



Full Length Research Paper

Assessment of the hygienic practices and the incidence of enteric bacteria in food handlers in small businesses in an urban area in Abeokuta

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Abstract

One hundred and eighty one (181) food handlers working in 12 small food businesses in Abeokuta North Local Government were surveyed to assess their personal hygienic practices while handling food. The study also isolated and identified enteric bacteria from the stool samples of the food handlers. A cross sectional study was conducted among the food handlers using a pre-tested structured questionnaire. Of the 181 food handlers, 30.9% normally work with long fingernails, 77.4% wear jewelry and 39.5% chew gum while handling food. Also, 90.1% and 31.5% of the food handlers respectively does not wear gloves or apron when handling food. Few of the food handlers (14.3%) wash their hands at the commencement of each day's work; 19.3% wash hands after every visit to the toilet and 13.2% usually washed their hands each time they blow their nose or when hair, nose or mouth is touched. The enteric bacteria isolated from the food handlers and their frequency of occurrence are: *Eschericia coli* (17.7%); *Klebsiella oxytoca* (7.7%); *Salmonella spp* (5.5%); *Citrobacter freundii* (4.4%), *Enterobacter cloacae* (2.8%); *Pseudomonas aeruginosa* (8.3%) and *Proteus mirabilis* (4.4%). There is an immediate need for education and increasing awareness among food handlers regarding safe food handling practices.

Keywords: Food handlers, Hygiene, Practises, Enteric, Bacteria, incidence, small businesses.

INTRODUCTION

Increasing urbanization, industrialization and the increased population of cities leads to increased consumption of food in collective eating-places. This increases the importance of these places for public health. Food contamination may occur at any point during production, processing, distribution, and preparation (Green, 2005; Hennessy, 2004). The risk of food getting contaminated depends largely on the health status of the food handlers, their personal hygiene, knowledge and practice of food hygiene (Mead, 1999 and Collins, 2001). A study in the USA suggested that improper food handler practices contributed to approximately 97% of foodborne illnesses in foodservice establishments and homes (Howes *et al.*, 1996).

Foods handlers may cross-contaminate raw and

processed foodstuffs as well as inadequately cook and store foods (Cruickshank, 1990). Food handlers may be sources of organisms either during the course of gastrointestinal illness or during and after convalescence, when they no longer have symptoms. Several studies have indicated that various bacteria, amongst others *Staphylococcus aureus*, *Escherichia coli* and *Salmonella* sp., survive on hands and surfaces for hours or even days after initial contact with the microorganisms (Jiang and Doyle, 1999; Kusumaningrum *et al.*, 2002; Scott and BloomWeld, 1990). These microbiota have been associated with food-borne illness for decades and there is no doubt that they, together with members of amongst others the genera *Listeria*, *Campylobacter*, *Bacillus* and *Clostridium* are the cause of illness and even death to

many people each year, at immeasurable economic cost and human suffering (Borch and Arinder, 2002). It has been reported that is not only the ignorance of food hygiene that causes food poisoning, but also the lack of applying the acquired knowledge (Bryan, 1988; Ehiri and Morris, 1994). A major challenge in the food industry is to motivate food handlers to apply what they have learnt regarding food hygiene (Ehiri and Morris, 1994). Recruitment from lower socio-economic classes with low educational levels, rapid staff turnover, high level of seasonal staff literacy and language problems and poor motivation due to low pay and job status are some of the proposed reasons for the lack of applying the acquired knowledge especially in small food businesses (Travis, 1986; Burch and Sawyer, 1991; Oteri and Ekanem, 1992; Rennie, 1995; Taylor, 1996). When food poisoning outbreaks are investigated it has been established that small and medium sized businesses are often important locations in the transmission of foodborne illness (Walker *et al.*, 2003). This study was therefore aimed at assessing the personal and general hygienic practices of food handlers in small businesses in an urban area in Abeokuta. The study also screened the faecal samples of healthy food handlers within the study area.

MATERIALS AND METHODS

Study Area

The study area is Abeokuta North Local Government of Abeokuta, Ogun state. Abeokuta North is a Local Government Area in Ogun State, Nigeria. It has an area of 808 km² and a population of 201,329 at the 2006 census (Akinwale *et al.*, 2008). The inhabitants are petty traders, artisans, government and company workers.

Participating businesses

This survey was conducted for 6 months and it involves 200 food handlers working in 12 different small food businesses within the area of study. A food handler is any person who handles food, regardless of whether he actually prepares or serves it (Isara, 2009).

