



<https://africanjournalofbiomedicalresearch.com/index.php/AJBR>

Afr. J. Biomed. Res. Vol. 28(3s) (April 2025); 138-155

Research Article

Selected Traditional Nigerian Foods and Their Impact on Chronic Non-Communicable Diseases – A Review

Anthony Obilana^{1*}, Abiodun Famakinwa¹, Oluwafemi Omoniyi Oguntibeju²

^{1*,1}Department of Food Science and Technology, Faculty of Applied Sciences, Cape Peninsula University of Technology, Bellville 7535, South Africa.

²Phytomedicine & Phytochemistry Group, Department of Biomedical Sciences, Faculty of Health and Wellness Sciences, Cape Peninsula University of Technology, Bellville 7535, South Africa.

***Corresponding author:** Anthony Obilana

*Email: obilanaa@cput.ac.za; (AO) Tel.: +27-60-525-6292

ABSTRACT

This review acknowledges the global rise in non-communicable diseases (NCDs) and highlights the specific impact on low- and middle-income nations like Nigeria. It underlines Nigeria's potential increase in health-related expenditures, aligning with international trends. The shift towards exploring the nutritional benefits of local foods is attributed to the escalating prevalence of NCDs, prompting a paradigm change favouring healthier dietary choices. This exploration aims to investigate and understand the nutritional and functional aspects of traditional Nigerian foods, such as beans, red palm oil, and ogi. The focus is on unravelling their impact on health, exploring their cultural significance, and promoting awareness of the health benefits of these foods within the Nigerian context. The exploration employs a comprehensive review methodology, analyzing existing literature and research on traditional Nigerian foods. Information is gathered on the nutritional content, biochemical composition, and techno-functional properties of staples like beans, red palm oil, and ogi. The investigation thoroughly examines traditional recipes, cooking methods, and cultural significance to provide insights into the health benefits of these foods. Additionally, the review considers studies on consumer awareness and industry efforts related to functional foods in Nigeria. The exploration results reveal a rich tapestry of nutritional and functional aspects associated with traditional Nigerian foods. Analyzing staples such as beans, red palm oil, and ogi highlights their diverse nutrient compositions, biochemical properties, and techno-functional attributes. Traditional recipes and cooking methods play a pivotal role in preserving the cultural significance of these foods, contributing to identity and community cohesion. The findings underscore the potential health benefits of incorporating these foods into daily diets and emphasize the need for increased consumer awareness, especially in rural areas. Overall, the results showcase the nutritional richness of traditional Nigerian cuisine and its potential positive impact on health.

Keywords: Traditional, Nigerian foods, functional foods, techno-functional properties, non-communicable diseases

***Authors for correspondence:** obilanaa@cput.ac.za

Received: 18/04/2025

Accepted: 23/04/2025

DOI: <https://doi.org/10.53555/AJBR.v28i3S.7487>

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Introduction

Hippocrates coined "Let food be thy medicine and medicine be thy food" two millennia ago. This has

received much interest from food scientists and consumers since the health benefits of certain foods have become known over time. These foods contain

ingredients that aid specific body functions and improve our health and well-being (Sohaimy, 2012). Non-communicable diseases (NCDs) substantially impact the global disease burden, particularly in low to middle-income countries, where nearly three-quarters of NCD-related deaths and most premature NCD deaths occur (WHO, 2022). According to WHO (2022), non-communicable diseases encompass a range of non-infectious medical conditions or diseases. Yet approximately 82% of all NCD deaths worldwide can be attributed to four specific groups: cardiovascular diseases (including cerebrovascular disease), cancers, chronic respiratory diseases, and diabetes.

The terms NCDs and chronic diseases are often used interchangeably. Still, it is important to note that in certain cases, chronic diseases, which include Acquired Immune Deficiency Syndrome (AIDS), mental health malaise, and specific injuries, can also be considered NCDs. (Sheik et al., 2016). According to the (Global Nutrition Report, 2014), the prevalence of NCDs in Nigeria has increased over the last two decades, with 49%, 10% and 17% of Nigerian adults suffering from high blood pressure, diabetes, and high blood cholesterol, respectively (Ilo & Famakinwa, 2022).

