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Review Article

The Health Implications of Street Vended Foods in Nigeria: A Food Safety Approach -A Review

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Abstract:

This review work emphasizes the value of food, the idea of selling street food, the different kinds of sellers, the locations of the vending machines, and the people who buy street food. Along with food handling procedures, it addressed the main factors that lead to microbial contamination of food, including the location of preparation, food raw materials, cooking and serving utensils, food packaging materials, the setting in which food is prepared or sold, water sources, dust, sewage, and refuse, as well as food vendors' personal hygiene. The microbiological safety of food as well as other hygienic issues related to food safety were also highlighted in this work. Food-borne diseases, such as botulism, typhoid fever, salmonellosis, bacillary dysentery, and Escherichia coli, Amoebic dysentery, Shigellosis, and so on, are frequently linked to foods that are sold. It also butressed food control systems such as GAP, GHP, GMP and HACCP; implementation of food safety policies and the benefits of food control systems.

Key words: food safety; typhoid fever; salmonellosis

1.Introduction

The practice of selling street food is widespread in Nigerian cities and towns. By definition, street-vended meals are prepared foods and drinks that are sold by hawkers and vendors on the street, or they can be eaten on the street without undergoing additional preparation (FAO, 1989). Still, they are the most accessible and least expensive way to meet your nutritional needs. The demand for food sold on the street has increased due to the unheard-of urban growth and, in particular, the rise in the number of unemployed workers. The so-called "ready-to-eat" items are typically offered by street vendors and hawkers out of improvised stalls and push carts in public areas like marketplaces, repair shops, and the like. In Nigeria, one of the most intriguing features of social life in urban and peri-urban areas is the availability of street food and street food vendors. In actuality, Nigeria's street food commerce is growing into a significant and sustainable informal sector enterprise. Like many other developing nations, street vendors sell a wide variety of meals, and Nigeria is no exception. In addition to its convenience and deliciousness, it presents numerous economic options for enterprising individuals. In addition to satisfying urban people' dietary needs, particularly those of the lower income bracket, the selling of street food increases the operators' profits.

While street food vendors are not a new phenomenon in Nigeria, the number of them has been steadily rising in recent years. The weak situation of the Nigerian economy may be the cause of this growth. For instance, social problems are occurring in Nigeria at a never-before-seen rate. The worsening economic climate has contributed to the ongoing increase in unemployment. As a result, young people are migrating to urban areas at an increasing rate. The migrants' ongoing migration has resulted in a significant demand for items that are ready to consume. Given the severe economic conditions in the nation, these foods are reasonably priced and easily accessible for the vast number of jobless people. Health professionals and international authorities continue to have major concerns about the safety and quality of street-vendered food, despite its accessibility and relative affordability (Agu, 2011). As per Ashenafi (1995) and the World Health Organisation (WHO, 1984), food items sold on the street have the potential to be contaminated by harmful microorganisms or deterioration. According to the Food and Agriculture Organisation (FAO,1997), goods sold on the street are more likely to cause food poisoning because they are handled improperly and unhygienically and since this is an unregulated economic sector.

According to studies conducted in Nigeria in 2006 and 2007 by the Federal Ministry of Health's Department of Public Health, there were over two million cases of food-borne illnesses and over 500,000 deaths. It was reported that eating food sold on the street that was tainted was a contributing factor in many of these deaths. Additionally, a comparable scenario that assumes that things may be worse in the hinterland was provided by the Consumer Protection Council survey on goods sold on the street in the Federal Capital Territory of Abuja (Agu, 2011). Foods sold by street vendors have been shown to have high epidemiological associations with disease, according to studies conducted by Abdussalam and Kaferstein (1993). Nigerians have grown to love the regional specialties that are frequently sold on our streets throughout time. It's interesting to note that Nigeria is an agricultural nation with a wide variety of foods. Regretfully, the majority of street food vendors lack knowledge on the optimal methods for food preparation, presentation, packing, and preservation. Street food varieties differ significantly between nations or regions. But the majority of meals are made up of the basic items, presented in different ways, along with accompaniments like spices, stews, and gravies. Furthermore, an assortment of ready-to-eat snacks is prepared and served, including dried meat, fish, and cereal-based foods; sausages; meat, fish, eggs (boiled); cereals; coffee, tea; porridge; root tubers (yams, cassavas, sweet potatoes, and cocoyams); maize cobs; pumpkin pieces; bananas; potatoes, carrots, onions, and garlic; whole milk; yoghurt; ice cream; mangoes; water melons; pineapples; pawpaw; beef, pork, sausages, etc. Therefore, street food vendors provide a variety of items that may be reasonably priced and beneficial to different demographic groups in terms of nutrition.

