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Sanitary Conditions and Food Handling Practices of Selected Restaurants: A Case Study of Bauchi Metropolis, Bauchi State, Northeastern Nigeria

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Abstract **Original Research Article**

The sanitary conditions of restaurants and food handling practices if not addressed with seriousness in accordance with international standard practices can be a means of transmitting food-borne infections or intoxications to the public. A study was carried out between December, 2017 and January, 2018 to assess the sanitary conditions, food handling practices of food handlers and the microbial quality of food contact surfaces of selected restaurants in Bauchi metropolis. A total of fourteen (14) restaurants were randomly selected, seven (7) registered with the appropriate authority while seven (7) not unregistered ones. One hundred (100) pre-tested structured questionnaires were equally administered to randomly selected staff of the restaurants. Thirty (30) swab samples of food contact surfaces (spoons and plates) were collected, packed on ice pack and transported to the National Veterinary Research Institute (NVRI) diagnostic laboratory, Bauchi office for analysis. Results of the study showed that majority of the food handlers (*n*=37; 75.5%) in the registered restaurants were aged 21–35 years, and (*n*=35; 71.4%) have attained tertiary education while majority (*n*=38; 77.5%) of the respondents have worked for 1–10 years. While in the non-registered restaurants majority of the food handlers (*n*=36; 73.5%) were aged 21–35 years, and (*n*=25; 51.0%) have attained tertiary education and (*n*=36; 73.5%) of the respondents have worked for 1–10 years. The sanitation and personnel hygiene of most restaurants were observed to be 100% effective with good toilet facilities available. It was also observed that 49.0% of the female workers covers their hairs, 83.7% wears gowns during operations while 59.2% trim their finger nails on weekly basis. Three bacterial organisms (*Escherichia coli*, *streptococcus* and *staphylococcus*) were isolated from the SSFCS with an overall 65% isolation rate. The study also indicated majority (73.4%) have undergone training on food hygiene and handling, and that a large number (89.8%) have heard of food borne diseases. The study showed no much difference in the isolation rate of microorganisms between spoons and plates as well as between registered and non-registered restaurants. And the Sanitary conditions of our restaurants must be improved by enforcing certain measures towards preventing the occurrence of food-borne diseases.

Keywords: Restaurants, food handlers, food-borne diseases.

INTRODUCTION

Food service establishments are sources of food borne illnesses and food handlers contribute to food borne illness outbreaks [1]. According to World Health Organization (WHO) [2], food handling personnel play important role in ensuring food safety throughout the chain of food production and storage [2]. The World Health Organization [2] identified several factors associated with food borne illness such as poor food safety knowledge, poor personal hygiene, cross-contamination as well as time and temperature abuse during storage and preparation of food by mobile food handlers [3].

Lack of basic infrastructure, lack of knowledge of hygiene, absence of potable water, lack of proper storage facility and unsuitable environments for food operations (such as proximity to sewers and garbage dumps) can contribute to poor microbial quality of foods. Inadequate facilities for garbage disposal poses further hazards [4].

As an integral part of its National Health Policy, Nigeria launched the National Policy on Food hygiene and Safety in 2000. Responsibilities for food safety and hygiene practice devolve on different tiers of government and their agencies—federal, state, and local. The control and regulation of street food vending, catering establishment, and the enforcement of food

hygiene and safety are, however, carried out at the local government level, where Health Officers enforce relevant sections of the Public Health Laws [5].

The socioeconomic role of the street food sector in terms of its potential for employment creation, yielding income particularly for women, and provision of food at affordable cost to lower income groups in the cities has been documented [6]. In Nigeria, urban city dwellers spend as much as half of their food expenditure on street foods [7]. Food borne illness is a serious and underreported public health problem with high health and financial costs. Worldwide, food borne diseases are a major health burden leading to high morbidity and mortality. The most common clinical symptoms of food borne illnesses are diarrhea, vomiting, abdominal cramps, headache and nausea [8]. This study therefore, was aimed at determining the sanitary and hygienic practices observed by food handlers and availability of water supply and toilet facilities in restaurants in Bauchi metropolis Bauchi state.