The rising incidents of NCDs in Nigeria will inevitably lead to increasing health-related expenditures, which concur with a report by the US Centre for Disease Control (CDC), where more than half of US adults have at least one chronic disease, resulting in health-related expenditures of \$3.7 trillion per year, the highest globally (Centre For Disease Control and Prevention, 2020; Malla et al., 2013). According to Malla et al., (2013), the correlation between diet and health has been supported by scientific evidence, leading to a growing awareness of this connection. Factors such as sedentary lifestyles, an ageing population, and rising healthcare costs have increased interest in producing healthier food items. The primary focus of this interest is the development of natural health products and functional foods, also referred to as nutraceuticals or dietary supplements, that provide consumers with beneficial health outcomes (Acham et al., 2018).

Researchers and reviewers have noted that traditional Nigerian foods (TNF) contain a variety of substances that could be considered functional and that these substances impart their functional properties to the body when consumed (Zhang et al., 2018; Karim et al., 2014; Shen et al., 2019; Akinbule et al., 2022; Ekesa et al., 2012a; Khatun et al., 2010; Bawa & Badrie, 2016; Sekhavatizadeh et al., 2023; Alamu et al., 2022; Wang et al., 2023; Ekesa et al., 2012b; Passo Tsamo et al., 2015; Singh et al., 2016). Delicious and rich in nutrients, traditional Nigerian cuisine can help prevent or treat chronic non-communicable diseases (NCDs) (Udoessien & Aremu, 1991; Alabi et al., 2022; Achika et al., 2023; Alalade Ajayi & Korede, 1991; Akinbule et al., 2022). Nigerians are particularly concerned about non-communicable diseases, as the prevalence of these, including diabetes, hypertension, and cardiovascular disease are on the rise (Global Nutrition Report, 2014).

Lean proteins, fruits, vegetables, whole grains, healthy fats, and lean proteins can all be included in a balanced diet to help mitigate and treat chronic disorders.

The nutraceutical and functional characteristics of a few Nigerian traditional foods (TNF) items and raw materials as well as their impact on NCDs will be looked at in this review. Additionally, the impact of food preparation methods on these functional and nutraceutical components of these foods is highlighted. All of this is an attempt to better inform Nigerian customers about the relationship between good health and food preparation, healthy eating, and a need for these functional foods as part of their regular diet.

Functional Foods

According to Sohaimy (2012), functional foods refer to foods consisting of ingredients which aid specific functions in the body, improving the health and well-being of the consumer. Malla et al. (2013) posit that the growing consumer interest in healthier food products is driven by various factors, including knowledge of the link between diet and health, the desire to slow the ageing process, increased convenience in accessing nutritional needs and preventing chronic NCDs such as diabetes, cancer, cardiovascular diseases, and respiratory diseases. Evidence suggests adequate nutritional intake could sustain normal physiological function to prevent diet-related chronic diseases (Stover et al., 2020).

Consequently, functional foods were developed to improve consumers' health and well-being, decrease health expenditures, reduce the risk of chronic diseases, and support human health (Hasler, 2002; La Barbera et al., 2016). Consumers are more conscious of maintaining good health through diet, thereby gravitating towards foods that offer additional benefits beyond that provided by conventional food and are also willing to pay a premium for these products. This assertion is corroborated by Baker et al. (2022), who concluded from their research that increasing customers' knowledge of functional foods is important to improve their acceptance of them and, hence, their consumption. Additionally, they intimated the roles to be played by agricultural and health communicators, educators, and functional foods industry professionals in prioritising increasing consumers' knowledge through their various communications and marketing activities. This is very important, especially in rural communities where the consumption of foods known to have functional properties is prevalent.

The combination of indigenous knowledge and modern communication techniques could further increase the acceptance and proliferation of functional foods not only in rural communities but in migrant and urban settings as well. **Table 1** shows the chronic non-communicable diseases impacted by consuming selected TNFs.

