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Perspectives of Food Safety Challenges of Selected Food Commodities in Sub-Saharan Africa: A Review

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Abstract

This paper gives some perspectives on the food safety challenges of countries in Sub-Saharan Africa (SSA) on health, trade and the economy as well as food safety issues associated with selected food commodities. Sector-specific challenges affecting the horticulture, cereals and grain legumes, poultry, dairy and aquaculture in the SSA region are highlighted. It is well understood that SSA countries suffer enormous losses in trade and ultimately overall Gross Domestic Product (GDP) as well as disease burden due to unsafe food. In summarising the overall narration on these aspects, the paper finally argues that in addressing these challenges to facilitate trade and improve public health, a multi-sectoral and integrated approach involving all the relevant stakeholders is required.

Keywords: food commodities, food safety, health, Sub Saharan Africa, trade

1. Introduction

Sub-Saharan Africa (SSA) produces a variety of food and food products at both subsistence and commercial levels. These include local and indigenous foods such as cereals and grains, roots and tubers, fruits and vegetables, livestock, nuts, and forest products. These foods are a potential resource that is currently underutilized due to limited information on methods of preparation, nutritional value, quality and safety. Additionally, these foods have the potential to create employment and contribute to increased income for households as well as to the overall gross domestic product (GDP) of Sub-Saharan countries. Limited information on methods of preparation, nutritional value, quality and safety of these foods hinders the potential to unlock the much-needed social, economic, cultural and health benefits from these food resources (Food and Agriculture Organisation (FAO), 2002).

Among the bottlenecks hindering the exploitation of the above-highlighted benefits, food safety challenges seem to be predominant across value chains. These challenges among others include; safety of foods produced by the farmers, food sold directly to the public, street-vended foods, and imported foods. Since food moves from farms to consumers via supply chains composed of multiple actors, food safety hazards (biological, chemical and physical) can enter the food chain at any stage from farm to fork through various stages that include production at the farm, storage, transportation, processing, distribution, retail and consumption.

According to FAO and World Health Organisation (WHO) (2003) hazards emerge from

- the design of the food and agricultural systems, such as intensive livestock operations and the globalisation of distribution and processing
- technologies and their by-products, such as the use of pesticides, heavy metals, growth promoters, antibiotics, fertilisers and genetically engineered crops and foods
- technologies introduced to solve other food safety and quality problems, including additives and irradiation
- adulteration (intentional or unintentional)
- new approaches to food as health delivery agents, functional foods and edible vaccines
- poor hygiene and sanitation, and other food safety risks

Food safety hazards are of serious public health concern worldwide with far-reaching consequences that include outbreaks of food borne diseases, medical costs, loss of lives, long-term debilitating effects and loss of productivity. The problem of food borne diseases is further compounded by the emergence of antimicrobial resistance (AMR). In addition to public health concerns, access of food commodities to both local and export markets may be limited due to the failure to meet food trade regulations. Ensuring food safety is vitally important especially to Small and Medium Enterprises (SMEs) particularly those in the horticulture, aquaculture and poultry sectors as they are constrained by limited resources and lack of expertise concerning food safety standards and management systems. Adequate control through food safety management systems integrating the prerequisite programs (PRPs) and principles of Hazard Analysis and Critical Control Point (HACCP) application steps is thus essential.

Governments of respective countries in SSA have the responsibility of ensuring food safety from farm to fork to protect the consumer and maintain consumer confidence in the food systems through food safety policies, legislation and its implementation. However, SSA governments face the following food systems challenges among others; limited financing of food safety activities, difficulties in coordination of food safety function, resulting in overlap and duplication of functions, inadequate locally accredited labs for food safety analysis and insufficient laboratory analysis capacity and capabilities. In addition, there is a problematic application of food standards despite the presence of regulatory bodies (Cudjoe et al., 2022). Further, there is unavailability of reliable information on the extent and the magnitude of food contamination (Nguz, 2007; Grace et al., 2014), that consequently result in inadequate scientific-based evidence to support risk assessments which should inform and support decision-making and establish food safety control measures. This is further compounded by the inability to fully utilise technology (Bicaba, Brixiová & Ncube, 2017).

