



Environmental Conditions Around Food Vending Sites in Imo State, Nigeria: A Cross-Sectional Study

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ABSTRACT

Environmental characteristics around informal food vending facilities can lead to many paths of food contamination and may affect the safety of ready-to-eat foods. Poor waste disposal, inadequate drainage, closeness to toilets and garbage dumps, pest infestation and limited access to safe water can raise the chances of microbiological and chemical contamination. This study evaluated the environmental conditions around food selling sites in selected areas of Imo State, Nigeria. A descriptive cross-sectional study was carried out among 705 food merchants. Data were acquired by structured interviewer presented questionnaire and observational checklist. Environmental conditions studied included the proximity of vending locations to garbage dumps and toilets, open drains and stagnant water, solid-waste disposal procedures, the prevalence of flies and rats and sources of water utilised by vendors. Data were descriptively examined and expressed as frequencies and percentages. Many of the examined vending venues noted flaws in the environment. Almost three quarters (74.9%) of the vending sites were located within 30 m of a trash disposal with 27.9% being located within 10 m of the waste dump. About 64.7% locations were found with open drain and about 40.3% sites with stagnant water. Approximately one-fifth (20.3%) of vending sites were placed within 10 m of a toilet. Open dumping was reported at 40.0% of the sites, while rubbish was collected by a designated waste-management organization at just 27.8%. Flies, rats, or both were detected at 81.4% of vending sites, with flies alone the most common vector-related concern (42.3%). Tap or borehole water was used by fifty-six-point three percent of vendors, and 43.7% used wells, stored or vendor provided water or surface water sources. The food vending sites in the research region were typified by great deficits in environmental sanitation, waste management, drainage, vector control and water supply. These factors may enhance the potential for contamination of food and food-contact products. Risk reduction efforts should focus on better drainage, reliable collection of solid waste, appropriate separation of vending sites from waste dumps and toilet facilities, increased pest-control methods and reliable access to safe water. Environmental health authorities should include these strategies in routine inspection, sanitation planning and food-vendor support programs.

Keywords: environmental sanitation; food contamination; food safety; street food; food vendors; environmental health; Imo State; Nigeria.

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INTRODUCTION

Street-vended and informally cooked foods are essential components of the urban food system, especially in low- and middle-income nations. They provide relatively cheap, accessible and easy meals to students, workers, commuters and other urban inhabitants while at the same time promoting employment and income production for thousands of

vendors and their households. In many Nigerian localities, informal food selling is closely integrated into the fabric of everyday life with vending operations taking place near marketplaces, motor parks, schools, hospitals, offices, residential areas and important transit corridors. These socio-economic advantages notwithstanding, the safety of food sold in such settings, is dependent not only on the personal cleanliness and food-handling standards

of vendors, but also on the ambient conditions in which food is made, kept and served [1].

Significant potential for contamination may occur in the immediate physical environment of a food vending facility. Food may get contaminated by contact with dirty water, contaminated surfaces, improperly handled garbage, wastewater, soil, dust, insects, rodents and other environmental vectors. Open drains, stagnant water, overflowing trash containers and rubbish dumps located next to food preparation or serving areas can help microorganisms to survive and spread and can attract flies, cockroaches and rats. These vectors can mechanically transport bacteria from faecal matter, decaying organic waste and other contaminated items to food, utensils and food-contact surfaces [2]. Thus, environmental cleanliness should be viewed as part of food safety and not a distinct issue of public health. This is particularly the case in fast-urbanising places where population expansion can outstrip sanitation facilities and adequate municipal waste-management systems. Indiscriminate dumping of solid wastes in streets and commercial areas can be caused by poor collection and disposal of solid wastes. Refuse can obstruct poorly maintained drainage systems and generate stagnant pools of water. These conditions may enhance the environmental contamination and offer breeding and harbourage locations for disease vectors. In the absence of handwashing facilities and safe water, the risk of faecal contamination is high if the toilet infrastructure is inadequate or if food vending operations are located in the vicinity of toilet facilities. The resulting overall consequence is the generation of a complex environmental situation in which numerous contamination pathways can be simultaneously active [3].