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Foods sold on the street are often seen to be unhealthy due to the conditions in which they are made and eaten, which expose the food to a variety of potential pollutants, most of which are pathogens. Since street food vendors typically deliver their goods to consumers, they typically operate out of bus terminals, warehouses, marketplaces, and other locations where there is a large and ready-to-eat customer base. Regretfully, most of the time these places don't adhere to all food safety regulations. For instance, a lot of trash can build up and serve as a haven for pest animals, diseases, and insects. Additionally, the type of utensils used has the potential to cause contamination, particularly if hazardous heavy metals leach out of them or if they are exposed to the environment in an unhygienic manner. However, some research has found that food served on the street can also be safe, giving customers another option. Therefore, in order to get the most out of the street food vending company, it must be approached thoughtfully and creatively.

This study outlines the current state of street food vending in Africa, with a focus on Nigeria. It also discusses the socioeconomic effects, safety concerns, and necessary countermeasures for this expanding problem. The study aims to investigate the following topics: the general microbiological quality of some street foods; the knowledge and attitudes of consumers and street food vendors regarding food safety; the handling practices of street food vendors to evaluate whether the methods of food preparation, storage, and presentation meet the required food safety standards; and how to ensure the safety of vended foods in Nigeria. Foods sold on the street are often seen to be unhealthy due to the conditions in which they are made and eaten, which expose the food to a variety of potential pollutants, most of which are pathogens. This study outlines the current state of street food vending in Africa, with a focus on Nigeria. It also discusses the socioeconomic effects, safety concerns, and necessary countermeasures for this expanding problem. The study aims to investigate the following topics: the general microbiological quality of some street foods; the knowledge and attitudes of consumers and street food vendors regarding food safety; the handling practices of street food vendors to evaluate whether the methods of food preparation, storage, and presentation meet the required food safety standards; and how to ensure the safety of vended foods in Nigeria.

2.0. Concept and Socio-Economic Status of Street Food Vending

2.1. Concept of street food vending in Nigeria and in Africa at large

Definition of terms

It is essential that we first search up a few related terms before delving into the specifics of the topic. Let's start by defining food: food is any edible substance that contains necessary nutrients that, when consumed by the body, rebuild and repair damaged tissues and cells, support good health, and provide the energy needed for normal bodily development and function. On the other hand, food vending is the act of selling food to members of the public (consumers) by an individual or business, and a vendor is a person who does this. More specifically, foods served by vendors or hawkers on the streets are prepared foods that can be eaten on the spot or at home. These foods are frequently consumed without further preparation on the streets or roadways.

- **Types of vendor**

According to Janie and Marie (2010), of all the street food vendors surveyed, only approximately 17.3% were on the move. The remainder kept either temporary static buildings or immovable posts.

- **Type of vending location**

Nearly half (45.5%) of the vending locations were constructed from zinc sheets or canopies. According to a survey done in Zaria, northern Nigeria, only 4% of the vending sites were made of block constructions, whereas 2.8% and 6.4% were made of mud and timber structures, respectively (Ehirim et al, 2001).

- **Food handling practices**

Nonetheless, the majority of food vendors' handling, cooking, and serving procedures for food were generally unhygienic. As a result, some food vendors don't thoroughly cleanse their raw ingredients before cooking. Due to a lack of water, vendors selling grilled fish, roasted beef or chicken, and chips only rinsed their raw ingredients once before cooking. In a similar vein, fruit vendors do not adequately wash their produce, and it is uncertain if the purity water they use will be portable. Additionally, it was noted that most food sellers cook their food on the same surface multiple times without cleaning it, and they also reuse waste water for rinsing and leftover, rancid oil for frying. Even when not in use, processed food remnants were being left on the surfaces. Without any consideration for hygiene, vendors selling fried plantain, fried yam, bean cakes, maize cake, grilled fish, and chips prepared their food on the same surface. Reusing oil has the potential to lower its nutritional value and darken its