The respective governments must recognize the vital role that an integrated food quality and safety system plays in enhancing competitiveness and protecting the health of consumers. This requires the involvement of various government ministries, research institutions, universities and other relevant stakeholders to enhance food safety. In addition, some infrastructure for food safety such as a unified agency for food control, standards body, certification and inspection bodies and laboratories essential for local and international trade of food commodities must be available. Technical interventions are straightforward, however, institutional arrangements for food safety governance could be more challenging as they usually involve health, agriculture, fisheries and livestock, commerce, trade and industry ministries and various other government agencies. Addressing these challenges requires a multi-sectoral and integrated approach involving all these relevant stakeholders.

The scope of this review gives some perspectives on food safety challenges in SSA. The paper has attempted to highlight the impact of food safety challenges on health, trade and the economy as well as food safety issues associated with selected food commodities.

2. Methodology

This study review followed a systematic approach to understand the food safety challenges in SSA with the focus (inclusion criteria) on health, trade and economy and specific food safety issue affecting selected commodity value chains. The review was done from June, 2023 to August, 2024, broken down into three different searches. Search 1 was conducted from June 2023 to November, 2023, search 2 was conducted from January, 2024 to April, 2024 and search 3 from May, 2024 to August, 2024.

Document analysis approach, a systemic procedure for reviewing or evaluating documents both printed and electronic (Bowen, 2009), was used to analyse information on the subject under review. Search styles adapted the Boolean operators such as “AND” “OR” and “NOT”. The analysis followed two search themes using a combination of keywords to search for literature.

Food safety challenges, health, trade, economy and Sub-Saharan Africa were keywords used in the first theme, on the impact of food safety challenges on health, trade and the economy. Food safety challenges, horticulture, poultry, cereals and grain legumes, dairy, aquaculture and Sub-Saharan Africa were keywords used in the second theme, on food safety issues associated with selected food commodities. Studies that were outside these commodities were excluded as they were outside the scope of this review.

In both search themes, search engines including Google, Google Scholar, ScienceDirect, and PubMed were used, and in all 1175 documents were found. The 1175 documents included books, technical reports, review articles and research articles. After screening, duplicates, documents whose references could not be traced and those that did not discuss the research topic were excluded. After scrutinising the titles, abstracts and full-text articles using the inclusion and exclusion criteria, a total of 62 papers that referenced, the research topic was collected.

3. Impact of Food Safety Challenges on Heath, Trade and Economy

Food safety hazards pose serious public health concerns and contribute to the global burden of food borne diseases. This burden is substantial to an extent that about one (1) in 10 individuals fall ill and 33 million lives are lost annually (WHO, 2022). Food borne diseases can be deadly especially in children under the age of five (5) accounting for about one (1) in every three (3) deaths (WHO, 2015). Food borne diseases are due to food infection such as cholera, salmonellosis, listeriosis, campylobacteriosis (Gupta, 2017) and food intoxications such as aflatoxicosis, heavy metal, pesticides and other chemical poisoning (Mutua et al., 2021). Further, the burden of food borne diseases is exacerbated by AMR (Adinortey, 2014; Kunadu, et al., 2018) that complicates the treatment of diseases (Stewardson et al, 2016). Consequences related to AMR such as longer hospital stays, increased cost of treatment and societal costs that include death and loss of productivity have been reported previously by Prestinaci et al., (2015). This is even compounded further by food handlers who are generally aware of food safety issues but have limited acceptable attitudes and practices (Saidu, 2020; Alemayehu et al., 2021) that lead to food contamination and consequently food borne diseases. Limited acceptable food safety attitudes and practices are due to inadequate food safety knowledge (Saidu, 2020; Alemayehu et al., 2021), particularly of food hazards. Despite all these issues, estimates of the risks and burden of foodborne disease to support decision-making in most countries in SSA are limited.

For purposes of regional and international trade, food products must meet sanitary and phytosanitary (SPS) requirements. Countries in SSA are affiliated to the World Trade Organisation (WTO) and regional bodies such as the Southern African Development Community (SADC), Common Market for Eastern and Southern Africa (COMESA) and Economic Community of West African States (ECOWAS) in terms of SPS standards and have the obligation under the agreements of applying SPS measures. WTO- SPS Agreement sets out the importance of SPS measures to protect human, animal and plant health and facilitate safe trade (WTO, 1998).