Access to adequate and safe water is another fundamental factor for food safety. Water is essential at vending locations for drinking, hand washing, washing utensils, food preparation, washing of raw materials and for general cleanliness. Contamination can happen before, during or after food preparation when vendors use poorly protected wells, surface water, badly stored water or water provided from questionable sources [4]. Even if the water supply is largely safe, inadequate storage and handling can reintroduce germs into water that is used for food preparation and washing. Thus, the availability of a reliable safe water supply is a fundamental prerequisite to transferring knowledge of food hygiene into efficient day-to-day practice [5]. Unsafe food is a leading cause of preventable disease globally, disproportionately impacting those with limited access to safe water, sanitation and food-safety infrastructure, according to the World Health Organization [6]. Foodborne dangers may include bacteria, viruses, parasites, pesticides and other pollutants and exposure can occur at many points in the food chain from manufacturing to consumption. Of particular concern for ready-to-eat meals is

environmental contamination at the point of preparation and sale, where there may be little chance for later processing to eliminate dangers. So, the physical environment of food vending sites is an important part of the wider food-safety chain [7].

There is significant evidence of environmental issues around informal food vending activities in African urban contexts, including poor drainage, overcrowding and exposure to flies and other pests, inadequate rubbish disposal and poor water supply [8]. These difficulties are typically interlinked. Poor waste management for example can lead to clogged drains and stagna Poor waste management for example can lead to blocked drains and stagna Similarly, the location of vending activities near garbage dumps or sanitation facilities may expose food and food contact surfaces to environmental pollutants. Thus, interventions to address food safety in informal vending need to go beyond training individual vendors and should include improvements to the surrounding physical and institutional environment [9]. These issues are of particular relevance in Nigeria, where informal food selling is an essential source of affordable food and occurs throughout a wide range of urban and semi-urban settings. Regulatory and environmental health agencies face the difficulty of reconciling the economic significance of informal food companies with the requirement to protect customers from preventable foodborne dangers. To be effective, regulation must be based on credible local evidence on the real conditions under which food is supplied. Information about the placement of vending sites relative to rubbish dumps and toilets, drainage, waste disposal practices, insect presence and sources of water might allow environmental health officers to identify priority hazards and devise context-specific interventions [10].

Imo State provides an essential site to examine these environmental variables of food safety. Food vending activities are common in urban and peri-urban populations but there is limited unified research documenting the environmental conditions immediately surrounding vending facilities. Existing food-safety research has often focused on vendors' knowledge, attitudes, hygiene practices or microbiological contamination of food. Relatively less attention has been paid to the physical environment in which vending occurs [11]. This creates an evidentiary gap as even vendors with the right expertise and strong personal hygiene practices could find it difficult to maintain food safety where their operating environment lacks suitable drainage, waste management, safe water and effective insect control. Therefore, knowledge of these environmental parameters is important for the creation of practical and sustainable food safety solutions. Environmental health inspection, urban sanitary planning, enhanced waste-collection systems, suitable zoning of vending operations, provision of clean water and drainage infrastructure, and integrated vector management may all lead to a reduction in the risks of

contamination. Such techniques can also be used to supplement vendor-specific education and training by helping to address environmental impediments that individual suppliers cannot sufficiently control on their own. In this context, this study evaluated the environmental conditions in and around food vending places in some selected areas of Imo State, Nigeria. In particular, it assessed the closeness of vending locations to waste dumps and toilets, open drains and stagnant water, solid-waste disposal procedures, fly and rat presence and sources of water of food vendors. The results constitute the first objective of the parent thesis and give baseline evidence to assess environmental sanitation conditions around informal food vending locations and to identify priority areas for food-safety and environmental-health interventions in the research area.

MATERIALS AND METHODS

Study design and setting

This was a descriptive cross-sectional study conducted in selected local government areas of Imo State, South-East Nigeria. The study covered food vending environments in urban and peri-urban settings, including markets, roadsides, transport nodes, and other clusters where ready-to-eat foods were prepared or sold. The state has a humid tropical climate, and seasonal rainfall may worsen run-off, drainage obstruction, stagnant water, and vector breeding around poorly serviced vending areas.

Study population and sample

The study population comprised food vendors operating at selected vending sites. A total of 705 vendors/sites were assessed. The parent study used a multistage sampling approach to recruit vendors across selected local government areas and vending clusters. Eligible participants were active vendors who met the study's inclusion criteria and consented to participate.