Study Design

A cross sectional study was conducted among the food handlers using a pre-tested structured questionnaire to collect data on age, sex, educational level, years of service, status of training, hygienic status, food safety knowledge and practises. The subjects were food vendors who satisfied the inclusion criteria and agreed to participate in the study. Those with fever, diarrhea headache, constipation or abdominal pains-symptoms of active enteric disease and those who refused consent were excluded from the study.

The study also screened the faecal samples of the healthy food handlers using stool culture method.

Ethical Consideration

Informed consent was sought and obtained before the analysis from the public environmental health office of the Abeokuta North Local Government and interested food handlers within the community. The identities of the participants involved in the study were kept anonymous.

Sample Collection

Stool specimen was collected from each food handler in sterile universal containers, kept on ice packs and transported to the laboratory within two hour of collection for laboratory analysis. All the samples were cultured on Mac Conkey Agar and Blood Agar and incubated at 37°C for 24 hours and the bacterial species were identified using standard procedures (Mackie and Mc Cartney, 2007).

Statistical analysis

All statistical analyses were conducted using SPSS for Windows (version 11.0, 2001, Chicago, IL). Statistical significance was set $p < 0.05$.

RESULTS

Out of the 200 total food handlers working in 12 small food establishments contacted, 181 food handlers (90.5%) participated in the study. Foods handlers assessed include those in food businesses around primary schools (4), hospital (2) and roadside sheds around different offices (6). These food businesses were typically small, with the average number of employees being less than 10.

Table 1 presents the socio-demographic characteristics of the surveyed food handlers. Result showed that 93% of the respondents are female while only 7% are male. Most (54.7%) of the respondent are in the 22-30 years age range and only 5% are above 40 years of age. On the level of education, many (33.7%) of the respondents had only primary school certificate while 16% had post secondary school certificates. Over half (52.5%) of the respondents are married; 13.2% are single with children and 26.0% are single without children. Majority (79%) of the food handlers works full time and 66.8% had over a year experience in food handling. Statistical analysis revealed no significant ($p \leq 0.05$) relationship between marital status, sex and the nature of business.

The training received by the food handlers on general and personal hygiene is presented in Table 2. Majority (71.3%, 75.1%) of the food handlers had received some

Table 1. Socioeconomic profile of the street food handler surveyed

Parameter	Frequency (f)	Percentage (%)
Sex		
Male	13	7.2
Female	168	92.8
Age range		
18-21	23	12.7
22-30	99	54.7
31-40	50	27.6
>40	09	5.0
Educational Qualification:		
Primary Six Leaving Certificate	61	33.7
Junior Secondary School Certificate	45	24.9
Senior Secondary School Certificate	46	25.4
Post Senior Secondary School Certificate	29	16.0
No formal education	0	0
Marital status		
Single (without children)	47	26.0
Married	95	52.5
Widowed	10	5.5
Divorced	05	2.8
Single with children	24	13.2
Are you a full time employee of this workplace?		
Yes	143	79.0
No	36	19.9
None	2	1.1
How long have you had experience in food handling?		
Less than 3 months	19	10.5
More than 6 months and 12 months	41	22.7
More than a year	121	66.8

Table 2. Training of food handlers on personal and general hygiene

Parameter	Frequency (f)	Percentage (%)
Received any form of formal training on personal hygiene?		
Yes	129	71.3
No	52	28.7
Received any formal training on general hygiene?		
Yes	136	75.1
No	45	24.9
Was training organized by work place?		
Yes	113	62.4
No	65	35.9
No answer	03	1.7

form of training on personal and general hygiene respectively. Most (62.4%) of the food handlers claimed that the training was organized by the work place; 39.5% had the training through personal efforts while 18% did not respond to the question at all. The food handling practices among the food handlers showed that 30.9% of the food handlers normally work with long fingernails, 55.3% normally wear dresses that are not moisture proof,

77.4% normally wear jewelry and 39.5% normally chew gum while handling food.

On the frequency of wearing apron and replacement of gloves, 31.5% never wear apron while handling food, 56.4% wear apron at least once in a day. Majority (90.1%) of the food handlers never wear gloves when handling food (Figure 1).