However, in most cases, foods from SSA fail to meet SPS requirements and hence do not benefit from lucrative markets. Potentially this translates into economic losses. This is in part due to the majority (85%) of the total marketed food supply in SSA being handled by SMEs (Reardon et al., 2019) with limited technical capacity (Liverpool-Tasie et al., 2020) such as inadequate basic knowledge of food safety management systems (PRPs (Good Agriculture Practices (GAPs), Good Veterinary Practices (GVPs), Good Manufacturing Practices (GMPs), Good Hygiene Practices (GHPs), and Good Storage Practices (GSPs)) and HACCP) coupled with inadequate monitoring and surveillance of food for safety along value chains. In addition, these SMEs have limited access to finance (Liverpool-Tasie et al., 2020) resulting in inadequate basic equipment for proper thermal processing, cooling and sterilisation coupled with erratic power supply, packaging and labeling of food. Further, there is inadequate appropriate transport for food commodities leading to the use of inappropriate vessels, inadequate systems to facilitate traceability in animal and plant products from farm to fork and a lack of proper channels of knowledge and technology transfer from researchers to these stakeholders.

4. Food Safety Issues of Selected Food Commodities

Food systems face varied food safety challenges due to their complex nature. According to IFPRI (2020), food systems are the sum of actors and interactions along the food value chain - from input supply and production of crops, livestock, fish, and other agricultural commodities to transportation, processing, retailing, wholesaling, and preparation of foods to consumption and disposal. At each and every stage of the food value chain, hazard may occur if adequate food safety control measures are not put in place. This is further complicated by weak food control systems especially in most countries of the SSA where mandatory enforcement activities are irregular. In the following sections, specific food safety challenges for selected commodities are highlighted.

4.1 Horticulture (Fruits and Vegetables)

The horticultural sector plays important roles in human nutrition, health, and boosting the economy particularly through employment creation and income generation in SSA countries (Joosten et al., 2015). The full potential of this sector is not fully exploited due to food safety challenges that occur at pre-harvest and post-harvest stages. At pre-harvest stage there are several routes through which fruits and vegetables become contaminated with food hazards which include pesticides, fertilizers and environmental contaminants (heavy metals and other pollutants) (Omwenga, et al., 2021). Chemical pesticides, fertilizers and environmental contaminants are an important concern for consumers.

During post-harvest activities (harvesting, handling, storage, processing, packaging, transportation and marketing), pathological, physiological and physical damage may predispose fruits and vegetables to microbiological hazards. Post-harvest operations create surfaces upon which enteric pathogens can more easily attach and often cut surfaces of produce also release large amounts of nutrients that are readily utilised by

spoilage and pathogenic micro-organisms (Alegbeleye, Singleton, & Sant'Ana, 2018) Spoilage organisms include bacteria, yeast and fungi, while pathogenic micro-organisms include *Escherichia coli* O157:H7, *Salmonella* species, *Shigella* species, *Listeria monocytogenes, and cryptosporidium.* Other hazards such as antimicrobial agents (disinfectants/sanitizers), colouring substances and preservatives may occur during processing and packaging operations. These hazards may persist along the value chain until they reach the consumer and cause adverse health effects. Hazards associated with post-harvest activities are more relevant to big cities where fruits and vegetables are sold through street vending and open markets. The farm produce sold include tomatoes, onions, peppers, cabbages, tubers, leafy vegetables, and various squashes.

4.2 Cereals and Grain Legumes

Cereals and grain legumes are important staples that help with the daily sustenance of people through the provision of carbohydrates and protein. The commodities play a key role in food and nutrition security, income generation and maintenance of the environment in most smallholder farming systems in SSA (Vanlauwe et al. 2019). The major cereals are maize, sorghum, millet, rice and wheat, while the major grain legumes are cowpea (*Vigna unguiculata* (L.) Walp.), chickpea (*Cicer arietinum* L.), groundnut (*Arachis hypogaea* L.), common bean (*Phaseolus vulgaris* L.), faba bean (*Vicia faba* L.), pigeonpea (*Cajanus cajan* (L.) Millsp.), and soybean (*Glycine max* (L.) Merr.) (Vanlauwe et al. 2019).

