Factors Contributing to Unsafe Food Processing and Preservation among Food Handlers in Port Harcourt, Nigeria

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Authors’ contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Unsafe food processing and preservation among food handlers has been one of the common causes of food and waterborne diseases. This study aimed to identify factors contributing to unsafe food processing and preservation practices among food handlers in Obio-Akpor LGA of Rivers state.

Materials and Methods: The study was a descriptive cross-sectional study which assessed 365 food handlers in Obio/Akpor Local Government Area of Port Harcourt, Nigeria. A semi-structured questionnaire was used to collect relevant data. Quantitative data was presented as frequencies and percentages. All statistical tests were set at a significance level of p< 0.05.

Results: Findings show that out of the 365 food handlers who participated in the study, only 43.0% had a set of standard practice guidelines. 47.4% of the food handlers practiced unsafe food processing and preservation methods. Duration of practice for more than 5 years (63.6% vs. 36.4%; p=0.04) and scale of business (large/small) (turnover>NGN50,000.00) (58.4%, vs. 10.4%, p=0.05) were significantly associated with unsafe food processing and preservation practices as handlers who have been in the food business longer and those with larger scale food outlets tended to have better standards.

Conclusion: Unsafe food processing practices exist among food handlers with nearly half of the food handlers studied having poor practices. Inadequate working experience and the presence of

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more small and medium scale businesses was found to be the factors affecting unsafe food processing and preservation practices in our locality.

Keywords: Food safety; food service; food borne diseases; good practices.

1. INTRODUCTION

Food is the most essential of the three basic physiological needs of all human beings according to the Maslow’s hierarchy of needs [1]. Food is a necessary requirement for the sustenance of life. Six principles guide the food system (plant or animal) from production to consumption. These are that the food is safe, authentic and nutritive. Others are that the food should be produced by sustainable systems, the highest ethical standards are employed and need to have respect and consideration to our physical, biological and the social environment [2]. In order to achieve all that have been outlined in the principles, wholesome food processing and preservation are central to these objectives.

According to Food and Agricultural Organization (FAO) [3], the most basic level of food processing is preservation. In prehistoric ages, when the ancient man realized food was essential for his sustenance and survival, his earliest action was harnessing nature to preserve his food such that in temperate climate, the froze seal meat on the ice while those in the tropics dried food in the sun [4]. He later worked out other basic methods such as fermenting, preserving with salt, roasting, smoking, steaming, and sand oven baking. Salt preservation was particularly common for foods that constituted diets that warriors and sailors depended on since they were usually apart from the society for long stretches of time [5].

Primary food processing is aimed at making raw materials edible, such as milling wheat into flour, while secondary food processing turns the ingredients into familiar foods, such as wheat flour into bread, cake. Tertiary food processing is the commercial production of what is commonly called convenience or processed food. These are ready-to-eat or heat-and-serve foods, such as pasta, candy, soft drinks, canned products like soups and meat [6].

Food processing has enormous benefits which include; preservation, removal of non-edible part, making marketing and distribution easier. In addition, processing increases yearly availability of many food items, enables transportation of delicate perishable foods across long distances and makes many kinds of foods safe to eat by delaying spoilage and de-activating pathogenic micro-organisms [7].

Any deviation from ethical practices during processing and preservation could produce unwholesome foods which pose serious concerns over the health and safety of the practitioners and consumers [8].

Unsafe food processing and preservation among food handlers has been one of the basic causes of food borne diseases and infections [9]. These unsafe activities have been noted to transverse the whole supply chain of food industry from agricultural raw materials (plant and animal) to retailed street foods [10]. The safety of food is an integral part of food safety and is the protection of food from microbial, chemical and physical hazards that may occur during all stages of food production. Food safety thus gives the “assurance that food will not cause harm to the consumer when it is prepared or eaten and should meet the initial intention” [11].