colour due to carbon deposits formed during food frying, which can impact the flavour and aroma of the food. Some sellers offer their meal with bare hands, but very few use forks or spoons. While preparing, serving, and even handing out food for customers, some vendors were seen chewing and chatting. Foods that are being prepared or served may get contaminated by saliva from this action. The likelihood of currency being rubbed on food is increased because the majority of those working in food vending handle money while serving food. A few vendors offering plantain, chips, and fried yam offered their food on improperly cleaned plates. Therefore, it is possible that all of these circumstances will raise the risk of food contamination and, in turn, food poisoning.

- **Handling and storage of leftovers**

While some vendors may not have sold all of their things, the majority of them show their food on trays without a cover, and their houses then devour the food that was left over. For sale the following day, some sellers keep leftover food in the refrigerator, while others store it in a cupboard or container. These subpar storage facilities could make it easier for pathogenic microorganisms to contaminate.

- **Water supply**

It is important to pay attention to the water sources utilised by the neighbourhood food sellers, as some of them draw from streams, wells, and rainwater. Therefore, it is well recognised that the majority of water-borne illnesses, including cholera, can be easily contracted from dirty water that may have been tainted by faecal coliforms. Nonetheless, there is never much access to water sources near the vending places. The majority of food vendors get their water from water tankers or vendors, who typically get their water from unidentified sources. Food vendors purchase little amounts of water in an effort to save money; as a result, they do not have enough water to wash their dishes and food items.

- **The Surroundings of the vending site**

A significant portion of food vendors cook their food in filthy conditions with flies flying everywhere, and some of their stalls were situated in close proximity to waste disposal facilities in an effort to avoid creating obstacles within the selling area. Some street sellers set up shop beside filthy drainage systems that are clogged with waste from residences, workplaces, and factories. Further more, some food vendors do not properly clean their cooking equipment with lovely portable water, while others utilise recycled water to clean their dishes and utensils. Furthermore, the vast majority of them lack efficient waste disposal facilities, which are all in violation of good manufacturing practice (GMP).

2.2. Socio-economic Status of Street Food Vendors

In terms of employment opportunities, street foods are a significant socioeconomic factor in African countries. The majority of street food vendors are female heads of homes, despite the fact that their backgrounds are different. For instance, a significant portion of the population in Nigeria, where the majority of individuals are street food vendors, are women, with a notable proportion of males (particularly young men) and children. The majority of these suppliers saw themselves as employers because they hire workers to help with the operation. Street food vendors operate out of a variety of locations, such as undesignated areas, abandoned bus shelters, industrial sites, municipal markets, and cooperative markets.

2.3. Consumers of street food

In Africa, street cuisine is consumed by people of all ages. However, depending on the area, there might be variations in the kind of clients. Although it is commonly believed that children under five are fed at home, Mensah et al. (2002) found that many moms who worked at major cities' markets, like Lagos, Kano, Kastina, etc., also purchased food products from sellers to feed their infants. This has detrimental effects on the children's health.

In West Africa, men make up the bulk of street food customers (more than 65% in Nigeria, Benin, Senegal, Togo, and Côte d'Ivoire). Although the majority of the customers come from lower- and middle-class backgrounds, a sizeable portion are professionals and represent the many ethnic groups that are present in the countries in question. In addition to those with varying levels of education, the customers also include the illiterate (FAO/WHO, 2005).

2.4. Safety of street foods

Food control officials and other health organisations are increasingly concerned about the hygienic issues of street food vending. In addition to being rudimentary buildings, vending booths frequently lack running water, restrooms, sinks, and waste disposal facilities (Kubheka et al., 2001). Through awareness-raising campaigns involving a number of partners, including local authorities, food sellers, government departments, consumer organisations, standard-setting bodies, and some non-governmental organisations (NGOs), it is possible to improve the safety of street meals. In certain cases, vendors are eager to take part in initiatives that offer the bare minimum of amenities so they can operate in hygienic settings. For instance, in a poll of street food sellers in Kano and Lagos, the vendors said they would be happy to pay for utilities like electricity and running water, but they would rather that the water fountains, trash cans, and restrooms be provided by the local government. In order to enhance business circumstances and enable vendors and their families to live better lives, it is therefore recommended that local authorities, vendors, and policy makers form a strong cooperation.