Composition of Selected Traditional Nigerian Foods and their impact on Chronic Non-Communicable Disease

Table 1 summarises the key nutrient content of selected TNFs, their preparation methods, and NCDs mitigated. For instance, the high fibre content of whole grains like millet, rice, and maize can help reduce the risk of cardiovascular disease, diabetes, and hypertension. Additionally, legumes rich in protein and fibre, like cowpeas and beans, can help decrease blood pressure and blood sugar levels. Rich in vitamins and minerals like iron, calcium, and vitamin C, vegetables like okra and pumpkin leaves can help prevent or treat renal disease and osteoporosis. Antioxidants found in fruits like pineapples and mangoes can help prevent or treat Alzheimer's disease and stroke. Animal products such as fish are high in omega-3 fatty acids, which can help lower the risk of developing cardiovascular disease and arthritis (Elekwa et al., 2017).

But specific issues must be resolved, such as food insecurity, a significant problem in Nigeria. Nutrient

deficits result from a widespread lack of availability of various nutrient-dense meals. To solve this issue, Akinlua et al. (2020) analyzed food patterns and habits in Nigeria and suggested food fortification. Furthermore, nutrient retention in food can also be impacted by conventional processing techniques. Traditional food processing techniques like boiling, frying, and roasting have been shown by Oladejo et al. (2017) to cause nutrient loss and reduce the nutritional value of food. Therefore, when preparing TNFs, it is crucial to consider the cooking methods and their effect on nutrient retention.

Traditional Nigerian foods can help avoid and manage chronic non-communicable diseases (NCDs) and have considerable health advantages. Choosing appropriate cooking techniques can help preserve the nutrients in traditional Nigerian meals, even if tackling food insecurity and fostering healthy eating habits and practices are equally important. Optimum health must have a nutritious, well-balanced diet incorporating traditional Nigerian dishes.

Table 1: Chronic non-communicable diseases impacted by consuming traditional Nigerian foods

Food	Raw Materials	Nutritional Information	Non-communicable Diseases Mitigated	References
Efo riro (vegetable soup)	Leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish, crayfish	Vitamins A, C, K, iron, fibre, protein	Type 2 diabetes, hypertension, heart disease	(Ayodele, 2005) (Dada et al., 2021; Helwig et al., 2018)
Jollof rice	Rice, tomatoes, onions, peppers, vegetable oil, seasoning, chicken or beef	Carbohydrates, protein, vitamins B1, B3, and C, iron	Obesity, heart disease, type 2 diabetes	(Okanlawon et al., 2023)
Moi moi (bean pudding/dumpling) (<i>Vigna unguiculata</i>)	Black-eyed beans, onion, pepper, crayfish, oil, egg	Protein, fibre, vitamins B1 and B6, folate	Type 2 diabetes, hypertension, heart disease	(Okwunodulu et al., 2019) (Nwazulu et al., 2019)
Gbegiri Soup	Made with beans, rich in protein, fibre, and essential nutrients.	Protein, vitamins B1 and B2, calcium, iron	Type 2 diabetes, hypertension, heart disease	(Kayode et al., 2010)
Egusi soup (Melon seed <i>Citrullus colocynthis</i>)	Egusi seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish	Protein, vitamins A, B1, B2, B3, B6, and E, magnesium, healthy fats, vitamins, and minerals.	Hypertension, type 2 diabetes, heart disease	(Babayehu et al., 2014; Olubi et al., 2021; Olubi, 2018)
Okra soup (Lady's finger - <i>Abelmoschus esculentus</i>)	Okra, onions, tomatoes, pepper, palm oil, assorted meat or fish	Vitamins C, K, and folate, fibre. Lysine, Phenolic compounds, Ascorbic acid, K, Na, Mg & Ca	Type 2 diabetes, hypertension, heart disease	(Bhimrao et al., 2017) (Habtamu et al., 2014; Arapitsas, 2008; Rani et al., 2021)
Akara (fried bean cakes) (<i>Vigna unguiculata</i>)	Black-eyed beans, onion, pepper, oil	Protein, fibre, vitamins B1 and B6, folate	Type 2 diabetes, hypertension, heart disease	(Ogundele et al., 2014)
Pounded yam	Yam, water	Carbohydrates, fibre, potassium	Hypertension, heart disease	(Lawal et al., 2014)