Factors like globalization, rapid urbanization and population growth, increase in the working-class population, especially among women, have led to a significant increase in the growth of food service outlets and street foods. In order to meet up with demand, what is often noted is a resort to poor food handling, poor storage, unsanitary environment, poor personal hygiene practices, lack of good water supply and improper waste disposal. These are some of the identified factors associated with unwholesome food processing and preservation [12,13].

According to some reports, unsafe food causes 600 million cases of food borne disease and 420,000 deaths worldwide, resulting in the loss of 33 million healthy life years (DALYS) with the number said to be likely an under estimation. In Nigeria, Ezirigwe and colleagues reported that more than 200,000 persons die of food related illness leaving the cost of food borne disease in Nigeria at 3.6 billion dollars per annum. Hygiene of food handlers, food processing methods,
improper preservation practices are possible sources for food borne diseases [14].

Obio/Akpor is not only the second richest local government in Nigeria but a very fast developing urban area, hence urbanization and its accompanying increase in demand for street foods will lead to an increase in unwholesome food processing and resultant food borne disease outbreaks. Against this background, it is imperative to identify factors affecting unsafe food processing and preservation practices among food handlers in Obio/Akpor LGA of Rivers state.

2. MATERIALS AND METHODS

2.1 Study Design

A descriptive cross sectional study was employed for this study.

2.2 Study Area

The study was carried out in Obio/Akpor local Government Area of Rivers state. This LGA is in the metropolis of Port Harcourt, one of the major centers for economic activity in Nigeria. Obio/Akpor is one of the 8 local government areas that form the Rivers East senatorial district. It consists of 17 electoral wards administered by the Obio/Akpor Local Government Council. The indigenes are Ikwere’s, but due to its urban status, it also comprises of people from various tribes of Nigeria and other nationalities.

2.3 Study Population

The study population comprised 365 food handlers in Obio/Akpor LGA of Rivers state.

2.4 Sample Size Determination

The sample size was determined using the formula for descriptive studies [15].

\[ n = \frac{Z_{1-\alpha/2}^2 \cdot P \cdot (1-P)}{d^2} \]

\[ P = \text{the prevalence of poor food safety practices in a study conducted in South-western Nigeria [9].} \]

A minimum sample size of 365 was calculated.

2.5 Sampling Procedure

Multistage sampling method was used in the selection of the wards for the study in the local government. A total of 4 wards were selected and two (2) communities were randomly selected from each of the 4 wards, making a total number of eight (8) communities selected for the study. Systematic sampling procedure was adopted in the recruitment of all food handlers from the nearest point till the minimum sample size of 46 was reached for each community.

2.6 Method of Data Collection

2.6.1 Quantitative study

A semi-structured questionnaire and an observational checklist were used to capture socio-demographic data, Food Processing / Preservation practices, methods used by respondents in compliance to the standards of serving food and other variables related to the study objectives.

2.7 Prevalence of Unsafe Food Processing and Preservation Practice Score

In measuring prevalence of unsafe food processing and preservation practices, twenty-six (26) responses on the questionnaire were scored, with (1) having safe food processing and preservation practices and (0) having unsafe food processing and preservation. The scores were summed for the 365 respondents. Participants having safe food processing and preservation practices were scored (14-26) and those with unsafe food processing and preservation practices were scored (0-13).

2.8 Data Analysis

Data from the questionnaires were extracted, coded and entered into Microsoft excel version 2010 and imported into the Statistical Package for social sciences (SPSS) version 22 for data analysis. Categorical data was presented in frequencies and percentages, while continuous data was presented in means and standard deviations. Inferential Statistics was done using Chi-square (\( X^2 \)) test. A p-value ≤ 0.05 was considered statistically significant.

3. RESULTS

The age group 30-39 had the highest number of food handlers (150/365). Also, there were more females (74.5%). Christianity was the dominant
religion of the handlers (92.0%). More food handlers were married individuals (59.4%). Also, most of the food handlers were secondary school leavers (46.0%). Most of the food handlers (79.2%) had been in the food handling business for less than 10 years. Small and medium scale businesses were practiced by the majority of the food handlers (25.7% and 61.4% respectively) whereas only about 12.9% had a large-scale business.