MATERIALS AND METHODS

The study was carried out in Bauchi metropolis; the study area was purposively divided into two (2) for ease of sampling and for an even distribution and unbiased sample collection. The swab samples and the questionnaires were collected and distributed according to the two divisions of the metropolis respectively, and at the same time equally shared among the two categories of the restaurants i.e. registered (7) and non-registered (7). A cross sectional study was carried out to determine the, hygiene practices of food handlers, knowledge on food borne diseases, availability of water supply and toilet facilities, sanitary conditions of the dining room and kitchens of restaurants in Bauchi metropolis. Food handlers working in the Bauchi metropolis restaurants were the target population of the study. Randomly selected food handlers working in the various restaurants of Bauchi metropolis were used. Food handlers who are engaged in food preparation and cleaning were in included. The restaurants were enrolled through a simple random selection technique after a list of all food establishments was obtained from the authorities concerned with their registrations.

Sample collection

Sixty (60) swab samples were aseptically collected using sterile swab sticks, inserted into normal saline and then transported to the NVRI laboratory in an ice pack cooler for analysis. Also one hundred (100) pre-tested structured questionnaires were administered to selected food handlers in the fourteen (14) restaurants. Assessment forms were filled for information on operations and facilities available at the restaurants.

Laboratory Procedure

Swab samples

The tubes containing the swabs were rocked to suspend the organisms; total plate counts were determined by dropping 0.1ml of the swab suspension onto a plate count Agar (Nutrient Agar) and spread uniformly with a sterile glass rod. The duplicate plates were allowed to solidify, inverted and incubated at 37^{o}C for 24hrs. Organisms grown on the plate agar were counted and the average of the two was recorded. Serial dilutions of the original diluents containing the swabs were made earlier on with a dilution factor of 10^{6} to reduce the high surface contamination.

Sub-culturing: positive sample were further sub-cultured into blood Agar, MacConkey Agar, nutrient agar and were further incubated at 37^{0}c for 24hours. The organisms (bacterial growths) were identified and recorded via turbidity.

Isolation and identification of microorganisms

The microorganisms were isolated by plating the swab suspension samples on media using a sterile loop, incubated for 24h at 37^{o}C. Colonies with clear appearance were considered positive and were counted based on their morphological appearance. The results obtained were expressed as bacterial CFU per centimeter square (CFU/cm^{2})

Data Analysis

The questionnaires were coded and entered into SPSS software for Windows, version 17 (SPSS, Chicago, IL, USA) which were used for data management and analysis. Chi-square (χ^{2}) statistics was used to determine relationship or otherwise between variables. Data was summarized and presented in tabular form using Microsoft Excel. Also enumeration of total aerobic count (TAC) was expressed as mean ±SD.

RESULTS AND DISCUSSION

The presence of the different bacterial organisms may be due to lack of adequate training on knowledge and standards of hygiene which in most instances determine the microbiological quality of food [9] can actually lead to the presence of microorganisms on the food contact surfaces which poses some danger to the consumers if not addressed. Therefore, as majority of respondents belongs to such age group (21 – 35 years) it will be an advantage since the workers may likely work hard and be matured in executing duties assigned to them as was mentioned [10] in a work carried out in Bahir Dar town that majority of the food handlers were found to be in the age range between 21 and 30 years

Female in most instances are considered to be more reliable and financially disciplines and are capable of carrying out their duties more efficient and diligently than their male counterparts. They may also be considered as a means of attracting customers to the restaurants in certain instance especially if they are friendly in attending to customers it was mentioned in a survey [10] carried out in Bahir Dar town of Ethiopia that majority of the food handlers were found to be females. Also another similar study [11] mentioned that in Africa, women are commonly involved in preparation and serving of food as they are taught how to cook from a young age. The study also highlighted the predominance of female food vendors (n=181; 90.2%), and mentioned that in Nigeria women are popularly involved in street food vending [12], as they depend on as a means of complementing family income in the midst of a harsh economy.

