

Food safety and health: a survey of rural and urban household consumer practices, knowledge to food safety and food related illnesses in ogun state.

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ABSTRACT

Background: Consumers' knowledge on food safety and the related practices play a central role in reducing foodborne diseases, which represent significant concerns to public health.

Objectives: This is a preliminary study to evaluate rural and urban household consumers knowledge of food safety and related practices in Ogun state, Nigeria. Similarly, awareness of foodborne illnesses, and the association between the respondents' demographic characteristics and food safety knowledge were investigated.

Methods: A cross-sectional study, which involved a questionnaire based interview of 120 volunteers from rural and urban areas in four different local government (LGA) in Ogun State, Nigeria was conducted.

Results: Overall, eighteen (15.8%, 95% CI, 10.0 – 23.7) male, and ninety-six (82.2%, 95% CI, 76.3 – 89.9) female within the age range 16 – 60 years took part in the study. Our data showed poor knowledge regarding food safety practices, and awareness of foodborne illnesses among the rural and urban consumers surveyed. The level of awareness of foodborne illnesses and associated complications between rural and urban household consumers was significant ($p < 0.05$). There was an association between respondent's marital status and knowledge of food safety and practices ($p < 0.001$).

Conclusion: Poor consumer knowledge of food safety, and food related illnesses were reported, informing the urgent need to improve on food safety education such as food handling, preparation, storage and general hygiene practices in Nigerian homes.

Key words: Household Consumers, Knowledge, Food Safety, Foodborne Illnesses, Ogun State, Nigeria

INTRODUCTION

Food safety is a combination of conditions and measures that are necessary during food production and

preparation [1]. The World Health Organization (WHO) reported up to 30% of the population in developed countries suffer from foodborne diseases each year. Meanwhile, the incidence in developing countries is

unknown. This can be associated with the lack of official foodborne disease surveillance and monitoring systems, and inadequate specialized or reference laboratories and facilities [1]. In Nigeria, an alarming 200,000 people has been known to die from food poisoning every year due to improper food handling practices, lack of hygiene, and inappropriate food storage conditions [2, 3], but this could be higher. Hence, food safety is fundamental to consumers, the food industry and economy [4].

Most cases of foodborne infections are preventable if food protection guidelines are understood and followed from the production to consumption phase. Past studies have shown that consumers have inadequate knowledge of the measures needed to prevent foodborne illnesses in the home [5]. Several factors identified as the likely causes of foodborne illnesses in homes include contaminated raw food supplies, poor food handling and preparations, and the consumption of raw or undercooked foods [6]. The focus has been on educating consumers on all aspects of food safety and the hazards of improper practices and handling have been heavily emphasized [5-8]. For instance, in developed countries, the need for enhanced food safety education has led to the launch of national initiatives dedicated to efficiently educating consumers, especially in food preparation [8].

This study is a preliminary survey, which assessed household consumers' knowledge on food safety and related practices in both urban and rural areas of Ogun state, Nigeria. Consumers level of awareness to food-related illnesses was

also evaluated. Information gathered from this study would serve as baseline data on consumers' knowledge of food safety in Ogun state. This could consequently enhance future research in consumer welfare and food safety, development of operational policies and educational programs especially for household consumers in the studied area.