Table 1. Socio-demographic characteristics of the respondents

| Variables                  | Frequency (n=365) | Percentage (%) |
|----------------------------|------------------|----------------|
| Age                        |                  |                |
| 20-29                      | 120              | 32.9           |
| 30-39                      | 150              | 41.1           |
| 40-49                      | 77               | 21.1           |
| 50-59                      | 18               | 4.9            |
| **Mean**                   | **34.6 ± 8.14**  |                |
| Sex                        |                  |                |
| Male                       | 93               | 25.5           |
| Female                     | 272              | 74.5           |
| Tribe                      |                  |                |
| Igbo                       | 108              | 29.6           |
| Ikwerre                    | 72               | 19.7           |
| Yoruba                     | 54               | 14.8           |
| Hausa                      | 14               | 3.8            |
| Others                     | 117              | 32.1           |
| Marital Status             |                  |                |
| Married                    | 217              | 59.4           |
| Single                     | 138              | 37.8           |
| Widowed                    | 5                | 1.4            |
| Divorced                   | 5                | 1.4            |
| Educational Level          |                  |                |
| None                       | 17               | 4.7            |
| Primary                    | 32               | 8.8            |
| Secondary                  | 168              | 46.0           |
| Tertiary                   | 148              | 40.5           |
| Religion                   |                  |                |
| Christianity               | 336              | 92.0           |
| Islam                      | 28               | 7.7            |
| Others                     | 1                | 0.3            |
| Total                      |                  |                |
| Duration of work as a food handler (years) |            |                |
| 1-3                        | 131              | 35.9           |
| 4-6                        | 90               | 24.7           |
| 7-9                        | 68               | 18.6           |
| ≥10                        | 76               | 20.8           |
| **Mean**                   | **6.12 ± 4.40**  |                |
| Types of food handled (n=1548) (Multiple response) |            |                |
| Grains                     | 330              | 21.3           |
| Fried foods                | 323              | 20.9           |
| Fruits & Vegetables        | 317              | 20.5           |
| Meat/Fish                  | 297              | 19.2           |
| Beverages                  | 281              | 18.1           |
| Type of business           |                  |                |
| Small Scale                | 94               | 25.7           |
| Medium Scale               | 224              | 61.4           |
| Large Scale                | 47               | 12.9           |
Table 2 shows that majority of the food handlers undergo food safety training (72.6%), whereas only 43.0% has a set standard of practice guidelines. Thawing of foods below the room temperature was practiced always by 20.0% of the respondents. 68.2% wash their hands before handling food whereas only 45.2% always cook food as quickly as possible once it is taken out from the refrigerator. About 40.3% of food handlers prepare salad on request, 64.4% practices the reuse of cooking oil while 21.4% use dark coloured oil (always 11.0% and sometimes 10.4%). The majority of the handlers use additives to make cooking faster and avoid spoilage during food processing (always 11.0% and sometimes 49.9%). Prevalence of Unwholesome Food Processing and preservation practices score revealed that 47.4% of food handlers were associated with unsafe food processing practices.