2.5 Microbiological safety

The majority of people face serious health risks when it comes to street foods, thus the main worry is their microbiological safety. This is primarily due to the fact that vending is often conducted in unsanitary areas. Several microbes of public health significance, such as faecal coliforms, Escherichia coli, Staphylococcus aureus, Salmonella spp., and Bacillus cereus, have been tested for in street meals in several African nations. In a considerable number of food samples, water, hand, and surface swabs tested positive for E. Coli and S. Aureus. In Kastina and Kano States, Nigeria, samples of rice, garri, and fufu tested positive for Staphylococcus aureus and E. Coli. Mensah et al. (2002) found that out of 511 street food products tested in various African nations, mesophilic bacteria were found in 69.7% of them, Bacillus cereus in 5.5%, S. aureus in 31.9%, and Enterobacteriaceae in 33.7%. Salmonella arizonae was recovered from meat-based soup, Shigella sonnel from macaroni, and enteroaggregative E. coli from rice, tomato stew, and macaroni. While the majority of the meals tested showed microbiological quality within permissible bounds, samples of salads, macaroni, fufu, meat pies, and red pepper showed levels of contamination that were too high.

2.5 Heavy metals and pesticide residues

Food may be polluted by heavy metals and pesticide residues because of the circumstances in which street foods are sold. These pollutants could originate from the raw materials, tools, or transportation techniques that were employed. They might also arise from inadequate storage facilities. According to some research, street food vendors purchase their pots and other utensils from both official and unofficial producers and retailers. In comparison to ordinary meal samples, some of the street food samples contained greater concentrations of hazardous elements such lead, cadmium, arsenic, ferrous iron, mercury, and copper, which may have leached from the utensils. Subsequent testing revealed that if food came into direct touch with the food contact surfaces of the pots purchased from unlicensed producers, lead might seep into the meal. The scrap metal used to make these pots may come from a variety of sources, including abandoned vehicles, automobile batteries, and industrial machinery—all of which are patently unfit for use in food systems. Thus, before enough harm to health is done, its continuous use needs to be discouraged and addressed right away.

2.6 Hygienic aspects relating to Food Vending and Food Borne Diseases

2.6.1 Personal hygiene

These days, personal hygiene is a major public concern in our culture. Buying prepared meals and ingredients from street or market vendors presents a serious risk to the public's health, particularly in light of the documented lack of hygiene standards. When investigations of street food sellers have been conducted, they have typically found that the vendors lack sufficient restrooms and that some of them began working without first having a bath. To safeguard their goods, a few merchants spend the night in the locations where they set up shop. Foods and ingredients are also frequently contaminated by unclean hands and wrapping materials like nylons, reusable plastic bags, and leaves or old newspapers.

Nonetheless, a lot of merchants are conscious of the requirement to dress appropriately and neatly. A few of the female merchants have aprons and helmets on. Some market workers who handle food frequently wash their hands in the same bucket that's used to clean utensils, which could contaminate food with excrement. Another issue is that the majority of food vendors do not possess health certifications or licenses that prove they have completed a course on proper food handling methods. In order to clean their utensils, street food vendors discover that bar soap works better and is less expensive than liquid soap. They also clean ineffectively since they utilise cold water. Clean corners, plastic bowls, and cardboard boxes are common places to store washed dishes, which can cause cross-contamination or recontamination of the plates.

2.6.2 Environmental hygiene

Trash and sewage build up at food vending locations are caused by inadequate waste disposal facilities and well-functioning drainage systems. There will be a higher chance of food contamination as a result of the growing pest population. Nonetheless, the Nigerian cities of Lagos, Onitsha, and Aba in the state of Abia serve as excellent examples of this. Frequently, vending sites are not covered by city or town planning; as a result, services like garbage collection are not offered. City officials frequently struggle with the fear that by lending support to illicit enterprises, they would be seen as endorsing these activities. Vendors also do not make any contributions to the upkeep of public services or infrastructure because vending operations are prohibited. This leads the location where the food is sold to progressively deteriorate in terms of hygiene.