Ethical considerations

Permission was obtained from department of Public Health Science of Imo State University and that informed consent was obtained before questionnaire administration and site observation. Participation was voluntary, information was handled confidentially, and findings were reported in aggregate. The ethics committee of Imo State ministry of health approved the study.

Data collection and variables

Data were collected by trained research assistants using a structured interviewer-administered questionnaire and a direct observation checklist. For this objective, the analysis included distance to the nearest waste dump, presence of open drains, presence of stagnant water, distance to the nearest toilet, solid-waste disposal practice, observed flies and rodents, and the

main source of water used at the vending site. Observations were undertaken at the vending point to complement vendor reports and reduce reliance on self-report for visible environmental conditions.

Data analysis

Data were coded, cleaned, and analysed using IBM SPSS Statistics version 23. Categorical variables were summarised with frequencies and percentages. Because this article addresses a descriptive objective, no causal or inferential claims were made.

RESULTS

Characteristics of participants

A total of 705 food vendors participated. Females constituted 58.7% of respondents, 33.2% were aged 25–34 years, and 46.4% had secondary education. These characteristics provide context for the vending environments assessed but were not treated as explanatory factors in this objective-specific analysis.

Proximity to environmental contamination sources

Environmental hazards were common. Nearly three-quarters of sites (74.9%) were within 30 m of a waste dump, with 27.9% located less than 10 m away. Open drains were present at 64.7% of sites and stagnant water at 40.3%. In addition, 20.3% of sites were less than 10 m from a toilet (Table 1).

Table 1. Proximity and drainage conditions around food vending sites (n = 705)

Environmental indicator	Category	Frequency	Percent
Distance to nearest waste dump	<10 m	197	27.9
	10–30 m	331	47.0
	>30 m	177	25.1
Open drain around site	Present	456	64.7
	Absent	249	35.3
Stagnant water around site	Present	284	40.3
	Absent	421	59.7
Distance to nearest toilet	<10 m	143	20.3
	10–30 m	260	36.9
	>30 m	302	42.8

Waste disposal, vectors, and water sources

Open dumping was the most frequently reported waste-disposal practice (40.0%), followed by use of a covered bin (32.2%); only 27.8% reported collection by an agency. Flies and/or rodents were observed at 81.4% of sites: flies alone at 42.3%, both flies and rodents at 26.4%, and rodents alone at 12.8%. Tap or borehole water was the principal source for 56.3% of vendors. The remaining 43.7% used wells, stored or vendor-supplied water, or surface water (Table 2).

Table 2. Waste disposal, vector presence, and water sources at food vending sites (n = 705)

Environmental indicator	Category	Frequency	Percent
Solid-waste disposal	Collected by agency	196	27.8
	Covered bin	227	32.2
	Open dumping	282	40.0
Observed vectors	Both flies and rodents	186	26.4
	Flies only	298	42.3
	Rodents only	90	12.8
	None	131	18.6
Main water source	Tap/borehole	397	56.3
	Well	173	24.5
	Stored/vendor-supplied	93	13.2
	Surface water	42	6.0

DISCUSSION

The study indicated that food vending places in the selected districts of Imo State were often surrounded by some environmental variables which can raise chances of food contamination. The most commonly cited problems were open drains, vending sites close to waste dumps, stagnant water, inadequate solid-waste disposal, flies and rodents everywhere and the fact that a large proportion of vendors depended on sources of water other than taps or boreholes. Importantly, these environmental indications should not be read as proof of laboratory verified contamination. Instead, they show the possible routes for transfer of germs and other pollutants to food, utensils, food-contact surfaces and vendors' hands [12]. The clustering of various hazards at individual vending locations is of particular concern, because simultaneous exposure to multiple environmental risk factors may complicate efforts to maintain effective food-safety measures. One major environmental-health concern was the presence of open drains near 64.7% of the vending sites. Open and poorly-maintained drainage channels may be receiving home waste water, food waste and other polluted materials, especially in places where formal waste water management systems are inadequate. They can also become obstructed, flood after rainfall, contain organic debris that fosters the persistence or migration of micro-organisms and attract insects. The presence of stagnant water around 40.3% of sites may exacerbate these circumstances by providing additional breeding and harbourage for vectors. Similar environmental limitations have been documented in street-food contexts in other African nations, such as Ghana and Kenya, where inadequate drainage, wastewater management, and poor environmental sanitation have been identified as significant food safety problems [13]. The findings imply that better drainage surrounding vending outlets should be part of wider food-safety efforts, and not just seen as an urban infrastructure issue.

