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# **Understanding the Risk Landscape: Analyzing Factors Impacting Food Vending in Nigeria**

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# ABSTRACT

Even in the modern era with increased awareness about foodborne illness, it still remains a serious public health issue, everywhere around the world, and food handling, preparation and service are crucial practices for food safety. The factor of cookware preparation, storage systems, and/or the versatility and level of education of food handlers are all types of food safety factors that directly or indirectly influence food safety to some degree. Properly nailing down food hygiene first entails looking closely into personal hygiene and the conduct of employees working in food businesses. The food handlers with poor personal hygiene may, in close proximity to the food, be carriers of intestinal helminths, protozoa, and enteropathogenic bacteria. This is when the hands of the handlers can carry excreta from their feces, and they spread it into food with their fingers, thereby leading to infections in the customers. This study assessed the most influential risk factors causing food vendor's illness, identifies several of them, like the groceries, raw food and quality; food prepared and handled in the streets; transportation; absence of regulations involving time and specific holding temperature; and the environment's cleanliness. Nevertheless, the research work came to reveal that various aspects of street food safety are persistently being taken into much account in consuming what belongs to dissimilar socio-economic grouping. Therefore, since the economic benefits of street food trading are incalculable, it is very critical that authorities strengthened and implemented the policies/ regulations in order to ensure food safety. Keywords: Foodborne illnesses, Food safety, Food handling, Food vendors, Street food

# **INTRODUCTION**

The assuredness of food hygiene ensures food safety elements get seamlessly filled up from the start throughout the food involved with the production and packaging, delivery, storage, processing, selling and serving. Its main task includes administering quality checks to ensure that food remains consumable and safe even when prepared at home. But food itself is the major cause of the health problem in many developing countries where the risk of providing healthy handling is both common and challenges. The main public health goal of food hygiene and safety is the prevention of people's illnesses due to food consumption if contaminated, hence enough supply of healthy, safe and whole food is key to human's health and well-being  $\lceil 1$ , 27. Their assessment of the food hygiene practices among the Nigerian university-campus food handlers showed grossly the poor knowledge and participation in food hygiene and safety  $\lceil 3, 4, 5 \rceil$  in the university. Unfortunately, the situation was even worse: a staggering 69.6% had not had any medical care before taking a new job, and 32% lacked any health instruction. However, Ajeigbe et al postulated

that good knowledge and attitudes of workers concerning food hygiene and safety were reported from a study at fast food restaurants in Edo state Benin City. Nevertheless, their analysis showed that the knowledge and practice of food hygiene and safety were influenced by the previous training with the difference being statistically significant (P-value of 0.002). Besides that, with the food handlers who had more pace of working experience in food restaurants recording better performance of food hygiene and safety behavior (P-value of 0.036). Intriguingly, education posed a remarkable scenario; the practicing level was not significantly affected. The consumption of polluted or dysfunctional foods can make a person sad, generally lost in a deadly condition that is dubbed foodborne disease.

The issue of food borne ailments is catch as one can be a matter of world-wide public health concern, and even developed countries suffer from a wide range of such diseases. The frequency of occurrence of microbiological foodborne diseases among people in developed countries has been reported to be around

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https://www.inosr.net/inosr-experimental-sciences/ 33 % by [1]. [7] The World Health Organization also listed diarrhea and pesticide residue exposure as some of the main problems in industrialized countries, with up to 10% of these populations potentially affected by foodborne diseases on an annual basis. These diseases many times, what is in most cases diarrheal diseases with about 70% of diarrheal cases originating from contaminated food [1]. The fact of the matter is that there is a big impact of infectious diseases like those in countries of UK and USA. [7] CDC (2019) noted a worrying 76 million cases of foodborne illnesses annually in the US. Based on the permissible figure of 100,000, the risk of getting sick is more than 26,000 for every 100,000people. Additionally, the United Kingdom reports that roughly 2 million incidences of foodborne illness happen yearly, which is more than 3,400 incidences for every 100,000 people. Diarrheal diseases incidence is caused mainly by microbial pathogens hurled through water or food leading to an estimated 1.9 million lives lost annually which is the number one killer globally. Data records of such countries are less reliable than the developed ones, because of either the faulty or non-existent reporting systems in the agencies concerned [7]. Intestinal parasites and enteropathogenic bacteria pass through contaminated objects with human faeces, directly or indirectly via food, water, fingers and nails as a way of transmission. It brings a spotlight on the importance of feco-oral transmission from one human to another, i.e., human-to-human. On the other side, food handlers who maintain poor personal hygiene and provide services in food service establishments, risk to spread intestinal worms, protozoa, and enteropathogenic bacteria leading to potential outbreaks of foodborne diseases in consumers. It is certainly because of the handlers who may be holding and excreting intestinal parasites and enteropathogenic bacteria that they can either get or be the source of contamination of food with pathogens in different food which is resulting from their fingers by bacteria in the handlers' feces and thereby causing health risks to the consumers.

