



Microbial analysis of locally prepared vended dishes in Owerri municipality of Imo State, Nigeria

Mercy Adaramaja F

Department of Nutrition and Dietetics, Imo State University, Owerri, Nigeria

Abstract

A study was carried out to access the microbial analysis of locally prepared vended dishes in Owerri municipality of Imo state. Five zones namely: Prefab and Aladinma areas are represented as Zone A while Ikenegbu and Wethdral areas, Douglas area, School road and Tetlow areas and Worldbank area represented Zone B, C, D and E respectively. The food samples collected includes; rice, spagehetti, beans and white stew. The result obtained revealed that the total viable count in zone A contained 11.42×10^3 , 9.5×10^3 , 4.4×10^4 and 10.0×10^5 (Cfu/mL) for white rice, spaghetti, beans and stew while those of zone B are 9.0×10^3 , 7.70×10^3 , 2.5×10^4 and 6.0×10^5 (Cfu/mL) for white rice, spaghetti, beans and stew respectively. Zone C stew (10.4×10^3 cfu/mL), spaghetti (2.0×10^4 cfu/mL), Beans (3.3×10^4 cfu/mL) and stew (10.3×10^4 cfu/mL). Zone D stew (8.0×10^3 cfu/mL), spaghetti (1.5×10^4 cfu/mL), Beans (1.4×10^4 cfu/mL) and stew (4.0×10^5 cfu/mL). Zone E stew (12.55×10^3 cfu/mL), spaghetti (6.3×10^3 cfu/mL), Beans (6.0×10^4 cfu/mL) and stew (4.5×10^5 cfu/mL). Total coliform count shows no gas production in Durbam tube in all the zones, no mould were also observed in all the samples. Generally, mould growth on food is evidence deterioration. It was concluded that the zones maintained high sense of hygiene.

Keywords: Imo, Owerri, vended dishes, microbial count

Introduction

Due to socio-economic changes characterized by increased mobility, resulting in more locally prepared foods taken outside the home, food vendors services are on the increase and responsibility for the food safety have been transferred from individuals/families to the food vendors who rarely enforce good manufacturing practices which are linked with gastro-intestinal diseases such as diarrhea and typhoid fever due to poor environmental sanitation is largely responsible for much of the contamination and poor personal hygiene among the food handlers (Cho *et al.*, 2011) [19]. These bacteria can come in contact with the foods when they are prepared especially in unhygienic environments and contaminated cooking utensils (Shamsudden and Ameh 2008) [18].

In Owerri, preparing of locally made foods in streets and markets even along the road for travelers is very common. These food vendors enjoy huge patronage from different societal classes. Unfortunately, none of these food hawkers or vendors is licensed or monitored by relevant agencies saddled with the responsibility of ensuring the safety of our foods. Thus, owing to the manner and conditions these vendors operate, there is possibility that some of the locally made foods may be contaminated by food borne pathogens. Therefore, this study will explore the proximate analysis and microbial load of locally prepared dishes sold by food vendors in Owerri Municipality of Imo state. However, such foods have been implicated in food borne illnesses and diseases that remains a major public health challenge.

Street food vending employs on average 37.8 percent of the labor force, and contributes about 38 percent total gross domestic product in Africa (Charmes, 2008). Women predominate in street food business representing 53 percent of the vendors in Senegal (Winarno and Allain, 2011) and 75 percent of the vendors in Burkina Faso (WHO, 2009).

Concerns of cleanliness and freshness often discourage

some people from eating street food. With the increasing pace of globalization and tourism, the safety of street food has become one of the major concerns of public health and a focus for governments and scientists to raise public awareness (FAO, 2009 [16]; Muzaffah *et al.*, 2009). An assessment of some street foods widely consumed in Ouagadougou, Burkina Faso showed that vendors did not respect hygienic practices (WHO, 2009). In Accra, Ghana, a study to evaluate the role of street food vendors in the transmission of diarrheal pathogens showed that in 35 percent of the vending sites food was exposed to flies while 17.1 percent of the vendors handled food at ground level (WHO, 2009). In the United Kingdom, the Food Standards Agency provides comprehensive rule of food safety for the vendors, traders and retailers of the street food sector. In Mumbai, India, the Food safety Act, 2011 requires hawkers, food vendors including vegetable and fruit vendors to follow basic hygiene rules such as wearing an apron and gloves and using clean utensils and potable water. Other effective ways of enhancing the safety of street foods are through mystery shopping programmes, through training and rewarding programmes to vendors, through regulatory governing and membership management programmes, or through technical testing programs.

