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Hygiene, Food Safety Practices and Sanitation in Some Food Service Centres in Zaria, Kaduna State, Nigeria

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Abstract The aim of this research was to study the level of knowledge of hygiene, food safety and sanitation in some food service centres in Zaria. Questionnaires were used to collect information on personal characteristics of food handlers, hygiene and food handling techniques. As well as food safety practices and sanitation of food centres. Out of 90 respondents, 53(58.9%) were less than 30 years, 53(58.9%) were males, 37(41.1%) females and 83(84.4%) had formal education and exhibited good hygiene behaviour. There were significant differences ($p<0.05$) among the three categories of food service centres in hygiene practices. Moreover, meticulous hand washing was not observed in any of the food centres. This study also revealed the poor sanitary measures taken in the sanitation of food preparation and handling areas. Most of the food handlers did not know that disinfectants were used for reducing bacteria to a safe level. Water for washing raw materials and cleaning utensils were not adequate in "bukas" as they were in restaurants and cafeterias. There were also potential health risks associated with methods used by food handlers to test adequacy of cooking by touching foods with bare hands.

Keywords: *food service centres, food handlers, hygiene, food safety, sanitation*

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1. Introduction

Food service centre refers to a place where foods are prepared, served and eaten at the facility or taken away to be eaten elsewhere. It includes institutional facilities, catering operations and restaurants [1]. In Nigeria, like other developing countries, food service operations are means of income generation for highly and lowly educated individuals, especially women and their families. Most of such foods are prepared daily from a variety of ingredients to suit both local and continental taste and demand. Food service establishments provide an essential service to people of all walks of life by selling complete ready to eat meals, refreshing drinks and snacks to them. However, such practices as frequent handling of food with bare hands, addition of contaminated raw ingredients, use of contaminated water and preparation of foods in a polluted environment can expose food to contamination with pathogens which could result in health hazards [2]. Although there are less food surveillance activities in Nigeria, some research studies have shown presence of food-borne pathogens and high microbial load in some street foods [2,3]. There has been minimal research into food safety and food handling practices in food service establishments in Nigeria, however, similar studies have been conducted in the United Kingdom and United States of America [4,5].

2. Materials and Methods

2.1. Questionnaire Interview of Food Handlers and Consumers

The questionnaires were designed to obtain information on hygiene practices, food-safety practices, sanitation in food preparation areas, waste disposal practices, sanitary facilities in food service centres and food-handlers personal hygiene practices. Additionally, information on knowledge of diarrhoea and food-poisoning were obtained. Other information collected include, whether or not food-handlers were aware of proper food preparation procedures, right cooking methods, correct food-handling methods after cooking and sources of food contamination. The study area was divided into three zones namely: Samaru-Hanwa Zone, Sabongari-Congo and Zaria City-Wusasa zone. The questionnaires were used to collect information from 45 food-service centres from the three zones. For each zone, a total of fifteen centres were visited comprising of five "bukas", five cafeterias and five restaurants. The selection of food-service centres for the study was based on consent given by the proprietors

of the food-service centres. The Tukey's test, a multiple comparison test obtained under the ONE-WAY Analysis of Variance menu of the SPSS Statistical Package was used for analysing the data at the 0.05 level of significance.

3. Results

3.1. Hygiene and Food Safety Practices and Knowledge of Diarrhoea

A total of 45 food centres comprising (15 restaurants, 15 cafeterias and 15 "bukas") in Zaria were visited and each centre was presented with questionnaires. Questionnaire for food hygiene, safety and sanitation practices in food service centres in Zaria was filled based on the researcher's observation of various hygiene, food safety practices and sanitation of the food centres. There were significant differences ($p < 0.05$) among the three categories of food service facilities in hygiene practices. About 14 (93.3%) of restaurants had adequate water for cleaning utensils. However, all 15 cafeterias had adequate water for cleaning utensils while only 7(46.7) of "bukas" had adequate water for cleaning utensils this is shown in Table 1. Water for washing raw materials and cleaning utensils were not adequate in "bukas" as they were in restaurants and cafeterias Table 1. Refrigeration facility was available in only two out of the fifteen "bukas" visited while the availability of this facility was similar in restaurants and cafeterias. Diarrhoea was defined by 72 (80%) respondents as the passage of more than three liquid stools in a day. Additionally, 18 (20%) associated diarrhoea with mucoid stools, Table 2. A total of 84 respondents (93.3 %) believed that diarrhoea was caused by germs while 6 (6.7%) associated diarrhoea with chemicals in food and water, Table 2. Similarly, 84 (93.3%) of respondents agree that diarrhoeal pathogens were transmitted through dirty food and water while 6 (6.7%) did not agree. A total of 78 (86.7%) associated transmission of diarrhoeal pathogens with dirty hands and 74 (82.2%) with dirty utensils while 12(13.3%) and 16 (17.8%) did not associate transmission of diarrhoeal pathogens with dirty hands or utensils respectively, Table 2.