Inadequate food storage and transportation circumstances are also a result of unhygienic surroundings in the food vendor area. There is less worry about the safety of these raw ingredients because street food vendors in several Nigerian states and cities source their veggies, maize meal, and other seasonings from illegal stores. All of the vendors do not, however, have permanent stalls where they may keep their raw supplies on hand. Their items are typically stored at home overnight and then transported to their operating areas the next day, frequently with inadequate covering. Food becomes more vulnerable to contamination during transit as a result.

2.6.3 Food borne illnesses

Food-borne illnesses, such as food infections and food intoxication, can develop as a result of consuming live microorganisms or their harmful metabolites (toxins), which are created as a result of the major bacteria (pathogens) in the meal. Nonetheless, a number of food-borne illnesses are brought on by pathogenic microbes (such as Salmonellosis, Botulism, Bacilliary dysentery, Amoebic dysentery, Shigellosis, and Staphylococcus aureus, Escherichia coli, and Shigella, among others, (Mensah et al., 2002

3.0. Food Control Systems

In order to safeguard customers from food poisoning and dishonest food traders, food producers, processors, retailers, and national or municipal authorities implement a systematic set of measures known as food control. Food control makes ensuring that all foods produced domestically or imported into the nation meet all applicable food safety regulations. Therefore, food laws, a food inspection division, food analysis facilities (labs), and information management and distribution comprise the food control system.

Nonetheless, this method of managing food safety systems involves applying Hazard Analysis and Critical Control Point (HACCP) systems, Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), and Good Agricultural Practices (GAP), as well as traceability/recall and food safety management systems. It is thought that GAPs, GHPs, and GMPs are prerequisite systems or programmes (PRPs) for implementation of HACCP systems (CAC, 2003).

3.1 GAP/GHP/GMP

To create safe food, certain steps are necessary, including GAP, GHP, and GMP. These specifications are necessary for all food enterprises and are a precondition for HACCP. Basic food safety principles known as "GAPs" are concerned with reducing physical, chemical, and biological risks during the initial stages of production. GHPs require that all employees who work directly with food, surfaces that food may come into contact with, and materials used in food packaging adhere to sanitation and hygienic procedures to the level required to prevent food contamination from direct or indirect sources.

Many countries' foods laws mandate that the owner of a food business be accountable for the hygienic standards of his establishment. Food businesses evaluate their own standards and make decisions on the processes and procedures that assure good food hygiene practices, which is one of the fundamental components of GHPs. The government and the food sector can work together to create industry guidelines for proper hygiene that are based on the Codex Recommended International Code of Practice for General Principles of Food Hygiene (CAC, 2003). Government and industry should both profit from the creation of industry guidelines, which have the ability to combine the best aspects of both private and public regulation.

The following requirements may be met by the industry in order for an industrial handbook on good hygiene to receive formal recognition (Holt and Benson, 2000):

• has a valid technical foundation;

• has adhered to the format recommended by the government;

• gives guidance on compliance with all sections of the rules pertinent to the sector and guidelines relating to GMP.

• gives an adequate definition of the sector to which it relates.

3.2 HACCP

The Codex Hazard Analysis and Critical Control Point (HACCP) system is widely acknowledged as the most effective way to guarantee food safety from the point of primary production to the point of final consumption. This is especially true when combined with the prerequisite programs (CAC, 2003). Food safety hazards are identified, assessed, and controlled using a systematic process called Hazard Analysis and Critical Control Points (HACCP) (CAC, 2003). By using a methodology that expands upon the frameworks established by the GAP/GHP/GMP prerequisite programs, HACCP guarantees food safety. It pinpoints the stages of the food manufacturing process that need ongoing supervision and oversight to ensure that the procedure maintains within predetermined bounds. The Codex strategy is applicable at every stage of the food chain.

International food trade now requires Codex-based HACCP, although it is not a cure-all for issues with food safety. It needs to be combined with efficient prerequisite programs. The integration of GAP/GHP/GMP and HACCP is especially advantageous since it enables the HACCP system to concentrate on the actual essential determinants of food safety through the efficient implementation of GAP/GHP/GMP. By using a HACCP-based strategy, food businesses, including small and medium-sized businesses, or SMEs, can show that they have a systems-based approach to ensuring the safety and quality of their products.