Table 2. Food processing/preservation practices of the respondents

| Variables | Frequency (n=365) | Percentage (%) |
|-----------|------------------|----------------|
| Have a set standard of practice guide | | |
| Yes       | 157              | 43.0           |
| Undergo regular food hygiene safety training | | |
| Yes       | 265              | 72.6           |
| How often do you buy food ingredients | | |
| Daily     | 112              | 30.7           |
| Weekly    | 227              | 62.2           |
| Monthly   | 26               | 7.1            |
| What you look out for during food purchase (n=845) | | |
| (Multiple response) | | |
| Wholeness | 330              | 39.0           |
| Freshness | 315              | 37.3           |
| Quantity  | 200              | 23.7           |
| Thaw frozen food to a temperature below the room temperature | | |
| Always    | 73               | 20.0           |
| Sometimes | 189              | 51.8           |
| Never     | 103              | 28.2           |
| Re use of cooking oil | | |
| Always    | 87               | 23.8           |
| Sometimes | 148              | 40.6           |
| Never     | 130              | 35.6           |
| Use of dark coloured oil | | |
| Always    | 40               | 11.0           |
| Sometimes | 38               | 10.4           |
| Never     | 287              | 78.6           |
| Use food additives to make food cook faster, avoid spoilage during processing | | |
| Always    | 40               | 10.9           |
| Sometimes | 182              | 49.9           |
| Never     | 143              | 39.2           |
Table 3 revealed that more than half (63.6%) of the respondents always reheat as well as serve food at the right temperature. Less than half (38.9%) sometimes use kitchen utensil for tasting while 23.0% always minimize bare hand contact with already cooked food. Majority (69.0%) of respondents practice good personal hygiene (bathing before going to work, keep fingers short and clean). More than half of the food handlers (57.5) do not use scoop and tongs for food service. About 63% of food handlers never minimizes bare hand contact with cooked foods.

Table 4 showed the food storage practices of the respondents. Only 19.5% of the respondents always take food out of the original package and store in tightly covered containers which is protective and easy to clean. About 17.3% always keep chemicals away from food items while 30.9% of the food handlers allow food thaw on table tops. The majority use insecticides (33.4%) to get rid of pests as well as other methods whereas cleaning up was the least method mentioned for getting rid of pests (2.1%).
Table 3. Adherence to the standards of serving food

| Variables                                              | F(n=365) | Percentage (%) |
|--------------------------------------------------------|----------|----------------|
| **Serving food at the right temperature (Reheating)**  |          |                |
| Always                                                 | 232      | 63.6           |
| Sometimes                                              | 129      | 35.3           |
| Never                                                  | 4        | 1.1            |
| **Change to clothing known to food service**            |          |                |
| Always                                                 | 161      | 44.1           |
| Sometimes                                              | 183      | 50.1           |
| Never                                                  | 21       | 5.8            |
| **Use of kitchen utensil for tasting**                 |          |                |
| Always                                                 | 101      | 27.7           |
| Sometimes                                              | 142      | 38.9           |
| Never                                                  | 122      | 33.4           |
| **Minimizing bare hand contact with already cooked food** |          |                |
| Always                                                 | 84       | 23.0           |
| Sometimes                                              | 51       | 14.0           |
| Never                                                  | 230      | 63.0           |
| **Use of scoops and tongs**                            |          |                |
| Always                                                 | 101      | 27.7           |
| Sometimes                                              | 54       | 14.8           |
| Never                                                  | 210      | 57.5           |
| **Practicing good personal hygiene. Bathing before going to work, fingers kept short and clean** | | |
| Always                                                 | 252      | 69.0           |
| Sometimes                                              | 38       | 10.4           |
| Never                                                  | 75       | 20.6           |