There are more microbes and better hiding places under the nails than other areas of the hand.

LITERATURE REVIEW

The science of environmental sanitation dates back to the ancient period when our first ancestors settled down in the same location. Its chiefly deals with this approach and the completion of appropriate health and sanitation conditions in the surrounding to strengthen public health and welfare, lift the quality of life and achieve environmental sustainability. Environmental sanitation process is involved in identifying environmental nuisances or problems and looks at ways to prevent them or Therefore, it is challenging to clean under the nails as per the study reported in  $\lceil 8 \rceil$ . The natural contaminants, which are mainly bacteria, viruses, and parasites, are the major players behind foodborne diseases. First of all, nosocomial agents are the main reason behind ceremonies in less developed countries. These range from cholera, campylobacteriosis, E. coli, salmonellosis shigellosis, typhoid and paratyphoid fevers, brucellosis, amoebiasis, and poliomyelitis [9]. Sanitation and hygiene standards encompass most of the factors that affect food safety in kitchens including sanitation of the house and personal hygiene standards through the use of health facilities such as toilets, handwashing lavatories, waste management practices and dishwashing facilities. Food handling, preparation, and service procedures are as important in terms of food safety as the food storage protocols. Factors of food preparation and utensils, food conservation system - temperature and time - and also knowledge and compliance of workers are the major factors for the food safety. In the conditions prevalent in Nigeria, it is very easy for microorganisms that are responsible for food poisoning  $\lceil 10 \rceil$  to be replicated due to the prevalence of normal atmospheric temperatures. Occasionally, meals can seem flat and bland in both smell and taste but they quickly cause illness directly after eating or sometimes after a time period because of toxins created by bacteria. Worldwide, there are approximately thirty million (30%) of people who suffer due to food poisoning every year  $\lceil 11 \rceil$ . It is estimated that as much as 70% of disease transmission cases can be traced back to meals cooked outside of the house setting. Along urbanization, industrialization and improvement of the infrastructures, people are finding their conferences in providing services in public food business. As a result, the best practice in food handling involves the use of clean utensils, equipment, and service wares, as well as the reinforcement of sterile physical appearance. This study goes shows those things that makes up the causes that affect food vending.

reduce their implications as much as possible; thus, it ensures that all of the elements necessary for survival are available and that they last for as long as possible even without being the cause of health problems. Also factor in the environmental sanitation measure as the diseases outbreak is controlled, productivity and health are enhanced, act as food poisoning preventers, and offer safety, comfort, and optimal physiological performance. Different illnesses are related to the

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incorrect removal of human wastes, unacceptable latrines structures, improper solid wastes management and inadequate drainage systems. We need to bear in mind that most of which are transmitted through the host. The accumulative influence of all those unhealthy surroundings in relation to humans would be phenomenal. If this phenomenon could be completely illustrated, then this factual situation would without any doubt be identified as a great tragedy [12]. As pointed out by [13], other usual mistakes in food handling, beside what got served as raw food, are inadequate cooking, heating, and reheating of foods; eating food from unsafe sources; and so much time elapsed to wait before the food cooled off. Nevertheless, these health factors, adequate sanitation, good hygiene and safe water, are the necessary elements for good life, social and economic development. It is extremely fitting that the current prime minister of India quoted Mahatma Gandhi who had by 1923 already written on the importance of sanitation. He said, "Sanitation is more important than independence."  $\lceil 14 \rceil$ . The provision of safe water and sanitation along with enough nutrition and essential healthcare services can reduce morbidity rates significantly; besides this, they will also decrease the severity of the diseases, particularly among children, in developing countries.