Table 3. Food handling practice among the food handlers

Parameter	Frequency (f)	Percentage (%)
A. Food handling		
Do you normally.....		
(a) Work with long finger nails		
Yes	56	30.9
No	125	69.1
(b) Wear dressings that are not moisture proof		
Yes	100	55.3
No	80	44.2
No answer	01	0.5
(c) Wear jewellery		
Yes	140	77.4
No	38	21.0
No answer	03	1.6
(d) Chew gum		
Yes	65	35.9
No	115	63.5
None of the above	01	0.6

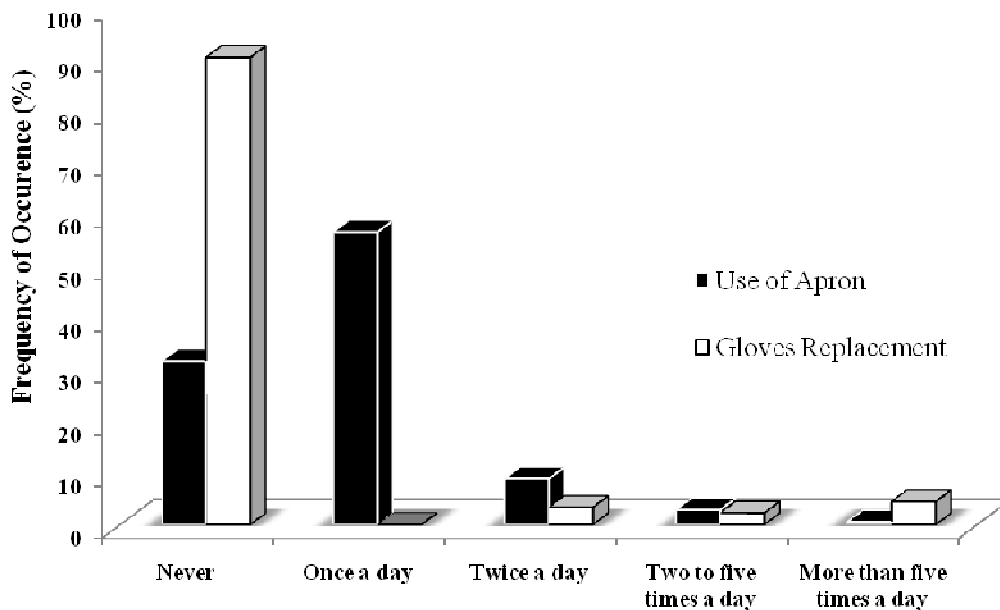


Figure 1. Food handlers' use of apron and replacement of gloves while handling food .

Table 4 shows food handlers practice with respect to illness in work place. Result shows that while 53.6% report illnesses to the management; 46.4% of food vendors never report any form of illness to the management. Result of the actions normally taken by the management when a staff is sick, 24.9% of the respondent claimed that management grant medical examination and sick leave when a staff is sick while

30.4% answered that no action is taken by management when a staff is sick. When there is an injury at the work place, 17.7% of the food handlers report to the management and 57.5% cover the injury with moisture proof material.

Table 5 shows the cleaning practices of the food vendors. Few (35.4%) of the food handlers cleaned the surfaces of their work area daily before the

Table 4. Food handler's practices with respect to illness in work place.

Parameter	Frequency (f)	Percentage (%)
Do you normally report any form illness to the management?		
Yes	84	46.4
No	97	53.6
What actions are normally taken by the Management?		
Medical examination and sick leave	45	24.9
Only sick leave	28	15.5
Only medical examination	09	5.0
No action taken by management	55	30.4
No answer	44	12.2
What actions do you normally take when there is an injury		
Report to management	32	17.7
Cover with moisture proof material	104	57.5
Others	44	24.3
No answer	01	0.5

Table 5. Cleaning practices of the Food handlers

Parameter	Frequency	Percentage (%)
How often do you normally clean the surface of your work bench / cooking place?		
Daily, before commencing work	64	35.4
Each time food is handled	15	8.3
Cleaned at every instance	98	54.1
Daily, after work is finished	04	2.2
What is the means of cleaning /washing?		
Cold water and detergent	173	95.5
Hot water and detergent	08	4.5

commencement of work while majority (54.1%) cleaned at every instance and only 2.2% clean daily at the end of work. Majority (95.5%) of the food handlers usually wash with cold water and detergent and only 4.5% wash with hot water and detergent.

Prevalence of pest and insect in the work place shows that 67.8% of the food vendors usually encounter rats in their work place seasonally, 7.7% encounters rats in their workplace daily and 17.7% never encounter rats in their work place. Majority (61.3%) of the food handlers never encounters flies in their work place, 22.7% encounter flies daily and 16% encounter flies seasonally. Only 16% of food handlers encounter cockroach in their workplace

while many of the food handlers (80.7%) encountered cockroach seasonally in their workplace (Table 6).