Cereals and grain legumes can be considered to present a lower risk to food safety than many other foods (Alldrick, 2017). Nevertheless, there are a number of potential hazards, which, if incorrectly managed, pose a significant threat to consumer health (Alldrick, 2017). These hazards can either be chemical or microbiological in origin and arise at specific points in the production and supply of grain as well as in the eventual manufacture of the food eaten by the consumer (Alldrick, 2017). Contaminated food enters and remains in the human food system, especially in situations of limited food availability and access.

Chemical hazards that are persistent in cereals and grain legumes include artificial and naturally occurring chemical substances as well as heavy metals. Pesticides which include insecticides, herbicides and fungicides, are frequently used in the farming systems in SSA to control, prevent or destroy any pests and diseases which may invade crops. However, the use of pesticides in most SSA countries is often indiscriminate and inappropriate to achieve high yields. Consequently, this often leads to the presence of residues in the crops after harvest with the potential to cause adverse (chronic and acute) health effects, pesticide resistance in pests, soil and groundwater pollution and poisoning of non-target (beneficial) organisms (Tambo et al 2021). And even worse, some pesticides that are either banned or restricted in developed countries are still in use among farmers in SSA (Jepson et al., 2020).

In addition to the use of chemicals during production, soils contain heavy metals such as copper, zinc, lead, cadmium, cobalt, manganese, arsenic and iron that contaminate the crops during production pose another chemical threat to public health (Tchounwou et al., 2012; Okereafor et al., 2020). Several pesticide poisoning have been reported in some countries of the SSA (Saoke, 2005; Ajayi & Akinnifesi, 2007; Banjo et al., 2010).

The mycotoxins most commonly associated with cereals and grain legumes and their products are aflatoxins, ochratoxins, patulin, fumonisins, zearalenone, and deoxynivalenol with potential for causing serious health problems in humans (El-Sayed, Jebur, Kang, & El-Demerdash, 2022). Prolonged exposure to low amounts of these toxins is a risk factor for human diseases, including cancer, kidney diseases and childhood stunting (Misihairabgwi et al 2019). Of these mycotoxins, the largest burdens on public health result from exposure to aflatoxin and fumonisin. Based on anecdotal evidence in most SSA countries, including Zambia, the majority of mycotoxin-contaminated food is consumed (Nabwire et al., 2019).

The use of feed prepared from contaminated cereals and grain legumes has also been shown to affect animal health, potentially affecting meat and milk production.

There is generally insufficient knowledge about the impact of exposure to chemical hazards which is of serious concern in most countries of the SSA region. Therefore, awareness about the risks of chemical contamination is important to reduce health impacts in the region. In addition, there is a need to improve the capacity for detecting and measuring chemical contamination to generate information that should support Risk assessment and decision-making processes.

4.3 Poultry

Poultry is one of the fastest growing agricultural sub sector that plays a vital role in improving livelihoods, food and nutrition security and poverty alleviation in most developing countries (Kejela et al., 2019). The sector provides an affordable dietary product for the consumers and profit for the producer (Rodic, Peric, Stojcic &

Vukelic, 2011). Chickens are the most commonly farmed species worldwide, with over 90 billion tons of chicken meat produced annually (Nhung, Chansiripornchai & Carrique-Mas, 2017).

In SSA this sector is dominated by SMEs that usually have inadequate resources and skills in poultry production. As a result, the sector is experiencing food safety challenges attributed to poor rearing and hygiene practices. For instance, poor rearing practices such as inconsistent administration of antibiotics when treating infected poultry, overcrowding due to poor housing, contaminated feed and drinking water, poor sanitation and hygiene practices during slaughter (Ngunguni, Moodley, Msefula, Mkakosya & Muloi, 2024). In addition, poultry and poultry products are usually sold directly to consumers with no monitoring system to ensure safety. According to WHO, 2017 most farmers slaughter their birds without adequate slaughter facilities as it is expensive to use established slaughter abattoirs.

Due to the above raised concerns, safety of poultry continues to be a major concern for consumers. Several food safety hazards affecting the poultry industry have been documented previously. According to Wahyono & Utami (2018) food safety hazards associated with poultry can be divided into three categories: chemical hazards include contaminants such as toxic chemicals, unsafe levels of cleaning and sanitizing chemicals, and biological hazards include organisms such as bacteria, viruses, fungi, and parasites. Biological hazards of concern in most countries of the SSA region include *Salmonella* spp, *Campylobacter* spp, pathogenic *E. coli* (Hurtado et al., 2017; Adesiyun et al 2020). Additionally, antibiotic resistant pathogens persist along the value chains. Furthermore, the issue of antibiotic residues continues to be an added challenge to the sector.