3.2. Personal Characteristics of Food Handlers

Table 3 shows responses to questionnaire on personal characteristics and hygiene of food handlers, 53(58.9%) of the respondents were less than 30 years indicating the active participation of youths in food preparation and handling in these centres, while 9 (10.0%) were above 50 years. A total of 7(7.8%) of the respondents had no formal education. However, 44(97.8%) of the food handlers exhibited good hygiene behaviour as they were dressed in clean cloth, 33(73.3%) wore hair cover and 41(91.1%) kept cut nails. Frequent hand washing was not observed in any of the centres. Table 4 indicates foods prepared by some food service centres studied in Zaria with identified sources of potential contamination.

Table 1. Food hygiene, safety and sanitation practices in some food service centres in Zaria

Parameters	Frequencies		
Hygiene practices	**R (n= 15)**	**C (n= 15)**	**B (n= 15)**
Clean water is provided for drinking	15(100.0)a	15(100.0)a	15(100.0)a
Water for washing raw material is adequate	14 (93.3)	15 (100.0)	9 (60.0)
Water for cleaning utensils for consumers and equipment is adequate	14 (93.3)	15(100.0)	7 (46.7)
Hand washing facility is adequate	15 (100.0)	15 (100.0)	15 (100.0)
Facilities for holding ready to eat food are adequate	15 (100.0)	15 (100.0)	15(100.0)
Food safety practices			
Refrigeration facility available	15 (100.0)	12 (80.0)	2 (13.3)
Holding cooked food exposed to flies, dust, insects, rodents etc.	0	0	0
Holding food covered	15 (100.0)	15(100.0)	15(100.0)
Holding food at ground level	0	0	0
Food is cooked well in advance of consumption	15 (100.0)	15 (100.0)	15 (100.)
Food is served with spoon/fork	15(100.0)	15(100.0)	15(100.0)
Sanitation in food preparation area			
Food area is swept daily	15 (100.0)	15 (100.0)	15 (100.0)
Food area is clean with soap and water	15 (100.0)	15 (100.0)	5 (33.3)
Food area is rarely clean	0	0	2 (13.3)
Waste disposal practices			
Waste water disposal is adequate	15 (100.0)	14 (93.3)	0
Garbage/refuse disposal is adequate	15 (100.0)	13 (86.7)	13(86.7)
General cleanliness of vicinity adequate	15 (100.0)	13(86.7)	11(73.3)
Evidence of sewage in vicinity	0	0	2(13.3)
Evidence of human waste in vicinity	0	0	1(6.7)
Evidence of animals/animal waste in vicinity	0	0	3(20)
Evidence of flies in vicinity	15 (100.0)	15 (100.0)	15 (100.0)
Numbers of workers	6-25	8-20	2-4

a = Figures in brackets represent percentages.

Table 2. Knowledge of causes of diarrhoea and sources of contamination of food by germs in some food service centres in Zaria

Parameter	Response (n=90)	
Definition of diarrhoea		
Passage of more than three liquid stools in a day	72 (80.0)a	
Passage of mucoid stools	18 (20.0)	
Transmission of diarrhoeal pathogens		
Dirty food	84 (93.3)	
Dirty water	84 (93.3)	
Dirty hand	78 (86.7)	
Dirty utensils	74 (82.2)	
Cause of diarrhoea		
Chemicals in water	6 (6.7)	
Germs	84 (93.3)	
Contamination of food is detected through		
Smell of food	17 (18. 9)	
Sight of food	8 (8. 9)	
Taste of food	65 (72.2)	
Germs multiply in food		
Kept at room temperature	86 (95.6)	
Kept at refrigeration temperature	4 (4 .4)	
Sources of contamination of food by food poisoning germs		
	Yes	No
Raw food materials	68 (75.6)	22 (24.4)
Food ingredients	65(72.2)	25 (27.8)
Dirty water	84 (93.3)	6 (6.7)
Dirty utensils	80 (88.9)	10 (11.1)
Dirty equipment	74(82.2)	16 (17.8)
Human hands	82 (91.1)	8 (8. 9)
Dirty environment	81 (90.0)	9 (10.0)
Dust	53 (58.9)	37 (41.1)
Packaging with paper/leaves	83 (92.2)	7(7.8)
Sewage in food vicinity	80 (88.9)	10 (11.1)
Garbage/ refuse dump in vicinity	84 (93.3)	6 (6.7)
Presence of rodents in vicinity	82 (91. 1)	8 (8. 9)
Human waste in food vicinity	84 (90.0)	6 (6.7)
Toilet/Urinary in close proximity to food area	81(90.0)	9 (10.0)
Dirty habit of food handlers	84 (93.3)	6 (6.7)

a = Figures in brackets represent percentages.