Table 7 shows the hand washing practices of the food handlers. Most (74%) of the facilities provided cold water only for hand washing by the food handlers, 12.4% provided both cold and hot water while 11.6% provided soap and air drier or disposable hand drying material for hand washing. On the frequency of hand washing, few of the food handlers (14.3%) wash their hands at the commencement of each day's work; only 19.3% wash hands after every visit to the toilet and 13.2% usually washed their hands each time they blow their nose or when hair, nose or mouth is touched. Most (94.5%) of

Table 6. Prevalence of pests and insects in the work place

Parameter	Frequency (f)	Percentage (%)
How often do you encounter rats in your work place		
Never	32	17.7
Daily	14	7.7
Weekly	11	6.1
Monthly	03	1.7
Seasonally	121	67.8
Rate at which flies is encountered		
Never	111	61.3
Daily	41	22.7
Seasonally	29	16.0
Rate at which cockroach is encountered		
Never	06	3.3
Daily	29	16.0
Seasonally	146	80.7

Table 7. Hand washing practices of the food handlers.

Parameter	Frequency	Percentage (%)
Hand washing facility provided at workplace:		
Cold water only	134	74.0
Cold and hot water	23	12.7
With soap and air drier or disposable hand drying material	21	11.6
None of the above	03	1.7
Frequency of washing the hand:		
At the beginning of each day's work	26	14.3
After every visit to the latrine or urinal	158	87.2
Every time nose is blown or hair, nose and mouth is touched	110	60.8
After handling raw foods	98	54.1
After smoking or on return to food premises	0	0.0
Methods of hand washing:		
Cold water, soap and a nail brush	171	94.5
Hot water ,soap and nail brush	09	5.0
Hot ,cold water and soap	01	0.5
Means of hand drying		
Use of disposable hand drying materials	51	28.2
Aprons/clothes	130	71.8

the food handlers normally wash hands with cold water and soap, 71.8% dry their hands with their aprons or clothes while only 28.2% use disposable drying materials.

The pattern of some symptoms of food borne illness among the food handlers show that 70.7% of the food handlers had suffered from diarrhea. Out of the 127 food handlers, 93.7% suffered occasionally from diarrhea while 6.3% suffered frequently from diarrhea. Many (65.8%) of the food handlers had never vomited in the last six months; some (26.5%) of the food handlers had

vomited twice in the last six months and 7.7% had vomited more than twice. About 37.6% and 33.0% of the food handlers had fever and cough respectively more than twice in the last 6 months. Some (47.5%) of the food handlers had cut or bruises two to five times in a year while 29.3% had experienced cuts and bruises more than 10 times in a year (Table 8).

Table 8 showed the types and prevalence of enteric bacteria in the stool samples of the food handlers. The isolates were identified as *Eschericia coli Pseudomonas*

Table 8. Pattern of some Symptoms of food borne illness among the food vendors

Parameter	Frequency	Percentage (%)
Have you ever suffered from diarrhoea?		
Yes	127	70.2
No	40	22.1
No answer	14	7.7
If yes, how often?		
Frequently	8	6.3
Occasionally	119	93.7
Number of times vomited in last 6 month		
Never	119	65.8
Twice	48	26.5
More than two times	14	7.7
Number of times you had fever in the last 6 month		
Never	95	52.5
Twice	68	37.6
More than two times	18	9.9
Occurrence of cough in the last 6 months		
Never	105	58.0
Twice	60	33.0
More than two times	16	8.8
Ever experienced cut or bruised hand?		
Never experienced cut or bruises	11	6.1
Once per year	31	17.1
Two to five times per year	86	47.5
More than ten times per year	53	29.3

Table 9. Frequency of occurrence of enteric isolates obtained from the food handlers

Isolates	Community	
	Frequency (n)	Percentage (%)
<i>Escherichia coli</i>	32	17.7
<i>Klebsiella oxytoca</i>	14	7.7
<i>Salmonella spp</i>	10	5.5
<i>Citrobacter freundii</i>	8	4.4
<i>Enterobacter cloacae</i>	5	2.8
<i>Pseudomonas aeruginosa</i>	15	8.4
<i>Proteus mirabilis</i>	8	4.4
None	89	49.1

aeruginosa, *Klebsiella oxytoca*, *Proteus mirabilis*, *Enterobacter cloacae*, *Salmonella spp* and *Citrobacter freundii*. Table 9 presents the frequency of the enteric bacteria. The percentage frequency of occurrence ranged from 29.3% for *Escherichia coli* to 3.8% for *Citrobacter freundii*.