METHODS

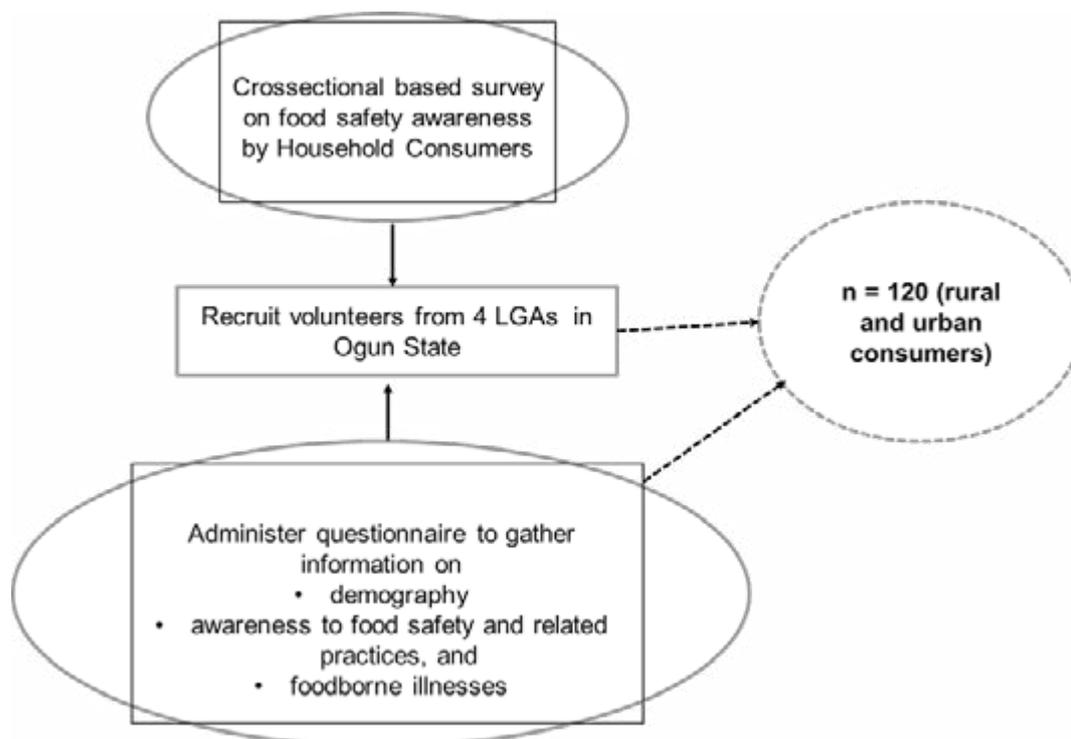
Study location

Ogun State is located in the Southwestern zone of Nigeria with a total land area of 16,409.26 square kilometers. Ogun state is situated between latitude 6.20°N and 7.80°N, and longitude 3.00°E and 5.00°E. The state has four geopolitical zones namely Egba, Yewa, Ijebu, and Remo, within which there are 20 LGAs.

Research design

A cross-sectional study with the administration of a structured household consumer questionnaire was performed. A simple random sampling was performed to select a local government area each from the four geopolitical zones in Ogun state. Briefly, local government areas in each geopolitical zones were assigned numbers 1-N, mixed, and one picked from each category. This

FIGURE 1. Flowchart of study design to investigate the household consumer knowledge of food safety practices and awareness of foodborne illnesses in Ogun State, Nigeria.



method was adopted to ensure each unit of the local government had an equal chance of selection. From each LGA, one urban and rural area were conveniently selected, and 120 volunteers with consent to participate were enrolled for the study.

Data collection

The study data was collected through a structured household consumer questionnaire. The questionnaire contained 37 various itemized questions, which were all closed questions. Previous to field administration of questionnaire, reliability of data collection tool was measured by Cronbach's alpha (reliability ≥ 0.7). The questionnaire was pre-tested on 20 randomly selected household consumers from another Southwestern state in Nigeria. The participants recruited for pre-testing were not included in the final survey. The pre-test resulted in some modifications that were necessary to improve the wording and administration time. The final questionnaire was divided into three sections:

1. a demographic section (7 questions);
2. awareness of foodborne illnesses and associated questions (10 questions) and
3. knowledge of food safety practices (20 issues)

The survey tool was administered to 120 respondents who willingly volunteered after the concept and aims of the study were explained (Figure 1). Being a pilot study, and due to financial limitations, a small sample size of 120 volunteers were conveniently recruited for the study. Household consumers particularly those within age group 16 and above, usually involved with food handling or preparations were targeted for this study. A total of sixty-one rural and fifty-nine urban household volunteers were finally enrolled, this may not be a representation of the household consumer population in Ogun State. Non-educated rural consumers were assisted with filling in questionnaire (by interpreting questions for clearer understanding). Questionnaire administration was conducted during the weekdays.

Data analysis

Descriptive and univariate statistics were carried out by SPSS 15.0 software (Statistical Package for Social Science, Inc. Chicago III, USA) and Graphpad Prism 7.03. Analysis of variance was used to examine the mean difference between rural and urban consumer levels of awareness to food related illnesses. Pearson chi-square test was conducted to determine the association of consumers' demographic parameters with knowledge of food safety. The frequency distribution of urban and rural consumers responses to knowledge on food safety and practices were likewise compared. In all analysis, differences were statistically significant at $p \leq 0.05$.