Recognizing this international problematic, the relevant monitoring structure of WHO/UNICEF joint program made it known that at least 3 billion people in the world's less-developed nations have no proper water supply facilities [15]. The other issue is unhealthy of water, sanitation and hygiene (WASH) environments, which we find in many developing countries and are mainly responsible for the diarrheal deaths of children. In the worldwide figures, 64.2 million Diability-Adjusted Life years (DALYs) occur due to unsafe water, poor sanitation, and unsustainable hygiene practices, with 52.5 million (82%) of these happening in the low-income countries. Disease burden is carried out in the burden of children with a greater share of the DALYs than in low-income countries accounting for more than 46 million DALYS which is above 88 percent (under 5 years of age). In other regions, the mortality due to unsafe water and bad sanitation is an alarming burden especially in sub-Saharan Africa (46% of global DALYs) and South Asia (34% of the thousand diseases). Generally, food wastage, ambiguous water source, and ineffective sanitation especially in the food handling are the contributing factors of foodborne illness in Malaysia. During the year 2006, a very high figure of 3,625 out of the 81,686 food premises (of which were inspected) got closed on part due to being recognized as indeed unhygienic according to the outlined regulations in

Part II of the Food Act 1983 [16]. Earlier assessments had already pointed out that inadequate food management was a leading cause of foodborne illnesses. These kinds of variations, which are well studied believe that they happen when one puts the raw food on top of the cooked food, undercooked food, and not storing the food in the right temperature. Besides the working individuals, these food service workers also act as carriers of bacteria or other food poisoning organisms [17], thus becoming a potential source of contamination. On the flip side, the availability of sufficient knowledge, and to a greater extent its transfer into behaviors especially, could be the key in preventing mishandling of foods and eventually its associated implication which affects public health and the economy.

Many aspects play a role on food handing conditions in every corner and circumstances. For instance, cities like Ankara in Turkey, Mekelle town and Bahir Dar town of Ethiopia met with central India, Bangladesh, and Nigeria who allied themselves in producing works that show significant association between proper food handling and actual food handling practice. However, Nigeria and Kenya studies done in 2009 indicated the key elements associated with food business premises, equipment cleanliness and jobs scopes to be determinants of the food handlers' practices [18]. Moreover, it is factored in that gender has a bearing on the street food handling small scale business in Nairobi, Kenya. Environmental factors are not less significant than features of individual. They equally affect some processes. The burgeon of studies has illustrated those criteria like temperature, solid waste storage and disposal, latrine condition and the accessibility of hand washing facilities connect with food handling practices. In a lot of developing countries, including Nigeria, foodborne diseases still a lot of people especially those who don't highlight food keep in safe also, food sanitation practices. The concern is augmented by poor food safety laws, weak institutions that regulate the sector, a lack of financial resources for startup mostly, and lack of training and insufficient education for food handlers **[**19**]**.

# **Risk factors**

Several factors which predispose street foods to public health risks are discussed below.

**Sources and quality of raw foods and ingredients** Street food often primarily targets customers that want to maximize the ratio between value and budget, thus vendors may turn to shady and unsafe ingredients in their effort to stay competitive and do not lose profit either, eventually bringing danger to consumers' health A survey conducted by [20] demonstrated that most Nigerian street food https://www.inosr.net/inosr-experimental-sciences/ vendors do more of the volume and price (94%, 93%) than the freshness and cleanliness while sourcing for raw foods for cooking and vending. Additionally, a study in India conducted by the  $\lceil 21 \rceil$  probing into the influence of the size of the street vendors' eating places to their procurement of food items observed the variations observed in the procurement of food items based on the size of the establishment. The type of dependents, ownership, and the average monthly income has shown their impact on the running of business which is why these habits became more important (p < 0.05). The small mobile vendors and restaurant owners normally buy from the grocery stores things with no specified packaging such as grains, semi-processed products e.t.c Moreover, over half (44%) home prepared and powdered their own ingredients while a good proportion of them (56%) used dry and powdered condiments or spices that were neither in a package nor carrying a label. Several studies have proved that pollution with Bacillus cereus in homemade cereal flour and street food preparations is a common practice, hence cases of food illnesses are increasing daily. The long-term habit of collecting samples of the 'kunu' in West Africa testified the place of B.cereus as the highest frequency fermented cereal product in West Africa observed by [22] due to the use of raw spices as condiments.