Table 8 shows that 90.1 (50.9 %) of the food handlers tested positive for bacteria. The enteric bacteria and their frequency of occurrence are: *Escherichia coli* (17.7%);

Klebsiella oxytoca (7.7%); *Salmonella spp* (5.5%); *Citrobacter freundii* (4.4%), *Enterobacter cloacae* (2.8%); *Pseudomonas aeruginosa* (8.3%) and *Proteus mirabilis* (4.4%).

DISCUSSION

The small food businesses surveyed on average had less

than 10 employees, who were involved in all aspects of food production (i.e. cooking, preparation, serving and cleaning) and many of them had been working in the business for over one year.

This study showed that 92.8% of the food handlers are women. Food handlers working in food business in many countries are predominantly women. In a study by Santos *et al.*, (2008) about food handlers' knowledge in Portuguese school canteens, all (n = 124) except one of the participants were women.

Many of the food handlers surveyed had received some form of training on general and personal hygiene in food handling; the training was mostly organised by the work place. Training and education are essential to ensure that workers have the awareness and knowledge necessary to comply with food hygiene demands, although these do not always result in a positive change in food handling behaviour (Clayton *et al.*, 2002; Seaman and Eves, 2008). Periodic training on food hygiene is important to both keep the level of knowledge high by preventing the information from being forgotten and also to increase the level (Acikel *et al.*, 2008). Campbell *et al.* (1998) reviewed 15 studies on the subject of training food handlers and reported that while it is difficult to change habits, training still has a positive effect on increasing food safety.

Majority (90.1%) of the food handlers did not wear gloves when handling food while about 3.3% replace the gloves at least twice in a day. During a survey done of food handlers at the delicatessen sections of a major retail group in South Africa it was observed that food handlers wore protective clothing, including gloves, when customers were served (Van Tonder and Lues, 2004). However, no or very little documented evidence exists that food served by gloved hands is safer than food served by bare hands, which have been subjected to effective hand washing. When food personnel use gloves while serving food, they should realise that microorganisms adhere to the surfaces of gloves and thus, when not changed frequently, could be sources of cross-contamination similar to unwashed hands (Snyder, 1997). Hand-washing is often neglected or omitted when gloves are used and organisms on the hands could multiply rapidly inside the moist and warm environment of the gloves

It was observed that 31.5% of the respondents did not wear aprons, 30.9% normally work with long fingernails and 77.4% wear jewelry while working. Avoiding the use of adornments of any type is an essential measure in good practices of personal hygiene (Radiers, 2008).

Assessment of hand washing practices revealed that many of the food handlers do not wash hands at the commencement of the day's work, few wash hands after every visit to the toilet and after touching their hair, nose or mouth. Hand cleanliness is one of the most critical parts of a food producer's daily regimen (Zain and Naing, 2002). According to Dag (1996), the most common bad

habits of workers at mass-production food facilities were touching their mouth with their hands, using the same towel to clean many places and to wipe their hands on their face or clothes while working. The result in this study reflected that the food handlers lack awareness about food contamination with poor hygienic practices.

Over half (50.9 %) of the 181 food handlers sampled were positive for enteric bacteria. The enteric bacteria and their frequency of occurrence are: *Escherichia coli* (17.7%); *Klebsiella oxytoca* (7.7%); *Salmonella spp* (5.5%); *Citrobacter freundii* (4.4%), *Enterobacter cloacae* (2.8%); *Pseudomonas aeruginosa* (8.4%) and *Proteus mirabilis* (4.4%). The hygiene condition of the food establishment was challenged by the isolation of enteric bacteria like *Salmonella* from the stool cultures. During the acute stages of gastroenteritis large number of organisms are excreted and by the nature of the disease are likely to be widely dispersed; clearly, food handlers who are symptomatically ill may present a real hazard and should be excluded from work. Good hygiene, both personal and in food handling practices, is the basis for preventing the transmission of pathogens from food handling personnel to consumer (Bryan, 1988; Evans *et al.*, 1998).

In conclusion, the findings of this study demonstrated that food handlers in the food businesses surveyed do not practice good hygiene while working. In addition, the prevalence of enteric from stool specimens of the food-handlers was high in this study. An effective means of preventing the transmission of pathogens from food-handling personnel via food to consumers is strict adherence to good personal hygiene and to hygienic food-handling practices. It is recommended that education and continuous training in good-hygiene practices should be provided to all food-handling personnel.

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