RESULTS

Demographic profile of respondents

Table 1 shows the demographics of the 120 respondents in relation to gender, marital status, age group, education, religion, and income per month. The demographic data of respondents' showed the majority of participants were within age group 23-42 years (55.8%, 95% CI, 46.9 – 64.4), married (47.5%, 95% CI, 38.8 – 56.4), and unemployed (49.1%, 95% CI, 37.1 – 61.4). The ratio of female participants to male (5:1) indicated that women are particularly responsible for food preparation or handling in Nigerian homes. Respondents' income per month were re-categorized using international poverty line of USD 2.00 per day. 29% (95% CI, 20.9 – 38.9) respondents were below the poverty line (<http://www.worldbank.org>), a higher proportion of whom were rural household dwellers 22 (22.9%, 95% CI, 15.6 – 32.3).

TABLE 1. Demographic profile of household consumers investigated in Ogun State, Nigeria.

Household consumer characteristics	Proportion (%)
Gender (114) ^a	
Male	18(15.8)
Female	96(84.2)
Age group (120) ^a	
16-22	22(18.4)
23-42	67(55.8)
43-60	12(10)
>60	19(15.8)
Marital status (120) ^a	
Married	57(47.5)
Single	47(39.2)
Separated /Divorced	3(2.5)
Widowed	4(3.3)
Others	9(7.5)
Education (120) ^a	
None	1(0.8)
Primary school	10(8.3)
Secondary school	9(7.5)
NCE	34(28.3)
Tertiary	58(48.3)
Others	8(6.8)
Religion (120) ^a	
Christian	80(66.7)
Muslim	34(28.3)
Traditionalist	1(0.8)
Others	4(4.2)
Employment status (61) ^a	
Employed (Private/public sectors)	18(29.5)
Self – Employed	13(21.3)
Unemployed	30(49.2)
Income in Naira/Dollar (96) ^{a, b}	
< 10,000 (<50.18 dollars)	28(29.1)
> 20,000 (>100.37 dollars)	68(71.9)

^a the number of participants that responded to questions. ^b International poverty line of US\$2.00 per day (average poverty line for developing countries, 2011).

Awareness of Foodborne illnesses and associated problems

The study revealed that over 90% of rural and urban respondents indicated they were aware that stomachache and diarrhoea were associated with foodborne infections. Urban (95%) and rural respondents (73.7%) believed foodborne illnesses might also be accompanied by vomiting, nausea and loss of body fluids. Overall, 95 (95% CI, 89.3 - 97.9) and 84.2% (95% CI, 76.5 - 89.7) household consumers indicated foodborne illnesses were associated with stomach ache, diarrhoea, vomiting, nausea, and loss of body fluids respectively (n = 120). Moreover, 50.8% and 93.2% rural and urban consumers respectively showed foodborne illness are majorly caused by faeco- oral transmission (hand to mouth). Furthermore, when asked if they were aware that hand washing could prevent foodborne illnesses, 55.7%, (95% CI, 43.3 - 67.5) and 84.7% (95% CI, 73.3 - 92.0) rural and urban respondents respectively indicated this was true. Overall, 70% (95% CI, 60.9 - 78.0) were aware handwashing plays a vital role in preventing hand to mouth transmission of foodborne infections (n=120). Majority, 71.7% (95%

CI, 63.0 to 79.0) of total respondents (n= 120) indicated foodborne illnesses could be fatal if not promptly treated. Data outcome showed a difference in the mean awareness score on foodborne illness between urban and rural household consumers (p <0.001).

Knowledge on food safety and practices

Table 2 presents answers given by rural and urban household consumers to the questions about food safety knowledge. A higher number of rural consumers 31(50.8%, 95% CI, 39.3 - 63.8) than urban household consumers 21(35.6%, 95% CI, 0.2457 - 48.4), recommended that expired food items should not be consumed (p=.026). In total, a high number of participants (80%, 95% CI, 71.2 - 86.3) indicated checking food for expiry dates or labeling may not have a significant impact on household health. Likewise, a significant number of rural household consumers believed source of water for food preparation was crucial (p = 0.018). Less than 40% respondents (n=120) reported swollen food can indicate food spoilage with a significant correct responses observed from rural consumers

TABLE 2. Distribution of answers given by surveyed respondents to questions relating to knowledge on food safety and practices.