In the eggs and egg products sub-sector in SSA, several factors such as poor hygiene practices, source of the eggs, inadequate and inappropriate storage conditions, as well as inappropriate transportation, contribute to the potential for contamination and foodborne illnesses (Hurtado et al., 2017; Whiley et al., 2015).

4.4 Dairy

Milk has a high nutritional value and contributes to food security in SSA (Fraval et al., 2019; Neumann, Harris, & Rogers, 2002). Milk and milk products serve as staples in the diets of both young and old around the world. In SSA, the dairy sector is mostly dominated by SMEs with limited food safety knowledge, infrastructure and financing instruments. These factors contribute to poor livestock production practices. With regards to the food safety aspect, milk and milk products pose many challenges, given that they are excellent media for the growth of many pathogenic and non-pathogenic microorganisms. There are many factors that may contribute to unsafe milk and milk-based products (Lubote, Shahada & Matengu, 2014), and these may be governance, structural, human resource or animal health related. According to FAO (2004), challenges in food safety in Africa are precipitated by poor food safety systems, lack of systematic surveillance, underdeveloped human resources and insufficient capacity to determine the magnitude of the problem. Microbiological characteristics of milk and milk-based products are key in determining their quality and safety. The microbiological quality of milk and milk-based products depends on several factors, including the health status of animals (Tryness, Matope & Petronella, 2011; Cabbold & Desmarchelier, 2000), and milk handling and storage practices. Practices with possible influence on milk microbiological quality that have been reported in SSA include muddy cowsheds, unconventional animal feed sources, re-use of spoilt raw milk, milk adulteration, acceptance of low-quality milk for processing, and lack of cold chain (Kaimbi, Fevre & Alarcon et al., 2022).

Raw milk and milk-based products can thereof be a source of zoonotic agents, such as *Campylobacter*, *Brucella, Mycobacterium, Salmonella*, *Listeria monocytogenes*, *Yersinia enterocolitica*, verotoxin-producing *Escherichia coli*, and *Staphylococcus aureus* (Schoder, et al., 2013; Berge & Baars, 2020). *S. aureus* is one of the main causes of foodborne intoxication as it produces heat-stable enterotoxins in foods at higher bacterial counts (Benkerroum, 2018).

Besides the biological hazards, the dairy sector in SSA is facing other food safety challenges that are attributed to the administration of veterinary drugs, such as the presence of drug residuals in the milk and milk-based products, and antibiotic resistance of zoonotic agents (Asiimwe et al., 2017). The presence of drug residues in milk and milk-based products causes microorganisms to be resistant to antibiotics. According to Mwansa et al., (2023), Antimicrobial Resistance (AMR) poses challenges in managing and treating infections in both food animals and humans due to the increase in the number of infections, prolonged duration of infection, limited choice of empirical treatment antibiotics, and complications resulting from failed treatment, consequently resulting in increased cost to society. The presence of antibiotic residues in milk has been reported to be a source of many public health problems (Madougou et al., 2019), such as hypersensitivity reactions, carcinogenicity, mutagenicity, teratogenicity, bone marrow depression and disruption of normal intestinal flora (Okocha et al. 2018).

4.5 Aquaculture

The fishery sector plays an important role in trade, food and nutrition security, employment and rural development for SSA countries (Tran et al., 2019). Fisheries can be broadly classified into three (3) categories: inland capture fisheries, inland aquaculture and marine fisheries according to Shamsuzzaman et al., (2017). Current trends show that inland capture fisheries represent the most important source of fish supply in many countries in SSA (Tran et al., 2019). Due to increased demand for fish and fish products in the region, governments of respective countries in SSA are promoting inland aquaculture (Tran et al., 2019). Promotion of this initiative may partly be attributed to fish being a cheaper source of protein and also because this sector is viewed by these governments as one with potential for employment creation especially for the women and youth (Chan et al., 2019). According to FAO (2020) aquaculture is defined as the farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants.

