. Richard Baker also admonished that to get rich never risk your health, for it is the truth that health is the wealth of wealth. These few statements are clear indication that he who provides health provides wealth". Formal training of food vendors is important in ensuring good personal and environmental hygiene and has been reported by Monney., *et al* [73] who showed that, food vendors trained on food hygiene and safety are more likely to keep their finger nails clean and adequately protect their food from flies and dust. Therefore, there is need to develop an environmentally literate citizenry. Formal and informal food safety education would be effective means to involve creating appropriate awareness of critical food safety issues. In particular, formal education is important to increase awareness, improve extension services, sensitize people on food safety issues and build institutional capacities. Non-formal food safety education will go along way in benefiting people outside the formal education. Although communication of food safety information to all stakeholders is still a challenge. Public awareness will help empowers the public to develop a strong sense of responsibility of food safety issues.

Only about 16 (38.8%) of the food vendors wore aprons. About half of these were clean. Some bad habits detected while the investigator was carrying out a non-participatory observation. This include talking while cooking, eating and chewing sticks, Nursing babies in stall etc. Babies nursed in the stalls were allowed to move freely. They often contaminate food by touching food items either by crawling around the bukateria premises or sneaking around unnoticed. Some of these babies could defecate and urinate in the stalls and all these has implication on the overall status of the food premises and the safety of the food cooked therein.

Method of storing perishable and cooked food

In about 50% of the bukateria, there were adequate facilities for storage, while the other 50% had no facilities at all. The latter bought and used any perishable item the same day or they left them un stored till when needed. As a result of this, such items can be acted upon by purifying bacteria for partial decomposition, which poses a danger to human health. According to Anon. [74], most cases of foodborne disease were due to improper handling of food, including the inappropriate use of temperature during food preparation and conservation, cross-contamination, poor personal hygiene and inadequate food utensils. In this survey, only 37.5% of the respondents managed to prove that they store their food in

food flask and covered bowl in the right temperature for storage of hot and cold ready to eat foods besides the temperature of refrigerators and freezers. This result is supported by Bas., *et al.* [57] that reports the knowledge of critical temperatures of these aspects were low amongst their studied food handlers. Walker., *et al.* [75] also reported that less than half of 444 respondents knew the correct temperature of holding hot foods. However, a few percentages of the respondents (25.1%) did not know the harm caused by *Staphylococcus aureus* and that incorrect storing temperature of the refrigerator could increase the risk of food contamination.

Hygiene status of food premises

The kitchen was kept clean in 56.3% of cases, while in 75% of cases, the restaurants were kept clean. The latter was higher because this is the area customers' visit. 75% of cases maintained the control of rats and flies. Though some of the recent/modern complexes has water closet toilets types, this percentage however is low with respect to the system of open field defecating practice common to the old bukateria complexes, which would predispose the environment to offensive odours and the transmission of diseases organism by flies. The method of refuse disposal in the bukateria is commendable. 100% of the stalls had dustbins at the time of visit. Therefore, in the present study, the level of personal and environmental hygiene appears to be moderately good, and therefore similar with some other studies [76,77] whose authors have argued that, due to the food vendor's necessity to depend on the customer's repeat patronage in order to maintain and sustain their livelihood, the vendors are more likely inclined to produce relatively safe food by maintaining the minimum required level of hygiene standards; even though a serious gap still exists for the improvement of proper hygienic conditions and access to basic sanitary facilities for the food vendors [78-82].

Conclusion

Life depends on a clean and healthy environment. Low environmental standards lead to reduced life expectancy. In terms of environmental health, air and water borne disease are associated with air and water pollution, sanitation, personal hygiene, waste disposal, food safety and chemicals. Other disease such as malaria, cholera, typhoid and Ebola are caused through exposure to harmful environment. The Environmental health sector suffers from lack of cooperation between the health sector and other sectors including a component of primary health care; weak local capacity of villages, townships and other authorities to promote health care services; lack of provision of safety and health codes for use in various sectors of the economy and low-level standard of environmental health services and conditions relating to water supply, sewages, solid waste and pollution control. Interestingly, studies of this type enable researchers to gather standardized environmental data, and they help identify contributing factors in outbreaks.