S/N	Statements	Rural n (%)	Urban n (%)	Total n (%)	P-value
1	Do you think checking food items for labels and expiry date do not have significant impact health?	19(31.2)	5(8.5)	24(20)	* 0.026
2	Do you recommend expired food items be consumed even after thorough cooking?	31(50.8)	21(35.6)	52(43.3)	0.101
3	Swollen cans do not indicate food spoilage	32(52.5)	13(22.0)	45(37.5)	*0.007
4	Food consumed at restaurant / social gathering may result to food poisoning	43(70.5)	45(76.3)	88(73.3)	0.539
5	It is always advisable to check the constituent of canned food before purchase	56(91.8)	57(96.6)	113(94.2)	0.440
6	There is no need separating raw foods from cooked/ready to eat food	18(29.5)	11(18.6)	29(25.2)	0.202
7	Is it advisable to use the same utensils for both raw and cooked food?	43(70.5)	52(88.1)	95(79.2)	*0.024
8	It is always necessary to clean up utensils immediately after use.	56(91.8)	57(96.6)	113(94.2)	0.439
9	Hand-washing practices do not necessarily prevent infection.	23(37.7)	16(27.1)	39(32.5)	0.173
10	Do you think the source of water used in food preparation is not important	25(41.0)	12(20.3)	37(30.8)	*0.018
11	Unpasteurized milk or cheese (wara) are nutritious and promote good health	14(23.0)	17(28.8)	31(25.8)	0.534
12	Does consumption of raw eggs, milk predispose to diseases?	32(52.5)	21(35.6)	53(44.2)	0.069
13	Do you thaw frozen foods at room temperature?	26(42.6)	18(30.5)	44(36.7)	0.189
14	Is it advisable to eat food immediately after preparation?	46(75.4)	46(78.0)	92(76.7)	0.830
15	Do you think the longer your food stays before consumption, the better?	36(59.0)	52(88.1)	88(73.3)	*0.001
16	Do you think a thoroughly cooked food is not as nutritious as a half-cooked food?	23(37.7)	44(74.6)	38(31.7)	*0.001
17	Do color changes determine if your meat has been properly cooked?	52(85.2)	44(74.6)	96(80.0)	0.174
18	Do you think reheating leftover food before consumption is not necessary?	20(32.8)	9(15.3)	29(24.2)	*0.033
19	Thawing frozen foods using a refrigerator / microwave / portable running water is not ideal.	28(45.9)	20(33.9)	48(60.0)	0.197
20	Do you think diarrhea may not be a symptom of foodborne illness?	22(36.1)	17(28.8)	39(32.5)	0.440

(26.6%; $p=0.007$). A small number of rural, 18(29.5%, 95% CI, 19.5 – 41.9%) and urban consumers 11(18.6%, 95% CI, 10.5 – 30.5), indicated the need to separate raw food items from cooked/ready to eat food. 43(70.5%, 95% CI, 58.5 – 80.5) and 52(88.1%, 95% CI, 77.2 – 94.4) rural and urban consumers respectively knew it was not advisable to use the same utensils for raw and cooked food. For consumption of raw milk or eggs, 32(52.5%, 95% CI, 39.5 – 63.6) and 21(35.6%, 95% CI, 24.6 – 48.4) rural and urban consumers, agreed this practice could predispose to foodborne illnesses. Also, 36(59.0%, 95% CI,) rural and 52(88.1%, 95% CI, 77.2 – 94.4) urban consumers do not believe leaving food for a longer time before consumption was best. The result outcome indicated a significant number of rural consumers 20(32.8%, 95% CI, 22.3 – 45.3) than urban 9(15.3%, 95% CI, 8.0 – 26.7) pointed out the need for leftover food to be properly reheated before consumption ($p=0.033$). In total, more than 70% of respondents agreed it was advisable to eat food immediately after preparation. Respondents demographic parameter such as marital status was found to be associated with level of consumers' food safety knowledge ($p<0.001$). No associations were found with age ($p=0.907$), religion ($p=0.762$) and gender ($p=0.162$).

DISCUSSION

The WHO report shows that over 30-40% of foodborne illness cases result from the home and is still progressively increasing [9]. Food safety has since emerged as an important factor to prevent infections acquired from food consumption. In Nigeria, several studies have assessed food safety knowledge and practices in food handlers especially food vendors [10-13]. The need to carry out a baseline study, which examines household consumers' awareness to foodborne illnesses and knowledge on food safety and associated practices is crucial to developing educational and health programs for Nigerian homes. Food safety programs should target especially the group of people involved with food handling and preparations, who form a whole part of the public [14]. Our findings in this study corroborate other studies, which showed female were most likely to handle food preparations at home [4,8,15]. In most African countries including Nigeria, women's first traditional roles are to the household (which includes cooking, home keeping) and childcare duties. This study interestingly revealed no association between gender and food safety knowledge, which agreed with studies by Badrie et al. 2006 [1]. On the contrary, there have been reports, which have shown an association in the favour of women than men [16] and vice versa [2,8]. In addition, present study reported the majority of respondents investigated lived below the expected international poverty baseline, and from the rural areas. People living in rural societies have been associated with

low income, unemployment, little or no formal education and extreme poverty [17,18].