The promotion of inland aquaculture in the region has generated interest among several stakeholders. In Zambia, for instance, a number of aquaculture businesses have been set up and are fully operational. The sector has attracted players from varied backgrounds some of which do not have adequate infrastructure, resources and relevant skills to efficiently run these businesses. Besides the above mentioned limitation for individual player, institutional capacities to coordinate and regulate the sector are not well established. The above scenario is therefore likely to pose a challenge to the success of these businesses, more so with regards to the production of fish and fish products that are safe for human consumption. Hazards and risks which may adversely affect human health are inherent in all human food production including aquaculture. Similarly, the FAO (2016), highlighted both institutional and enterprise level challenges that include inadequate enforcement of fisheries and aquaculture regulations, poor coordination among multiple stakeholders, inadequate control on fish farming zones, difficulties with access to land, poor control of discharges into water bodies, poor access to financial credits (especially SMEs), high cost of supplementary fish feed, high cost and shortages of quality fish seed, lack of technical expertise and experience and unavailability of skilled workforce.

The food safety hazards associated with fish and fish products are mainly biological and chemical in nature. Biological hazards are mostly bacteria, parasites, fungi and viruses to a lesser extent in tropical environments. Chemical hazards are pollutants (heavy metals), mycotoxins from contaminated feed, drug residues, pesticides from water run-off, cleaning agents, disinfectants and sanitizers.

5. Conclusions and Recommendations

Food safety challenges pose serious threats to public health, trade and economy of the SSA countries and cut across sectors of the food value chains. While it is noted and acknowledged that countries in the SSA region have competing priorities of national interest, food safety must be placed among the top priorities of national policy focus. Addressing these challenges requires a multi-sectoral and integrated approach involving all the relevant stakeholders. This requires effective and efficient evidence and risk-based national food safety systems that would ensure food safety thereby facilitating trade and improving public health.

Achieving this realisation, requires the following preconditions;

5.1 Food Safety Governance

To avert recurring food safety challenges and subsequently facilitate trade and protect human health, respective governments in SSA countries require strong leadership, commitment and political will. The presence of an agency that ensures food safety in each country of the SSA region with oversight (planning, data collection, policy and regulation development, and inspections) on agriculture, health, trade and other food safety-related sectors would eliminate organisational fragmentations that result in overlap and duplication of functions. This agency must be working in collaboration with a technical advisory body for scientific guidance and support. The technical advisory body would be engaged in periodic reviews of current and future food safety challenges, conducting risk assessments among other things. Beyond the above, respective governments must assure financial commitment to support food control systems.

5.2 Capacity Building

Respective countries in the SSA region must aim at building capacities of laboratory facilities to accredited status with Standard Operating Procedures (SOPs) in place. Again, there must be a deliberate policy by governments to build capacities of human resources including experts in different areas of food safety (laboratory, metrology, surveillance and inspection, standards development, certification, enforcement, and Information and Communication Technology (ICT). Further, governments must provide food safety management services (training and outreach programs) to SMEs that are the majority players in food systems.

5.3 Physical Infrastructure

It is imperative that countries in SSA region must invest in physical infrastructure including laboratory, processing facilities, sanitary facilities, clean water, cold chain, electrical energy and transport in order to build a robust base for effective and efficient risk-based national food safety systems.

5.4 Surveillance and Risk Analysis

In order to have a functional risk-based food safety system, countries in SSA must invest in analytical capacities to assess food safety risks from microbial, chemical and physical hazards and plan for mitigation measures for both current and future food safety challenges. This should constitute effective and efficient food safety surveillance system that would generate pertinent and technical data (inspection, laboratory and epidemiology). These data form the basis for risk assessments and provide scientific and technical advice for standards development, and ultimately influencing policy formulation. Finally, there is need for effective communication of food safety risks and interventions with stakeholders.

5.5 Consumer Food Safety Awareness and Education

Countries in SSA region must invest in consumer food safety awareness and education to minimize foodborne diseases. This awareness and education should primarily focus on sources of food hazards, food sources, personal hygiene, adequate cooking, cross contamination, safe temperature (for cooking, reheating and cooling). This action would reduce food contamination and ultimately improve public health.

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Authors contributions

All authors contributed equally to the literature search, writing and reviewing of the final manuscript, and have finally approved the manuscript for publication.

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Competing interests

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Informed consent

Obtained.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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