Another key problem discovered in the study was waste management. 40.0% of vending establishments reported open dumping, whereas only 27.8% had rubbish collected by an agency. Poor garbage disposal can cause decomposing organic matter to

accumulate around food-selling sites, providing conditions favourable to flies, rats and other possible vectors. The result that flies, rodents or both were seen around 81.4% of sites is therefore consistent with the broader environmental sanitation inadequacies reported in this study. Flies migrate between trash, faecal material and food-contact surfaces and rodents contaminate food and surrounding surfaces by body contact, urine and excrement. Previous studies have examined street-food environments and identified many potential sources of contamination, including food handlers, utensils, water, and regularly touched surfaces and objects [14]. The significant frequency of vectors revealed in the present study supports the necessity for ambient vector management in addition to individual food-hygiene education. The proximity of vending stations to possible sources of contamination was also impressive. Almost three-quarters of the locations were within 30 m of a garbage disposal and more than one-quarter were less than 10 m away. In addition, 20.3% of vending sites were within 10 m of the nearest bathroom. Proximity does not necessarily mean that food was contaminated but it does raise the risk of exposure to flies, smells, wastewater, aerosols, garbage and other environmental toxins, especially if sanitation facilities are badly kept. Consequently, environmental-health inspection and urban design of vending sites should include spatial separation of food selling activities from garbage disposal locations and sanitation facilities.[15]

Another crucial dimension of the findings is the water availability. Tap or borehole water was the main supply but 43.7% of vendors relied on wells, stored water, vendor provided water or surface water. The classification of a water source does not mean it is microbiologically safe, as contamination can occur at the source, during collection and transport or through poor storage and management. However, dependable access to potable water is vital to hand hygiene, washing of utensils, cleaning of food contact surfaces and preparation of meals. Intervention should therefore be targeted at the entire water chain, from source protection, transportation, storage containers, handling procedures and continuous availability at the point of vending [16]. The findings as a whole support a systems-based

approach to food safety. While it is still vital to educate vendors, information and good intentions may not go very far in locations where vendors are working in conditions of inadequate drainage, indiscriminate waste disposal, stagnant water, vectors and unstable water supply. Therefore, environmental health departments, local government authorities, waste-management agencies, market administrators, urban planners and food-vendor groups should work together to define and enforce pragmatic minimum environmental criteria for vending sites [17]. Priority interventions should include regular refuse collection, provision of covered waste receptacles, rehabilitation and maintenance of drainage systems, elimination of stagnant water, integrated pest-control measures, provision of reliable safe water and appropriate siting of vending activities away from refuse dumps and toilet facilities [18]. Such initiatives would target environmental constraints that individual suppliers may not have control over on their own.

There are various strengths to this study. A rather high sample size of 705 food sellers offered a good basis for defining the ambient characteristics in the designated study regions. The use of interviewer provided questionnaires with direct observational evaluation was another strength, since it enabled consideration of reported behaviours as well as the observed ambient variables. However, there are certain limits. The cross-sectional design provides a snapshot of the environmental circumstances and does not allow for determination of temporal or causal links between environmental factors and food contamination. For this purpose, no microbiological examination of food, water or ambient samples was performed and the hazards identified should therefore be viewed as potential contamination routes rather than confirmed sources of contamination. Some information, in particular trash disposal procedures and water sources, was self-reported and may be subject to recollection or social-desirability bias. Environmental conditions may also alter seasonally, especially drainage, stagnant water, vector abundance and garbage accumulation. Lastly, as the study was conducted in chosen regions, the findings should be generalised to other parts of Imo State with due caution.

CONCLUSION

Food vending facilities in the selected areas of Imo State were often marked by several sanitation and environmental-health problems. Open sewers, stagnant water, proximity to garbage dumps and toilets, inadequate waste disposal, flies and rats were ubiquitous and access to safer water was uneven. These variables do not directly point to the presence of food contamination but rather offer plausible environmental paths for contamination. Thus, vendor education alone is not enough to improve food safety in informal vending settings. Investment in drainage, reliable waste collection, vector control, safe-water availability, proper vending-site zoning and routine environmental-health

inspection need to be co-ordinated to establish conditions under which safe food-handling procedures may be routinely maintained.

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