This study concludes that, sanitation regulations and enforcement play crucial role in ensuring good environmental sanitation condition. The study revealed that, the mere fact that most human beings dread death makes environmental health and sanitation important to every citizen. Living healthfully is not and does not imply living expensively. Rather it involves an attitude towards life that brings about the highest attainable level of physical, emotional and social well-being. Essentially, the level of food hygiene among the food vendors and practice of food hygiene in bukateria complexes in Iju-Akure locality of Ondo State as assessed in this study was fair but still needs further effort to improve the misconception on food safety/hygienic practice. Also, the sanitary conditions of the bukateria complexes were good. However, there are still a lot of rooms for improvement. Basic efforts that could lead to good health and longevity include the taking of sensible actions and precautions based on sound health information, of which training and re-training remains the surest way of instilling new skills, technology and attitudes in individuals. Environmental sanitation education will no doubt help in educating and reconditioning the minds and attitudes of citizens in consonance with the norms of our millieu. Environmental public health service programs must be involved in promoting understanding of the environmental causes of food-borne and waterborne diseases, improving the practice of environmental health, and ultimately improving the health of the communities served. The study further emphasised on the need for institutional capacity building and proper coordination and collaboration between institutions and departments within the assembly responsible for ensuring good environmental sanitation. The enforcement of sanitation regulations and bye-laws, intensive public education and the provision of facilities such as waste bins on streets would go a long way to help the city authorities achieve good environmental sanitation in Ondo State. This study has therefore contributed valuable information on how restaurants should handle food. This information may contribute to the development of intervention efforts in restaurants and subsequent prevention of foodborne associated outbreaks. For example, environmental health specialists can use this information to support the restaurant industry in improving food handling practices. During their inspections and environmental assessments, environmental health specialists can educate restaurant managers and workers about the classification of foods storage as potentially hazardous, look for some of the specific inappropriate food handling practices identified in this study, and assist restaurant managers and workers in correcting those practices.

Recommendation

Having pointed out the important place of environmental sanitation and health in development, it also identified an important place for environmental health in Nations development and recommended that environmental health officers should be engaged to play their role in this regard. This is particularly important if Ni-

geria intends to achieve its desired diversification of the economy, poverty reduction and wealth creation through sustainable development. The following recommendations are being made for the way forward:

1. Appropriate authorities both at the local, state and national level need to set national wide specific standards to improve the food safety practice by food establishments i.e. Federal Ministry of Environment, Health, Education, NOA and NGOs etc.
2. Partnership and collaboration are cornerstones of EHS. This study emphasizes on the need to involve a partnership between all relevant stakeholders. Working together in partnerships, we can prevent or reduce much of the burden of illness due to unsafe food. Partnerships bring together groups in mutual trust and understanding for the purpose of preventing foodborne disease.
3. Institutionalise environmental audit, including health and safety surveillance in most bukateria and promote capacity building in the field of impact analysis.
4. That the bukateria complexes in Iju town should be more routinely visited and inspected by the Department of Environmental Health services from the Local Government Headquarters to monitor the level of food hygiene and their Environmental effects. Also, document, disseminate and encourage the use of indigenous knowledge in food protection.
5. To improve environmental assessments during foodborne outbreak events, the local environmental health services in collaboration with federal, state and industry stakeholders to develop a training course on how to conduct these assessments. This training should be based on the experience of partners in the environmental health specialists.
6. Regular and Informative Food vendors' training programme should be adopted by the necessary health authority and food handlers must make effort for self-learning and update. Also implement innovative public food safety education programmes.
7. Enhance the provision of occupational health and safety services and no person should be allowed to cook (handle) food in the bukateria without being screened medically.
8. An acceptable method of sewage disposal should be provided at the bukateria lacking it.
9. The current method of refuse disposal in the bukateria complexes is no longer adequate due to unhygienic practice of open waste dump burning.

10. Effective sanitation and hygiene programmes need to combine interventions to change behaviour with the selection of the right technology. Changing behaviour requires culturally sensitive and appropriate health education.

Authors Contribution

Raimi Morufu Olalekan, Odipe Oluwaseun Emmanuel and Abdulraheem Aishat Funmilayo: Initiated the research, wrote the research proposal, conducted the research, did data entry and analysis and wrote the manuscript.

Nimisingha Deinkuro Sancher, Okolos Patainnocent Edewor, Habeeb Modupe Lateefat and Mary Fadeyibi: Involved in the write up of methodology of proposal and research work. All authors approved the manuscript.

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