Materials and Methods

Study Area

The study was carried out in Owerri Municipal Council Area, it is an autonomous community made up to five (5) indigenous Kindred namely; Umuoroonjo, Amawom, Umuoneeche, Umuodu and Umuoyima in the order of seniority under the leadership of one paramount ruler. Owerri Municipal Council covers areas such as World Bank, Aladinma, Ikenegbu, Prefab, Tetlow, School Road, Wetheral and Douglas. Owerri Municipal Council is located in the humid tropical ecological zoon of Nigeria between

latitudes 5° 25'N and 50° 23'N and longitude 7° 21' E and 149° 33'E of the Greenwich meridian (Microsoft Corporation, 2009 and Wikipedia, 2012).

Food Samples collection

The food samples were procured from selected food vendors some minutes after food preparation at the different zones in Owerri municipality of Imo State. From the common locally prepared food samples, the samples that were collected includes; cooked white rice, cooked spaghetti, cooked beans and stew, an appropriate portion of samples were purchased from each vendor and aseptically kept separately in a sterile labeled transparent polythene bags. The collected samples were then transported immediately to the laboratory within the shortest possible time for analysis.

Determination of Microbial Population

Microbial count was carried out according to International Commission on Microbiological Specifications for Foods (ICMSF, 2012) [1]. Ten grams (10g) of each macerated food samples that were collected from the food vendors was added to 90mL of peptone water and serially diluted into 10-folds dilution using sterile peptone water, and then homogenized by shaking vigorously. An aliquot portion (0.1ml) of 3rd up to 9th dilution was inoculated in duplicate onto the potato dextrose agar (PDA), nutrient agar (NA) and Mac Conkey agar (MA) for the isolation of heterotrophic fungi and bacteria respectively. Again, 0.1ml from the 2nd up to 5th dilution was inoculated in duplicate onto Brain Heart Infusion Agar (BHIA) for isolation of spore formers.

Result

Table 1: Microbial load of cooked food samples from different food vendors

	Food Sample	Total viable count cfu/mL	Total coliform count cfu/mL		Fungi/Yeast count	
			Observation at presumptive stage	cfu/mL	Colonial characteristic	Result
a.	White rice Zone-A	11.42 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-B	9.0 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-C	10.4 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-D	8.0 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-E	12.55 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
b.	Spaghetti Zone-A	9.5 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-B	7.70 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-C	2.0 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-D	1.5 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-E	6.3 x 10 ³	No gas production in Durham tube	-ve	No morphological sign	NG
c.	Beans Zone A	4.4 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-B	2.5 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-C	3.3 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-D	1.4 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-E	6.0 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
d.	Stew Zone-A	10.0 x 10 ⁵	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-B	6.0 x 10 ⁵	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-C	10.3 x 10 ⁴	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-D	4.0 x 10 ⁵	No gas production in Durham tube	-ve	No morphological sign	NG
	Zone-E	4.5 x 10 ⁵	No gas production in Durham tube	-ve	No morphological sign	NG

Microbial load of cooked food samples from different food vendors within Owerri municipal

NG- No growth, -ve – negative, +ve-positive, Zone A- Prefab and Aladinma areas, Zone B- Ikenegbu and Wethdral areas, Zone C- Douglas area, Zone D- School road and Tetlow areas, Zone E- Worldbank area.

Potato dextrose agar plates were incubated at ambient temperature (28±02°C) for fungal growth. The nutrient agar plates were spread evenly with a sterile spreader and incubated for 24-48h at a temperature of 37°C for total viable count (Pelezar *et al.* 2013; Harrigan and Mclance, 2009) [14]. The Mac Conkey plate agars were incubated at 37°C for 24h for coliform bacteria growth (Pelezar *et al.*, 2013; Cheesbrough, 2009 [15]; Alagbe, 2019 [11]; Shittu *et al.*, 2020 [9]; Bashir *et al.*, 2020) [7]. The Brain Heart Infusion Agar plates were incubated at 48-50°C 24-48h for spore formers (ICMSF, 2012). After overnight incubation, counts were made using a colony counting device that allows viewing of individual colonies. All plates were counted but those showing colony counts between 25 and 250 were selected and their colony forming unit per gram (cfu g⁻¹) calculated by multiplying the count by the dilution factor which ranged from 10⁻¹ to 10⁻⁹ (Harrigan and McCance, 2008).