The attainment of tertiary education by majority of respondents will serve as an advantage as the respondents may probably be more enlightened and educated as such can be able to handle issues related to hygiene and sanitation more efficiently than those who have not attained such level of education contrary to report of an assessment carried out [13] where none of the 80 respondents working in the restaurants attained level of tertiary education out of all the individuals interviewed. However, the survey by [11] indicated slightly number of respondents (n=13; 4.5%) out of 286 interviewed have attained tertiary education which is a figure very low compared to this study.

The large number of single respondents from both registered and un-registered restaurants can be an advantage as they may not be much engaged and devoid of responsibilities such as family chaos. And as such large number of single respondents would therefore pay more attention in duties assigned to them than the married ones. Similar findings was reported [14] in a survey conducted to determine food safety knowledge and personal hygiene practices amongst mobile food handlers in Shah Alam, Selangor Malaysia which revealed that 65.5% of the respondents were single. This large number of respondents with 1 – 10 years working experience found in this research can be of advantage as they may be hard working in trying to put in their best towards building their career compared to those with 11 – 20 years. The result is similar to what has been reported [14] in their survey where a higher (n=225; 70.3%) of the workers were reported to have worked for 2 – 10 years.

Result of this research indicates many staff are washing their hands with water and disinfectant. This will help in maintaining sanitation and prevents the tendency of disease transmission from hands of food handlers. The knowledge of food-borne diseases indicated that whenever they come across with anything capable of causing food-borne disease can immediately alert the management of the restaurant for preventive measures. This is as a result of different findings that were reported on the risk factors for food borne diseases, which stated that most outbreaks result from improper food handling practices [15, 16] as well as unhygienic practices of food handler and less knowledge on food borne disease are among the causes of food borne infection and intoxication.

The knowledge of using same chopping board as a means of cross contamination is also an indication that respondents can take precautionary measures in disease prevention as reported in [17] that cross contamination occurs when bacteria and viruses are transferred from a contaminated food or surface such as a chopping board and utensils to other food. For example, it can happen when bacteria from the surface of raw meat, poultry, seafood and raw vegetables (such as unwashed potatoes and other root vegetables).

Also the wearing of uniforms will help in maintenance of sanitary condition and as such help in preventing the spread of diseases as has been reported [11] that food vendors should not only wear clean aprons as part of food aesthetics, but they should also perform periodic medical examination and store food items in such a way that they are free of contamination. They also stated that the practice of the use of head covers and the wearing of aprons by the vendors is commendable as many food safety regulations including the Public Health Laws of Edo State specify the wearing of caps/aprons as a part of a vendor's food safety responsibility

The knowledge on food safety management is an advantage to sanitation maintenance and prevention of spread of diseases, the attendance of training will also help in disease spread prevention just like the clipping of finger nails will help in hygiene maintenance as reported in a work [16] and also [18] which stated that hygiene training of food handlers could contribute significantly to improve knowledge and understanding of food-borne diseases and illnesses; since most outbreaks result from faulty food handling practices.

The covering of hair (head) with head-tie will protect the spread of micro-organisms onto food contact surfaces such as spoons and plates. Also the routine check-up on some respondents against any form of disease like tuberculosis is very important in the prevention of spread of diseases to consumers as is been stated [19] that you should not prepare food for others or provide healthcare while you are sick *and for at least 2 days after symptoms stop*. This also applies to sick workers in restaurants, schools, daycares, long-term care facilities, and other places where they may expose people to noro virus. The issue of restaurant's food handlers taking excuse duty as stated by respondents is a very good development because whenever any staff is

sick the possibility of transmitting such disease he is harboring to consumers is eliminated or minimized.

Contrary to expectation more respondents from the non-registered restaurants (*n*=37; 75.5%) were immunized against transmissible diseases as opposed the few (*n*=12; 24.5%) from the registered restaurants, the issue of immunization to restaurant workers should be taken with all seriousness, as shown in a recent hepatitis A outbreak [20] that showed to have affected at least a dozen restaurants in three southeast Michigan counties in 2017. That's why Oakland County hosted two vaccination clinics for restaurant workers. Restaurant workers are a priority target for the limited supply of the Hepatitis A vaccine because they handle other people's food. Those who catch the virus are most contagious before they show symptoms of the disease. "They can contaminate the food unaware, and then sometimes even in the early stages of illness" said William Schaffner, medical director for the US Foundation for Infectious Diseases.