Table 4. Food Storage technique practiced by the respondents

| Variables                                                                                     | Frequency (n=365) | Percentage (%) |
|-----------------------------------------------------------------------------------------------|------------------|----------------|
| **Take food out of the original package store in tightly covered containers which is protective and easy to clean** |                  |                |
| Always                                                                                       | 71               | 19.5           |
| Sometimes                                                                                    | 178              | 48.9           |
| Never                                                                                       | 115              | 31.6           |
| **Store chemical products away from food items**                                             |                  |                |
| Always                                                                                       | 63               | 17.3           |
| Sometimes                                                                                    | 60               | 16.4           |
| Never                                                                                       | 242              | 66.3           |
| **Store foods at the right temperature.**                                                    |                  |                |
| Always                                                                                       | 257              | 70.4           |
| Sometimes                                                                                    | 88               | 24.1           |
| Never                                                                                       | 20               | 5.5            |
| **How you thaw foods brought out of the freezer (n=920) (Multiple response)**                |                  |                |
| Running water                                                                                | 289              | 31.4           |
| Left on the surface to defrost                                                               | 285              | 30.9           |
| In the refrigerator                                                                          | 191              | 20.8           |
| Microwave                                                                                    | 155              | 16.9           |
| **Where prepared food is kept (n=600) (Multiple response)**                                  |                  |                |
| Food warmer                                                                                  | 232              | 38.7           |
| In a plastic container                                                                       | 152              | 25.3           |
| In the freezer                                                                               | 108              | 18.0           |
| Left in the pot                                                                             | 108              | 18.0           |
Table 5 shows that no statistically significant association was observed between age, sex, marital status, educational status, income of the respondents and unwholesome food processing and preservation practices (p>0.05). Statistically significant association was observed between the duration of work as a food handler and unwholesome food processing and preservation practices, as respondents with 5 years or less work experience had a statistically significantly higher proportion for having unwholesome food processing and preservation practices than those that have worked for greater than 5 years (63.6% vs. 36.4%; p=0.04). Similar observation was also recorded between scale of business and unwholesome food processing and preservation practices, as respondents who have either small or medium scale businesses had a statistically significantly higher proportion for having unwholesome food processing and preservation practices than those with large scale businesses (58.4% small scale, 31.2% medium and 10.4% large).

Table 5. Association between Socio-demographic characteristics, and Unsafe Food Processing and preservation practices

| Variables                              | Unwholesome Food Processing and preservation practices | Total | Df | \( \chi^2 \) (p-value) |
|----------------------------------------|-------------------------------------------------------|-------|----|-------------------------|
|                                        | Present (n=173)                                      | Absent (n=192) |     |                          |
| Age                                    |                                                      |       |    |                         |
| >30                                    | 99 (57.2)                                            | 127 (66.2) | 226 (61.9) | 1 | 2.70 (0.100) |
| ≤30                                    | 74 (42.8)                                            | 65 (33.8)  | 139 (38.1) |  |                |
| Sex                                    |                                                      |       |    |                         |
| Male                                   | 45 (26.0)                                            | 48 (25.0)  | 93 (25.5)  | 1 | 0.01 (0.919) |
| Female                                 | 128 (74.0)                                           | 144 (75.0) | 272 (74.5) |  |                |
| Marital Status                         |                                                      |       |    |                         |
| Married (in union)                     | 99 (57.2)                                            | 118 (61.5) | 217 (59.5) | 1 | 0.512 (0.474) |
| Single (not in union)                  | 74 (42.8)                                            | 74 (38.5)  | 148 (40.5) |  |                |
| Educational Status                     |                                                      |       |    |                         |
| ≤Secondary                             | 110 (63.6)                                           | 107 (55.7) | 217 (59.5) | 1 | 2.01 (0.156) |
| Tertiary                               | 63 (36.4)                                            | 85 (44.3)  | 148 (40.5) |  |                |
| Daily turnover (₦)                     |                                                      |       |    |                         |
| ≤300000                                | 109 (63.0)                                           | 116 (60.4) | 225 (61.6) | 1 | 0.16 (0.612) |
| >300000                                | 64 (37.0)                                            | 76 (39.6)  | 140 (38.4) |  |                |
| Duration of work as a food handler (years) |                                                  |       |    |                         |
| ≤ 5                                    | 110 (63.6)                                           | 101 (52.6) | 211 (57.8) | 1 | 4.05 (0.04)* |
| > 5                                    | 63 (36.4)                                            | 91 (47.4)  | 154 (42.2) |  |                |
| Scale of business                      |                                                      |       |    |                         |
| Small Scale                            | 54 (31.2)                                            | 40 (20.8)  | 94 (25.7)  | 1 | 5.85 (0.05)* |
| Medium Scale                           | 101 (58.4)                                           | 123 (64.1) | 224 (61.4) |  |                |
| Large Scale                            | 18 (10.4)                                            | 29 (15.1)  | 47 (12.9)  |  |                |
4. DISCUSSION