Statistical Analysis

Data collected from respondents were entered into Statistical Package for the Social Sciences (SPSS) version 23.0 software, edited and subsequently used for univariate analysis. Analysis of Variance (ANOVA) (F-ratio) with the application of honest significant difference (HSD) was used to obtain the significant differences among the food samples for both microbial load. Percentage proportions were calculated for discrete variables while the mean with its standard deviation (SD) were computed for the continuous variable.

Discussion

Table 1 reveals the microbial load of cooked food samples from different food vendors. Total viable count in zone A contained 11.42 × 10³, 9.5 × 10³, 4.4 × 10⁴ and 10.0 × 10⁵

(Cfu/mL) for white rice, spaghetti, beans and stew while those of zone B are 9.0×10^3 , 7.70×10^3 , 2.5×10^4 and 6.0×10^5 (Cfu/mL) for white rice, spaghetti, beans and stew respectively. Zone C stew (10.4×10^3 cfu/mL), spaghetti (2.0×10^4 cfu/mL), Beans (3.3×10^4 cfu/mL) and stew (10.3×10^4 cfu/mL). Zone D stew (8.0×10^3 cfu/mL), spaghetti (1.5×10^4 cfu/mL), Beans (1.4×10^4 cfu/mL) and stew (4.0×10^5 cfu/mL). Zone E stew (12.55×10^3 cfu/mL), spaghetti (6.3×10^3 cfu/mL), Beans (6.0×10^4 cfu/mL) and stew (4.5×10^5 cfu/mL). Total coliform count shows no gas production in Durham tube in all the zones, no mould were also observed in all the samples. Generally, mould growth on food is evidence deterioration.

The results of the microbial load of cooked rice, cooked spaghetti, cooked beans and stew at different zones shows that the total viable counts and the total coliform counts on all the cooked food samples were within the acceptable range; this is in agreement with the International Commission on Microbiological Specifications for Foods (ICMSF 2012) [1]. This is in contrary to the findings of Peter and Ngozi, (2013) [13] which reported that there is appreciable amount of bacteria growth in the food samples purchased from food vendors among different restaurants in University of Port Harcourt, Port Harcourt Nigeria. This result showed that the food vending practices amongst the Vendors are up to standard; this may be due to supply of clean water; it also shows the vendors' level of hygiene is high. It could be observed in this study that nutritionally street foods provide appreciable nutrients and calories to the consumers.

The environments under which street foods are being prepared, vended and consumed predisposed them to recontamination and cross contamination from environmental pollutants such as airborne chemicals in dusts, exhaust discharges from moving vehicles and industrial engines, burning fumes and offensive smell from accumulated waste and effluent from industrial discharge, insects and rodents. Airborne diseases and microbes which may be pathogenic if allowed to settle on the prepared food surfaces abound in dust (Muynaja *et al.*, 2011) [12]. The microbial result on the vended food shows that food vendors have knowledge of hygienic practices but concluded that majority of them do not put the knowledge into practice (WHO, 2010) [10]. Although street vendors were reported to exhibit good personal cares, however, they were negligence to compliance with adequate hygiene practices at the preparation and vending sites. Inadequacy or near absence of basic facilities at the vending sites were mostly attributed for non-compliance with basic hygiene principles (Benny-Olliviera and Badrie 2009) [8] and contaminants (Alagbe, 2016) [4]. Idowu and Roland (2009) reported that Majority of the street food vendors studied in Abeokuta, Nigeria used dung hills and nearby bushes in place of toilets and clean up with sheets of paper. Barro *et al.* (2016) [5] reported that bacteria from dirty dish washing water and other sources adhere to the utensil surface and can constitute a risk during the food vending process. Micro-biological analysis of utensils surface and knives have shown the presence of *Salmonella* and *Shigella*. The serving utensils used at the vending site are often contaminated with *Micrococcus* spp. And *Staphylococcus* spp. which may have originated from the vendors hands when they touched the food preparation areas, dishcloths, or the water during dish washing or hand washing which indicates cross contamination between

dishwater, food preparation surfaces, and the food itself (Ohiokpaie, 2013).