Additionally, some of the street vendors in the poor world countries use left-over perishable raw materials which are not stored in well where conditions are atrocious.  $\lceil 21 \rceil$  of the interviewed nine small restaurant owners did not have refrigeration systems, and according to some restaurants, they are storing green vegetables, raw food materials, canned/bottled foods, and milk and milk products for more than 24 hours. Furthermore, the application of hazardous edibles, such as fish from randomly poisoned or chemically treated ponds, meat and milk from sick and old animals, and vegetables carrying a large number of chemical residues, is typical of some under developing nations. Inadequate regulation and excessive mentorship undoubtedly lead to such malpractices bringing numerous dangers to consumers health. Cases of foodborne illnesses are greatly attributed to preparation of ingredients with large concentrations of microbes. All such components have the potential to harbor foodborne pathogens that pose serious health risks to consumers. Results demonstrated the presence of high APC and spore counts in gravies, even when they were grilled or otherwise cooked before consumption, as shown in a four-month-long microbiological survey of the urban Johannesburg in South Africa. [23] As well, the number of bacteria in the spiralized samples was significantly lower than the ones detected in raw apple salads. Clostridium

perfringens was isolated from three percent of the salad samples; apparently tomatoes and onions, two principal ingredients in both salads and gravies, were the main source of contamination. They might crash into the surface of the ground just next to the vegetables where there are a lot of motile bacteria and spores come from.

#### Food Preparation, Handling and Vending Streets in most countries will always be full of street foods that are prepared and fried in the temperatures suitable for elimination of vegetative cells of pathogenic microorganisms, but spores that are hardier than other microbes will definitely survive. Nevertheless, the commonly done preparation, handling and vending of street food can be re-contaminated, cross-contaminated, and spread from one person to another because of the transmission of pathogens and food eating disorders. The reason street foods are save lies in the fact that these foods are cooked in excessive quantities for advanced consumption. Time period exceeds 6 hours and the temperature remains ambient. The placement of the food in this holding zone for the extended period of time, particularly between 5 and 60 °C (usually referred to as the danger zone) is ideal for the microbial growth. $\lceil 25 \rceil$ hints at the fact that the protective surrounding of the spores at dormancy and their upcoming activity on sprouting could be one of the main reasons for the most common cases of Bacillus bacteria infection, often consume with readymade foods like street food vendors.

# Method of transportation

The main reason of the contamination and spoilage of street foods is production and display of meats. This not only causes the fast disease transmission but also the risk of zoonosis. Empty slaughtered animal meat containers are a true cause of worry in the manner of transporting them from slaughter points to retailing points. We witness less technology application in transportation usually on motorcycles, open-top vehicles, or trucks that don't follow any default route. This might be a form of cross-contamination that will cause contamination. In Nigeria the poor condition of transporting meat products from the slaughter houses to the sell points are notorious. Meat products such as beef, pork, lamb, and chicken are transported by unsuitable means of public transports like the taxis, buses, and motorbikes which is not fitted with coolers. For example, when they are transporting carcasses designed for human consumption, butchers and retailers are typically known to use them as sitting or resting platforms in vehicles, but one study claims otherwise [17].

In the African continent, the kinds of meats are marketed with an open wooden tray in markets and https://www.inosr.net/inosr-experimental-sciences/ on the streets. This eventually results in issues of proper washing and presenting hideouts for microbial contamination as well as the deposition of airborne pollutants.  $\lceil 24 \rceil$  the aerobic plate and spore counts from both raw beef and chicken sold in Johannesburg, South Africa were high, showing that these products had high bacterial levels, since this means that there was significant microbial contamination taking place. High temperatures used in processing, nevertheless, some of studies indicated elevated concentrations of microbe in the products manufactured for this purpose which is intended for street vendors. [26] UNICEF created reports that showed higher coliform counts most frequently surpassing safe levels recommended for consumption of processed beef and chicken from street vendors in Lusaka and Lagos. [27] H: credited it with recontamination from a source as diverse as vending vendors, utensil, and vendor hands.

Non-regulation of time and holding temperature Such issues are an acknowledged risk wherever they are present, and so they are also a major contributor to food poisoning outbreaks in street food preparation. In Abeokuta, Nigeria, we had the majority of vendors (90%) who prepared their products the morning of sale and 55% sellers did it Ozamiz City, Filipino, whereas the most vendors cooked foods on the spot in Kampala, Uganda (75%) and in advance (77%) for consumption [28]. Other risk factors identified in the preparation and handling of street foods include: Other risk factors identified in the preparation and handling of street foods include:

- Frequent utilization of foo stove charcoal as a desirable way of keeping and warming the food over a long time, which most of the time is cold to prevent micro-organisms reproduction.
- Relatively short-range distance heating to 40°C (which would increase salmonella contamination) and long-range distance heating at higher temperatures (which would cause loss of vitamins and minerals in food) do not allow combinations of food heating processes.
- Placing food at the ground level and directing food onto human food chain that contains dust which contamination and flies, related to foodborne diseases such as cholera and diarrheal disease [29].
- In addition, hot-and-cold dinner bars where foods in open containers remained for serving for around 10 minutes at a go, which the study carried out by [24]
- 0% of the strains of S. aureus isolated from the samples of street food in Zaria, Nigeria,

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were hemolytic. At the same time, the proportion of entero-toxigenic isolates reached 18%. [22]. It has been reported that processing and water activities tend to be heading towards the high-range leading to low water activity in products which comply with these criteria. Thus, sufficient heat and low water activity in products mostly should prevent microbial proliferation and toxin formation.