The good toilets and sanitary conditions indicate good management that will as well translate to reduced chances of disease transmission. No matter how good or tasty your food is if you do not have good or standard toilet facilities for your worker (or even the customers) there is high tendency of contamination. However, the storage facilities in the restaurants examined were found to be fair and therefore a need for improvement because it can as well lead to growth and multiplication of microorganisms and in situation where there is preparation of meals long before their consumption and storing them at ambient temperature have been identified as key factors in the handling of meals that contribute to food poisoning [2] and can destroy food items leading to economic set back.

The covering of foods and cleanliness of handlers will certainly help in straightening the sanitary condition of the restaurants, by preventing the entry of disease causing microorganisms into the food. A very good source of drinking water is another positive development for encouraging more patronage from the consumers. Very good refuse disposal and good frequent sanitation at the restaurants will lead to reduced disease causing organisms, as has been noted [4] that foods should be prepared in places far away from the sources of contamination such as rubbish, wastewater, and animals; similar to a well-organized surfaces and equipment disinfection protocols.

Table-1: Total number of samples (plates and spoons) showing bacterial isolation from the restaurants

Restaurants	Items	No. of Samples	TPC $\log_{10}$ CFU/cm^2 (Mean ±SD)	Positive samples	Frequency of isolation (%)
Registered	Spoons	15	5.8±0.3	10	16.7
	Plates	15	5.6±0.4	5	8.3
Non-registered	Spoons	15	5.4±0.3	5	8.3
	Plates	15	5.5±0.2	9	15
		60		29	48.3

TPC=Total plate count, CFU=Colony forming unit

Table 2: Distribution of bacterial organisms on plates and spoons

Type of Bacteria isolated	No. of items found positive		No. of sample Positive (%)
	Plates	Spoons	
Escherichia coli	4	2	6(10)
Staphylococcus	5	6	11(18.3)
Strep. and staphylococcus	4	2	6(10)
Staphylococcus and E. coli	2	4	6(10)
Total	15	14	29(48.3)

Table-3a: Socio-economic characteristics of respondents from the restaurants (n=49)

Variables	Categories	Registered Frequency (%)	Non-registered Frequency (%)	χ^2p<0.05)
Age of respondents	<18 years 18-20 years 21-35 years	0(0.0) 12(24.5) 37(75.5)	1(2.0) 12(25.5) 36(73.5)	$\chi^2$0.0572, p-value 0.999599[N.S]
Sex of the respondents	Male Female	18(46.7) 31(63.3)	18(36.7) 31(63.3)	
Educational level	Primary Secondary Tertiary	0(0.0) 14(28.6) 35(71.4)	0(0.0) 24(49.0) 25(51.0)	χ^2 5.7831 p-value 0.122653[N.S]
Marital status	Single Married Divorce	30(61.2) 19(38.8) 0(0.0)	24(49.0) 25(51.0) 0(0.0)	
Working experience	1-10 years 11-20 years	38(77.5) 11(22.4)	36(73.4) 13(26.6)	χ^2 0.7652 p-value 0.85778 p<0.05 [N.S]
Washing of hands with warm water /antiseptic	Washing hands Not washing	46(93.9) 3(6.1)	44(89.8) 5(10.2)	
Knowledge of food borne disease	Knowledgeable Ignorant	44(89.8) 5(10.2)	37(75.5) 12(24.5)	χ^2 6.6865 p-value 0.082591 p<0.05 [N.S]
Knowledge chopping board causes cross contamination	Knowledgeable Ignorant	43(87.7) 6(24.5)	36(73.5) 13(26.5)	

Key: NS=Not significant

Table-3b: Assessment of food handler's knowledge and attitudes in the restaurants (n=49)