Consumers are often not aware of foodborne illnesses affecting their health [8]. However, in this study; most respondents could identify a foodborne infection and associated signs or complications such as diarrhoea, stomachache, vomiting, loss of body fluids, nausea and even death. This result indicates that respondents must have had previous experiences with gastroenteritis associated with contaminated food consumptions. A higher proportion of respondents, especially urban consumers were aware of the role handwashing plays in preventing foodborne illnesses. Averagely, rural consumers are informed that foodborne infections may occur via hand to mouth transmission. Recent research in the UK has re-emphasized the importance of hand washing to help reduce the risks of infections, both gastrointestinal and respiratory [10]. The WHO 1989 noted that hands are the most important vehicle for the transmission of organisms [19]. Pathogens such as *Salmonella*, *Campylobacter*, and *E. coli* O157: H7 can survive on fingertips for varying periods and in some cases even after hand washing. The low level of awareness by rural consumers to pathogen transmission mechanism (i.e hand to mouth), especially as relates to foodborne infections shows the need to develop programmes targeted at this group. Such programmes should provide guidelines which are practicable and easy to understand information on food pathogens, associated illnesses, and mechanisms of transmission. Likewise, provision of adequate hand wash facilities at homes and in public places could help promote good hand hygiene practices in rural settings as well as urban. For instance, during recent Ebola virus outbreak in Africa (2014), a national emergency handwashing campaign through the use of several media especially television, and provision of handwashing facilities in all schools, government and private establishment was launched in Nigeria [20]. This health education intervention strategies recorded a high improvement and change in handwashing practices and attitudes amongst Nigerians. Similar strategies can be employed to educate Nigerians about food safety practices and foodborne infections, and promote healthy and hygienic living.

Besides, knowledge on food safety and associated practices is still low among both rural and urban consumers in the study area. For instance, over 80% of participants did not know that safety practices such as checking expiry dates or labels on food might affect their health. In Nigeria, the National Agency for Food Drug Administration and Control (NAFDAC) are responsible for ensuring standards in food quality and safety in terms of products and processing standards. The role of NAFDAC also includes populace food safety education and restraining the sale of foods, which are unhygienically prepared, adulterated, contaminated, spoilt, and improperly labeled [19]. The primary problems encountered by this agency have been through the importation of food near to spoilage, and

expiration dates, fake and deceitful labelling and non – indication of production dates, and batch numbers [21] . The agency over the years has strived to educate Nigerian populace on the risks associated with food adulterations. However, the need for enforcement of the NAFDAC food quality control policies/regulations should be strengthened for both local food companies and importations [20].

The knowledge gap on food safety among consumers was observed especially with food handling and storage. About 44% of respondents, believed foods can be thawed at room temperature. This result is comparable with those from other studies, which reported respondents thawing food at room temperature [1, 22]. Frozen foods thawed at room temperature or on the counter increases the possibility of bacterial contamination, growth, and food poisoning. Interestingly, higher respondents, most especially from rural areas (20%) indicated that left – overs should be reheated properly before consumption. Left – over foods not re – heated properly or cooked have been described as one of the key factors that contribute to food poisoning outbreaks in homes. Also encouraging, more rural food consumers believed the source of water for food consumption was crucial in food preparations. The correct responses from rural consumers observed may be attributed to effectiveness of community educational programmes or campaigns targeted at rural rather than Urban communities. Some of these programmes are likely to be sponsored by UNICEF and Wateraid. Educational intervention programmes such as these or action plans should also target urban communities.

In conclusion, our findings still support the need to develop educational intervention programs or campaigns on safe food handling practices, which should target both household categories and aim at reducing foodborne diseases in all communities in Nigeria.

CONCLUSION

This study has shown that there is still a necessity for food safety education of household consumers to ensure a reduction in home-related foodborne outbreaks in Nigeria. Information in such a program should include proper food safety practices from purchase to consumption, be simple, workable, easily disseminated even to remote areas, and promote food standards.

Competing interests

The author(s) declare they have no competing interests.

Authors' contributions

AOO conceived and designed the study, acquired,

contributed to the analysis and interpretation of data, drafted and edited the manuscript. KO was involved in the study design, data acquisition, and analysis. AOO read the final manuscript draft before submission.

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