The socio-demographic characteristics, showed that majority of the food handlers were within the age 40 years and below, signifying that food handling is essentially a business run largely by the youth. Females were the predominant food handlers in food handling business in the study area which is in accordance with the prevailing standards and trend that cooking is a feminine business. These compare well with a study by Ituma et al. [16] on the food hygiene knowledge, practice and safety training intervention among food handlers in Abakiliki Nigeria, where 76.5% of the food handlers were female, but disagreed with Kasturwar and Shafee [17] who reported that 62.7% of food handlers in a study at apirative medical college were males. This difference might be due to different cultural settings where males work more than females. The majority of the food handlers practiced small and medium scale businesses with only about less than ten percent earning a daily turnover of fifty thousand naira (NGN50,000) and above. This is consistent with the study carried out among food handlers in Ijebu Ode, South-West Nigeria by Adebukola et al. [9] in their report, 84.50% of the food handlers had turnover below thirty thousand naira (NGN30,000).

4.1 Food Handling Practices

Unwholesome food handling practices have been identified as the leading cause of food borne diseases with food handlers as the culprit [18]. In this present study, nearly half of the food handlers had unwholesome food processing practice. This study is similar to the report of Azanaw et al. [19], Galgamuwa et al. [20], Adebukola et al. [9] Anuradha & Dandekar [21] who reported about 49.0%, 40.5%, 31.5%, and 43.8% respectively for poor food safety practices. Likewise, Otu and colleagues [22] recorded a prevalence of 23.0%. On the contrary, Fasoro et al. [23], Legesse et al. [24] and Derso et al. [25] noted a good food handling prevalence of 80.60%, 67.4% and 67.6% respectively in their own studies. These variations in prevalence rates might be due to differences in study locations, vision and mission of outlets and scale of food business. The prevalence level from the current study suggests that more efforts still need to be put in place to ensure better practices among food handlers. In the current study, despite a majority of food handlers undergoing regular food safety training, only less than half had a set standard of practice guideline. This simply means that knowledge does not necessarily translate into adequate good food handling practice [9,26,27,28]. Findings from the study showed that only few food handlers thaw their food at a temperature below the room temperature whereas a majority leave foods to thaw on the surface. Studies had shown incorrect food thawing practices demonstrated by both consumers and food handlers [28,29,30]. Over reuse of cooking oil exposes unsaturated fatty acids in the oil to thermal oxidation and these leads to an increase in the amount of trans fatty acids in the oil [31,32] which has been shown to be detrimental to the health of the consumers. Findings in this study reported that more than half of food handlers reuse cooking oil, with some using the oil even when it is dark in color. More than half of the respondents made use of chemical as food additives that included potash, drugs, sodas and detergent, sugar to cook food faster, avoid spoilage during processing and improve palatability. Some of these additives pose a major risk to the consumers as a study conducted in Abakiliki, Nigeria by Ibiama et al. [33] showed a reduction in the nutritional quality of eggs cooked with additives and thus should be discouraged, while a study by Iweka [34], revealed that potash altered the liver function as well as physical activity of the Wister Rats. Thus its consumption should be restricted and better sources of potassium like Banana should be consumed. Inetianbor et al. [35] advocated consumption of foods in their fresh natural state to avoid health consequences of food additives. From this study, it was observed that nearly half of the food outlets studied had open doors and windows. These encourage the activities of vectors and rodents - birds, flies, cockroaches, rats/mice and ants. They carry micro-organisms and deposit on food. Control of Pests, disease vectors and rodents are crucial anywhere food is handled [36]. Nearly half of the food outlets studied had no portable water and as such relied on water vendors or use of buckets and gallons to fetch and store water. The absence of portable running water explains reason why a good number of the food handlers in our study practice hand washing in bowls. Lack of toilet facilities is said to be one of the obstacles to food safety in Nigeria [37]. From the current study, nearly half of the food handling outlets had no toilet facility for customers, thus leading to passage of waste around the surroundings which in turn attracts presence of insects and rodents. The study recorded a high percentage of food handlers keeping chemical substances with food that can result in cross-contamination against instructions.
by FAO/WHO food handlers guide [36], likewise, it was reported that some of the handlers used chemicals to quicken food ripening, prevent pestson stored food products and use to hasten food fermentation and cooking. Studies had revealed that these chemicals can be detrimental to health as it causes various health hazards like headache, dizziness, mood disturbances, mental confusion, seizures and even cancer [38,39,40].