# Hygiene

The hygienic practices of street food vendors have been critically investigated by numerous studies, and these studies have corroborated the fact that most street food vendors have knowledge of the required hygiene measures, even if they rarely use this knowledge. Vendors usually demonstrate good personal health standards; however, they do most of the time break hygienic rules at the site of food preparation and distribution. Sub-par or complete lack of essential toiletries at these places is one of the main factors that lead to people not following basic cleanliness rules. Sample analysis is a good example. [30] researchers presented in their research on street food vending in Trinidad, West Indies, that about 97.5% of street vending sites do not have piped water, drainage for waste water and toilets facilities. As reported for the sites of street food selling in Kingston, Jamaica; Lima, Peru; the Philippines; and Uganda, similar scenarios were indicated. However, the absent of decent toilets and lavatories at those sites discourages some street food hawkers to sneak into nearby bushes and uncompleted buildings to empty themselves. [31] A study carried out recently in Abeokuta, Nigeria showed that 60 percent or more of the street food vendors rather prefer to use dung hills and nearby bushes instead of toilets, and they do their cleaning using the sheets of paper. Open bins were the most usual selection for garbage dumping especially in Kampala, Uganda as 92.8% of vendors used the for collection. [28] gunny bags waste Different studies pointed out the integrated garbage bins as being full at most vending points, with final garbage being disposed far away from vending spots. These piles of garbage are generated around the vending sites which become the breeding grounds not only of rodents and flies but also of insects, thus serve as an opportunity for the multiplication of microorganisms and increase the chance of food contamination and disease transmission.

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# Knowledge and Attitude of street food vendors to food safety practices

Most of the disease outbreaks linked to consumption of street foods are due to the unhygienic behavior of food handlers. Similarly, in Zhapo, a coastal resort in Guangdong, China, about 15 outbreaks of foodborne illness recorded during 2008-2011 were found to have resulted from misconduct of food sellers. The workers in different developing countries have done surveys which focused in knowing the depth of food safety knowledge, attitude towards the issues of food safety, and practices of street food vendors. The results that have been obtained by them have shown factors like education, food safety training, ethnicity, and vending environment as main elements affecting knowledge and attitudes about food safety among food vendors. [32] it was evident that a correlation (r = 0.000, p < 0.01) existed between such knowledge and attitude towards food safety practices. Among the authors who found that education and training improves the hawkers' knowledge and attitude about food safety practices [32, 21]; Raviprabha found that education had no

Street food vending plays a crucial role in the socioeconomic activities of developing countries. Its importance is evident from the substantial volume of trade, provision of ready-made meals, and employment opportunities it offers to the population along the business chain. Recognizing the benefits and contributions of street food trade to the economy of developing countries underscores the need to strengthen policies and regulations for safe

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significant impact on the knowledge and attitude of hawkers in Guwahati, Assam, India, with respect to practices such as procuring fresh foods, preventing food adulteration, and managing leftover or excess foods Finally, a survey by [33] showed that more than 66% of the food vendors in Shijiazhuang, China, who had food safety knowledge, still demonstrated food safety neglect.

# **Attitude of Consumers**

Roadside vendors bear the main burden of risk associated with the security of street food. Their concerns on food safety in the sidewalks fluctuate dependently on the social class and financial conditions. A certain portion of the consumers hankers after street foods and does not give much statement to the potential hazards, while another group sticks fastidiously to the rules concerning purchase and thus eats rarely in the streets [34]. Subconsciously consumption attitudes are determined by education level, income, food safety knowledge, age, and gender besides exposure to hazards through street foods.

#### CONCLUSION

street food vending and ensure their effective implementation. This will undoubtedly lead to a significant reduction in the hazards associated with consuming street food. Furthermore, raising awareness about unwholesome practices in street food vending through mass media campaigns and interactive programs will promote safety practices among food vendors and contribute to enhancing overall food safety standards.

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