Table 3. Personal characteristics and personal hygiene of respondents in some food service centres in Zaria, Nigeria

Parameter	Frequency (n = 90)
Age (years)	
30-39	15 (16.7)a
40-49	13 (14.4)
>50	9 (10.0)
SEX	
Female	37 (41.1)
Male	53 (58.9)
Educational attainment	
Primary School	6 (6.7)
Secondary School	24 (26.7)
Post Secondary School	44.(48.9)
Arabic School	9 (10.0)
No Education	7 (7.8)
Personal hygiene of food handlers	(n = 45)
Dressed in clean cloth	44 (97.8)
Wore hair cover	33 (73.3)
Wore covering/Apron on personal cloth	8 (17.8)
Keeps cut nails	41 (91.1)
Appears sickly	1 (2.2)
Frequent hand washing habit	0 (0.00)
Has dirty habit(s)	1(2.2)

a = Figures in brackets represent percentages.

Table 4. Some of the foods prepared by some food service centres studied in Zaria with identified sources of potential contamination

Food	Ingredients for Food preparation	Cooking method	Handling after Cooking	Sources of contamination
Moimoi	Beans, pepper, onions, spices, oil, chillies	Steaming	Placed in warmers	-Polythene bags -Fork used in removing moimoi from bag
Jollof rice	Rice, chillies, onions, oil, meat, peppers, tomatoes and spice	Boiling Frying	Scooped into food warmers	-Serving spoon - Talking
Pounded Yam	Yam and water	Boiling	-Pounding -Wrapping	-Mortar and pestle -Dipping pestle in cold water -Polythene bags
Vegetable soup	Egusi, spinach, chillies, onions, tomatoes, peppers, palm oil, and spices	Frying boiling	Scooped into serving pots	-Vegetables -Not reheating
Fried rice	Rice, oil, onion, spices, carrots, peas	Boiling Frying	Transferred into warmers	- Serving spoon - Talking
Semovita	Semovita flour and water	Boiling	- Wrapping	- Polythene bag - Scooping plate
Plantain/ Potato chips	Plantain, potatoes, oil	Frying	Placed on a colander	- Perforated spoon - Colander - Serving utensils
Tuwo Rice	Rice and water	Boiling	- Boiled rice mashed with wooden spoon - Tuwo moulded in polythene bags	- Use of dirty polythene bags - Dipping scooping plates at intervals in water - Moulding tuwo in a dirty calabash
Jollof Spaghetti	Spaghetti, spices, tomatoes, chillies, peppers, onions, maggi, oil meat, salt	Frying Boiling	Cooked Spaghetti is placed into food warmers using serving spoon	- Talking and sneezing while serving
Salad	Lettuce, salad cream, tomatoes, onions, carrots			- Allowed to stay long - Vegetables not adequately cleaned - use of bare hands in shredding
Pepper soup	Cowleg/head/tail or intestines, spices, tomatoes, chillies, peppers, onions, maggi, oil meat, salt	Boiling	Transferred to smaller pots	- Not reheating soups

4. Discussion

Poor personal hygiene behaviour of the food handlers was observed in this study, although 44(97.8%) were dressed in clean cloths, 33 (73.3%) wore hair covers, and 41(91.1%) kept short nails, frequent hand washing was not observed in any of the food service centres surveyed, therefore the food handlers lack the basic knowledge of the importance of hand washing during food preparation and handling. A hygienic hand washing for food handling purposes could be defined as requiring warm water, soap or detergent and scrubbing or rubbing action for at least 20 seconds. Washing without detergent or soap is generally regarded as ineffective in destroying microbes that could be present on hands [6,7]. Hand washing even with soap or detergent, for less than 20 seconds is also likely to be less effective hygiene activity [7,8]. Effective hand washing was therefore not practiced by a significant proportion of food handlers before or during food preparation. It could be reasonable to conclude therefore, that effective hand washing rarely occurs in food service centres.