4.2 Factors Affecting Unsafe Food Processing and Preservation Practices

The study showed no statistically significant association between socio-demographic characteristics and unwholesome food processing and preservation (p>0.05). The result of the study was related to the study by Okojie [41] and Ncube et al. [42] which recorded no statistical association between sex, educational status and hygiene practices, among food handlers (p=0.624 and p=0.362 respectively). Iluma et al. [16] also recorded no significant difference in the food safety practices of food handlers based on the level of education. These findings showed that unsafe food processing practices was not determined by the sex, age, or educational status of the food handlers. Whereas a study by Adebukola et al. [9] in another part of Nigeria, showed a significant relationship between educational qualification and the practices of food handlers (p=0.0011). Likewise, Faremi et al. [30], attributed the high level of good practice of food handlers to their high educational attainment.

Afoloranmi et al. [43] found the age of vendors to be related to their food safety and hygiene practices. There was a significant association between the duration of work as a food handler and unsafe food processing practice as practitioners that have worked for more than five years tended to have better practices. This finding was in tandem with the saying that “practice makes perfect”. These findings corroborate the findings by Nee and Sani [44], they reported a statistically significant relationship between food handlers’ food safety practices and their duration of work experience. On the contrary, Ncube et al. [42] and Abdul-Mutalib et al. [29] reported a non-significant correlation (p>0.05) between food handling work experience and all other variables relating to food handling. The presence of a low level of working experience as food handlers may increase the risk of food contamination as well as wrong food handling practices. The current study also showed a statistically significance association between scale of business and unsafe food processing and preservation practices, as small and medium scale business had a statistically significant association with unsafe preservation practices. They were associated with unsafe food practices. This can be attributed to the possibility of larger food outlets (large scale businesses) having more resources capabilities and knowledge to provide more standard operation and training for their employees. The current study tallies with a study by Mamoun et al. [45], which showed the highest food handling practices were among large scale businesses. On the contrary Adebukola et al. [9], recorded no significant relationship between the scale of business and food safety practices (p=0.654).

Azanaw et al. [19], reported food safety training, marital status, supervision by health professionals and knowledge as statistically associated variables with food safety practices. Their study agrees with the current study as themajority of the food handlers in their study had regular food safety training, but still exhibit other some practices. This may be attributed to irregular supervision by health professionals found in the present study. Regular supervision by health professionals can awaken safety consciousness among food handlers, as no one would want to be caught unawares.

5. CONCLUSION

Unsafe food processing practices exist among food handlers with nearly half of the food handlers studied having poor practices. Inadequate working experience and the presence of more small and medium scale businesses was found to be the factors affecting unsafe food processing and preservation practices in Obio-Akpor. There is need therefore for continuous training of food handlers on standard practices. Regulatory units should also increase the monitoring, supervisory and enforcement activities.

ETHICAL APPROVAL AND CONSENT

Written ethical clearance was obtained from the University of Port Harcourt Research Ethics Committee (UNIPORT REC) with an approval number (UPH/CEREMAD/REC/MM68/022). Written informed consent was obtained from all participants after informing them of the purpose of the research.
COMPETING INTERESTS

Authors have declared that no competing interests exist.

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