Variables	Categories	Registered Frequency (%)	Non-registered Frequency (%)	χ^2 p<0.05)
Wearing of uniform during work	Wearing Not wearing	41(83.7) 8(16.3)	39(73.5) 10(26.5)	χ^2 0.329 p-value 0.954479[N.S]
Staff with food safety knowledge	Understood Do not	38(77.6) 11(22.4)	37(75.5) 12(24.5)	
Staff that received hygiene training	Received trained Not trained	36(73.4) 13(26.5)	33(67.3) 16(32.7)	χ^2 0.4408 p-value 0.931695[N.S]
Cutting of finger nails	Twice a week Every week	20(40.8 29(59.2)	20(40.8) 29(59.2)	
				χ^2 p<0.01)
Covering of hair/ head	Hair net Head tie Others	11(22.4) 24(49.0) 14(8.2)	10(26.5) 25(51.0) 14(28.6)	χ^2 0.068 p-value 0.999434[N.S]
Medical checkup before employment	Checked up Not checked up	40(81.6) 9(18.3)	40(81.6) 9(18.3)	
Excused duty when sick	Seek for Excuse Do Not seek excuse	49(100) 0(0)	49(100) 0(0)	χ^2 25.5102 p-value 0.00001 [Significant]
Immunization against diseases	Immunized Not immunized	12(24.5) 37(75.5)	37(75.5) 12(24.5)	

Key: NS=Not significant

Table 4: Assessment of physical facilities and activities at the restaurants

Variables	Registered	Unregistered
Toilet facilities	+1	+1
Sanitary condition	+1	+1
Storage facilities	+3	+3
Cleanliness of food handler	+1	+1
Covering of food	+1	+1
Source of water for washing vegetable and fruit	+1	+2
Source of drinking water	+1	+2
Measures taken to prevent pests	+1	+3
Method of refuse disposal	+1	+2
Frequency of sanitation	+1	+2
Disinfection of surface and equipment	+1	+1

(Key): + =Present, 1 = Very good, 2=Good, 3=Fair, 4=Bad)

Very Good=All Facilities present, in functional status and adequately utilised

Good=Some of the facilities present, but not functional status

Fair=Some of the facilities are not there and those present are not in good condition or not fully utilised

Bad= Most of the facilties are absent, in absolute deplorable condition, or can not be utilized.
(Adapted from Thesis by Lawal, M. K., 2009 A. B. U. Zaria).

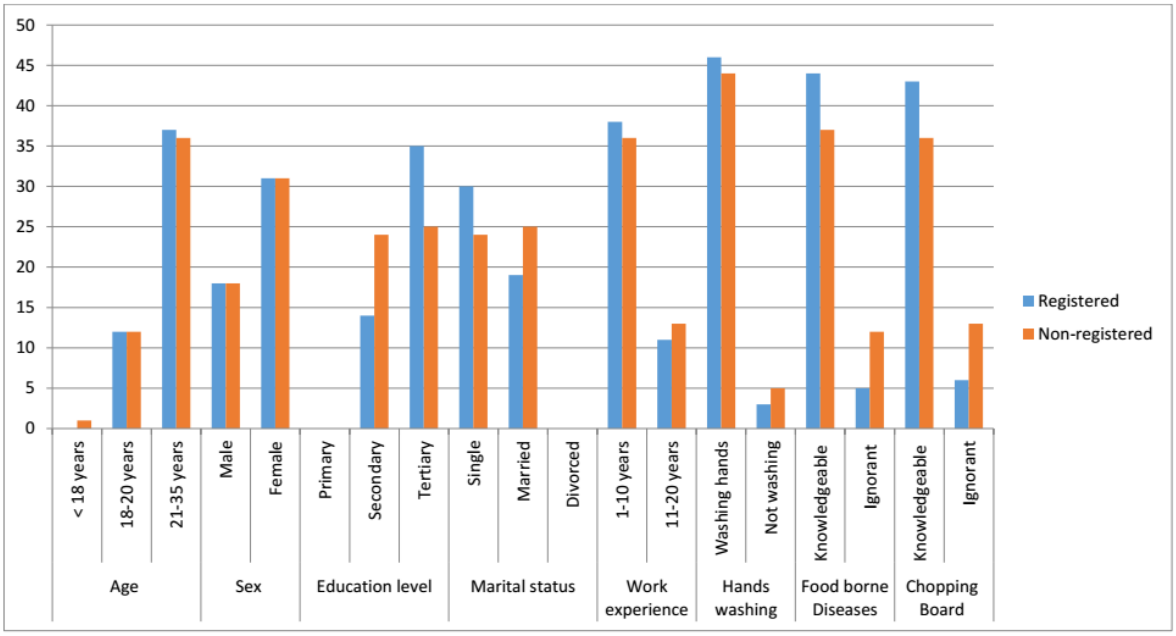

Fig-1: Socio-economic characteristics of respondents from the restaurants (n=49)