Conclusion

Diseases such as cholera, diarrhea, typhoid and hepatitis exist in our surroundings and are of great concern to public health. The pathogens gain access to the body via contaminated food and environment. It is therefore necessary that cooking utensils, environments are adequately cleaned, disinfection should be done regularly to kill pathogens, waste basket and toilets should also be put in place.

References

1. ICMSF (International Commission on Microbiological Specification for Foods). Microorganisms in food. In: Book of Microbiological testing in food safety management NY Kluwer Academic, Plenum, 2012. ISBN 0306472627.
2. ICMSF (International Commission on Microbiological Specifications for Foods). Spices, Herbs, and Dry Vegetable Seasonings. In: "Microorganisms in Foods, 2015.
3. Ohiokparie NB. The Prevalence and Nutrition Implication of Fast Food Consumption among haemodialysis patients. In: J. Renal Nutr. 2013; 17:264-269.
4. Alagbe JO. Effect of heavy metals contamination on performance, blood profile of broiler chicks fed Corn-soya diet. International Journal of Advanced Biological Research. 2016; 6(4):538-542.
5. Barro MA, Kartashov AI, Ebbeling CB, Van Horn L, Slattery ML, Jacobs DR, *et al.* Fast food increases the risk of Obesity and Diabetes. Lancet. 2016; 365:36-42.
6. Idowu LM, Rowland PS. Diet Composition and Body Composition in Preschool Children. In: Am. J. of Clin. Nutr. 2009; 72:15-21.
7. Musa Bashir, Alagbe JO, Adegbite Motunrade Betty, Omokore EA. Growth performance, caeca microbial population and immune response of broiler chicks fed aqueous extract of *Balanites aegyptiaca* and *Alchornea cordifolia* stem bark mixture. United Journal for Research and Technology. 2020; 2(2):13-21.
8. Benny Olliviera, Badrie A. The effect of cooking methods on mineral and vitamin contents of African catfish. In: Food Chem. 2009; 115:419-422.
9. Shittu MD, Adejumo DO, Ewuola EO, Alaba O, Alagbe JO, Ojebiyi OO, *et al.* Gut morphometric characteristic and ecological response of broiler starter fed varied levels of protein. Asian Journal of Animal Science. 2020; 14(1):33-39.
10. WHO. Protein Quality Evaluation; Report of the Joint FAO / WHO Expert consultation. FAO Food and Nutrition Paper 51 Bethesda Md., USA, 2010, 26-42.
11. Alagbe JO. Haematology, serum biochemistry, relative organ weight and bacteria count of broiler chicken given different levels of *Luffa aegyptiaca* leaf extracts. International Journal of Advanced Biological and Biomedical Research. 2019; 7(4):382-392.
12. Muynaja M, Steiner-Asiedu M, Julshamn K, Lie O. Effect of local processing methods (cooking, frying and smoking) on three fish species from Ghana: Part I. Proximate composition, fatty acids, minerals, trace elements and vitamins. In: J. Food Chem. 2011;

40:309-321

13. Peter L, Ngozi BO. Labor market informalisation, gender and social protection: Reflections on poor urban households in Bolivia, Ecuador and Thailand, in Razavi S. and Hassim S., Eds. Gender and social policy in a global context, In: Uncovering the gendered structure of the social. New York: Palgrave Macmillan, 2013.
14. Harrigan WF, Mclance ME. Laboratory Methods in Food and Dairy Microbiology, 8th ed. Academic Press Inc., London. 2009; 286:7-23.
15. Cheesbrough M. District Laboratory Practices in Tropical Countries, Part 2, Cambridge University Press, UK. 2009; 69:35-38.
16. Food and Agriculture Organisation, FAO. Street foods. Report of an FAO Technical Meeting on Street Foods. Calcutta, India. 2009; 6(1):1-7.
17. Muzaffar AT, Huq I, Mallik BA. "Entrepreneurs of the streets: an analytical work on the street food vendors of Dhaka city," In: International Journal of Business and Management. 2009; 4(2):80-88.
18. Shamsudden MA, Ameh K. Effects of microwave cooking on fish quality. International Journal of Food Properties. 2008; 4(3):501-512.
19. Cho MM, Chet O, Naing NN. "Sociodemographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: a preliminary report. In: Southeast Asian Journal of Tropical Medicine and Public Health. 2002; 33(2):410-417.