Most food handlers wipe their hands with either their personal clothing or with unclean kitchen towels. This attitude could lead to cross-contamination of food with pathogens. In a previous study conducted by [8], 18.0% of 1,203 respondents answered that they do dry their hands on the same towel they use for drying dishes.

The rubbing of nose, adjusting head covers, blowing nose, scratching parts of the body or touching dirty clothing, sneezing, yawning and coughing and many other habitual actions could dramatically affect food safety. These dirty habits are very hard to control, but a conscious effort should be made to curtail them while in food processing or preparation area [9]. There is also potential health risks associated with methods used by food handlers to test the adequacy of cooking by touching foods with bare hands. Fingers are normally used to feel food stuffs and ingredients for texture and to ascertain the adequacy of manual grinding or pounding, and this has the potential to contribute to the microbial load of foods [2]. Although the time-temperature exposure during cooking was adequate to kill vegetative cells, the frequency of cross-contamination from hands of food handlers and utensils was high. The holding of cooked foods for prolonged periods (i.e. several hours) after preparation and at temperatures of 27 to 40°C is a hazard. It is unacceptable by most public health standards because it is a contributing factor to occurrence of food-borne disease.

Poor sanitary handling of foods is identified as a major contribution to contamination in this study and other studies [3,7]. Sanitation comes from the Latin word santas meaning "health", in food plants and food services situation, sanitation means wholesome food, handled in a hygienic environment by healthy food handlers in a way that the food stays safe [9]. This study revealed the poor sanitary measures used in the sanitation of food preparation and handling areas. The practice of daily sweeping was observed in the food service centres but adequate scrubbing and mopping of floors and working surfaces was lacking especially in the cafeterias and “bukas”, disinfectants were not used in cleaning. Most of the food handlers did not know that disinfectants were used for reducing bacteria to a safe level. It is therefore likely that the entire environment could contain high number of microbiological contaminants. The lack of facilities for waste water drainage and garbage disposal in

the 15 “bukas” surveyed encourages waste to be thrown into nearby streets and gutters. Such areas act as habitats for rodents, breeding place for flies and media for growth of microorganisms. Ready-to-eat foods sold in unsanitary locations are susceptible to contamination by flies and pathogenic micro-organisms. The correlation between houseflies and diarrhoeal diseases has been documented [2,3,10]. The evidence of flies in cooking and serving vicinities of the studied food centres were visible.

Responses of the questionnaire on knowledge of diarrhoea and food poisoning demonstrated that the respondents were aware of the frequency of stools an individual should pass in a day before it is attributed to diarrhoea (84%), they also had the knowledge of diarrhoea being transmitted through dirty food and water, and germs are the primary cause of diarrhoea. In a similar study carried out in Ghana by [10], a higher percentage (94%) of respondents associated diarrhoea with the passage of three or more stools per day. But it is of public health concern to note that 70% of the respondents in this study were not aware that food poisoning bacteria could be present in food that look, smell and taste normal. This result clearly indicates that the majority of the respondents did not understand that organoleptic assessment of food was insufficient to identify food contaminated by pathogenic bacteria. Only 78(86.7%) out of the 90 respondents associated diarrhoeal transmission with dirty hands and 82.2% associated diarrhoeal transmission with dirty utensils, while 13.3% and 17.8% did not associate transmission of diarrhoeal pathogens with dirty hands and utensils respectively. In a similar study by [10] out of the 177 street vendors interviewed, none was aware that dirty hands were a risk factor for diarrhoea. A total of 18.6% out of 1,203 respondents in a national Australian food safety telephone survey failed to recognise that washing hands before handling or preparing food was an important food hygiene activity [8]. Only 6(6.7%) out of the ninety respondents in this study associated diarrhoea with chemicals. It is generally impossible by visual inspection to tell whether food is contaminated or not. It should be remembered also that most food-poisoning bacteria cause symptoms only when eaten in large number after multiplying in food, they do not usually alter the appearance, taste or smell of food. In a survey on knowledge, attitude and responses of a rural Nigerian community in Anambra State to outbreaks of cholera by [11] revealed that in spite of the people's knowledge of the causes and health consequences of cholera infection this did not translate into proper attitude and practice of appropriate hygienic and clean environmental behaviour. Behaviour related to personal and environmental hygiene in food preparation and handling facilitate occurrence and severity of food poisoning outbreaks [12].

5. Conclusion

This research finding indicates the need for stricter implementation of food sanitation code and the licensing of food service centres by appropriate food agencies such as the National Agency for Food and Drug Administration and Control (NAFDAC). Public health authorities also need to intensify efforts to monitor conditions of hygiene, food safety and sanitation in these establishments.

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