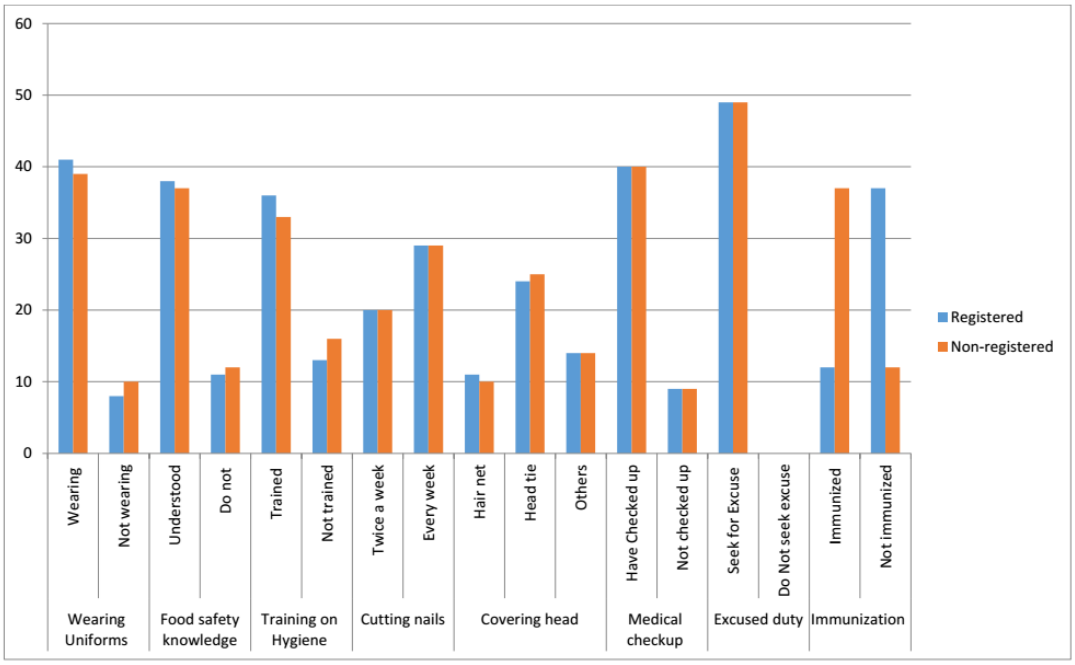

Fig-2: Assessment of food handler's knowledge and attitudes in the restaurants (n=49)
Results of questionnaires % calculate with 49 or 98?

CONCLUSION

The study revealed that there was no much difference in the isolation rate of microorganisms between spoons and plates as well as between registered and non-registered restaurants. Bacterial organisms were isolated from the contact surfaces of spoons and plates from all the restaurants. There exists a high level of awareness among the respondents on safety management issues even though majority of respondents have not undergone any formal training related to hygiene in the restaurants. Water was available and of good quality, there was no statistical significant difference between almost all the variables among the registered and non-registered restaurants except for the immunization of respondents against communicable diseases. It was observed that there is a significant difference between food handlers working in registered and non-registered restaurants.

Sanitary conditions of our restaurants must be improved by enforcing certain measures towards preventing the occurrence of food-borne diseases. All restaurants must be registered with the appropriate authorities in order to enhance proper monitoring of their activities. The government agencies saddled with the responsibility of registration and monitoring of restaurants should engage the services of public health expert in their activities for good results in their service delivery. Food handlers must from time to time undergo intensive practical training on hygiene and related services on food handling. All restaurant staff must undergo routine medical check-ups to curtail a possibility of spreading certain diseases to consumers from the food handlers. There must be enforcement of regulations that anybody to be engaged as food handler in a restaurant must be immunized against common communicable diseases.

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