4.0 Overview of Challenges to Achieving Food Safety

Achieving food safety is hampered by a number of factors, particularly for neighbourhood food vendors. These are listed below: **External obstacles include:**

a. Insufficient government infrastructure and commitment;

b. Absence of legal requirement (for HACCP) and/or poor management;

c. Lack of effective education and training programs;

d. Inadequate communications and awareness on food safety.

Internal obstacles within local food vending include

: a. Inadequate basic food hygiene;

b. Lack of expertise and information;

c. Human resources and financial constraints;

d. Inadequate infrastructure and facilities. (WHO, 2005).

4.1 Controlling of Food Safety and Quality

Global recognition has been accorded to food safety management systems founded on the GHP/HACCP principles as indispensable instruments for improving food safety and averting food-borne illness incidents. Transnational supermarkets and significant food export markets now have to adhere to GHP/HACCP standards. However, a number of obstacles prevent many small and medium-sized food vendors globally from implementing HACCP and GHP at a high enough level. In order to promote food safety management systems in local food vending, it is necessary to take a logical approach to removing obstacles and outlining the obvious advantages of these systems to both consumers and local food sellers. These kinds of projects heavily rely on organisational, cultural, economic, and geographic elements that differ from nation to nation.

4.2 Benefits of GHP/HACCP

GHP/HACCP implementation has definite advantages for the government, food businesses, and consumers. The anticipated advantages listed below should persuade organisations and authorities to adopt GHP/HACCP (Jirathana, 1998; OMAF, 2004; Taylor 2000 & WHO, 1999). Nonetheless, the advantages come with the following:

- Lower risk of food-borne illnesses;
- enhanced knowledge of food safety;
- enhanced trust in the food supply;
- enhanced market accessibility;
- decreased production costs (less food recalls and waste);
- enhanced staff and management commitment to food safety;
- decreased risk to the business;
- enhanced food security;
- more effective and focused food control and trade facilitation, etc.

4.3 Implementation of food quality/safety management systems

Numerous nations that have successfully implemented GHP/HACCP attest to the fact that government commitment, support, and collaboration with industry and trade groups are likely the most essential components in the establishment of food quality management systems (OMAF, 2004). It is the duty of the food industry to provide mechanisms that guarantee the production of food that is both safe and of excellent quality. Nonetheless, the government's job is to audit the mechanisms for conformity when they are put in place (FAO/WHO, 2005).

A comprehensive food safety management system implementation is thought to require the following components:

a. a national food safety policy; and

b. a food safety/quality management system strategy (GHP/HACCP).

5.0 Conclusion

Foods sold on the streets have grown in significance in the majority of African nations. Nonetheless, the suppliers are still working in unsatisfactory conditions. To increase the security of food sold on the street and the standard of living for street vendors throughout Africa, particularly in Nigeria, coordinated measures are required. Food handlers require additional information on food safety, which can be provided by billboards, radios, televisions, and posters, among other media means. Even the street food vendors acknowledge the necessity for frequent health inspector visits and on-site training to reinforce key aspects of safe food handling practices. The infrastructure required to increase the safety of food sold on the street should be provided by local authorities, and food vendors should be encouraged to operate out of recognised locations.

Food safety is therefore a shared duty of all parties involved, particularly civil society, consumers, and industry, which needs to have a single goal in order to prosper. Improved efficacy and thus better consumer health protection necessitate cooperation and coordination at the national, subregional, regional, and worldwide levels.

Authors' Contributions

This work was carried out in collaboration between all authors. **Ofoedum Arinze Franscis:** conceptualization, design and writing of original draft of manuscript, data curation, review and editing of manuscript. **Odimegwu Euphresia Nkiru:** review and editing of the manuscript, **Olawuni, I.A.** and **Ndukuba, O.E**: review and editing of manuscript. **Ugwoezuonu, Judith N:** Review of manuscript. **Alagbaoso, S.O** and **Uzoukwu, A.E:** Review and editing of manuscript**. Uyanwa Clara Njideka** and **Okezie, Paschal:** Review of manuscript**. Anaeke, E.J** and **Odeyemi Tokumbo Alaba:** Literature search, collection of data and review. All authors read and approved the final manuscript.

Competing Interest

The authors have declared that no competing interest exist.

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