Amala (yam flour pudding) (Yam (<i>Dioscorea</i>))	Yam flour, water	Carbohydrates, potassium	fibre,	Hypertension, heart disease	(Awoyale et al., 2020)
Eba (cassava pudding)	Cassava flour, water	Carbohydrates, thiamin	fibre,	Hypertension, heart disease	(Olaosebikan et al., 2023)
Ogbono soup (<i>Irvingia gabonensis</i>)	Ogbono seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish	Protein, fibre, vitamins A, C, and K, iron, magnesium		Type 2 diabetes, hypertension, heart disease	(Kiin-Kabari & Akusu, 2017; Bamidele et al., 2015)
Ayamase (Designer Stew)	Typically spicy, made with a variety of peppers, onions, and meats.	Vitamin C, iron, calcium		Heart disease, hypertension	(Morakinyo et al., 2016)
Fried rice	Rice, vegetables (carrots, peas, etc.), onions, peppers, vegetable oil, seasoning, chicken or shrimp	Carbohydrates, protein, vitamins B and C, fibre		Obesity, heart disease, type 2 diabetes	(Jemikalajah, 2018)
Suya	Skewered meat (beef, chicken, or goat), peanut spice mix	Protein, healthy fats, vitamins B6 and B12, iron, zinc, magnesium		Heart disease, hypertension	(Ike & Ogwuegbu, 2020)
Efo-egusi soup (leafy vegetables and Melon seed)	Egusi seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish	Protein, vitamins B1, B2, B3, and B6, magnesium, calcium, iron		Hypertension, type 2 diabetes, heart disease	(Babayeju et al., 2014)
Tuwo Shinkafa (Rice)	Rice, water	A source of energy, it provides B vitamins and minerals.		Heart disease, hypertension	(Morakinyo et al., 2016)
Tuwo masara (corn flour pudding)	Corn flour, water	Carbohydrates, fibre, thiamin, magnesium		Hypertension, heart disease	(Okafor et al., 2021) (Okoduwa & Abdulwaliyu, 2023)
Bitter leaf soup (<i>Vernonia amygdalina</i>)	Bitter leaf, onions, tomatoes, pepper, palm oil, assorted meat or fish	Vitamins A and C, iron, fibre, protein, vitamins B1 and B2, calcium		Type 2 diabetes, hypertension, heart disease	(Agbogidi & Akpomorine, 2013)
Pounded yam and Egusi soup	Yam, Egusi seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish	Carbohydrates, protein, vitamins B1, B2, B3, and B6, magnesium		Hypertension, type 2 diabetes, heart disease	(Lawal et al., 2014)(Olubi, 2018)
Moi moi and pap	Black-eyed beans, onion, pepper, oil, cornmeal, water	Protein, fibre, vitamins B1 and B6, folate		Type 2 diabetes, hypertension, heart disease	(Popoola et al., 2019)
Food	Raw Materials	Nutritional Information		Non-communicable Diseases Mitigated	
Ewedu soup (<i>Cochorus olitorius</i>)	Jute leaves, locust beans, onions, pepper, palm oil	Vitamins A and C, iron, calcium, fibre and antioxidants. Vitamins A, C, K, folate, calcium, potassium		Type 2 diabetes, hypertension, heart disease	(Islam, 2013) (EC, 2018)
Ofada rice and stew	Ofada rice, tomatoes, onions, peppers, vegetable oil, seasoning, assorted meat or fish	Carbohydrates, protein, vitamins B and C, fibre		Obesity, heart disease, type 2 diabetes	(Sowunmi et al., 2014) (Anuonye et al., 2016)

Plantain chips	Plantains, vegetable oil, salt	Fibre, vitamins A and C, potassium	Hypertension, heart disease	(Malomo et al., 2015)
Boli (Roasted Plantain)	Roasted plantains. A source of energy, carbohydrates, and some vitamins.	Fibre, potassium, vitamin C	Hypertension, heart disease	(Malomo et al., 2015)
Banga soup (Palm nut - <i>Elaeis guineensis</i>)	Palm fruit concentrate, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, assorted meat or fish	Protein, vitamins A, C, and E, calcium, iron, fibre, healthy fats	Type 2 diabetes, hypertension, heart disease	(Otuaga et al., 2020)
Ewa aganyin (mashed beans and sauce)	Black-eyed beans, onion, pepper, oil, tomato sauce	Protein, fibre, vitamins B1 and B6, folate	Type 2 diabetes, hypertension, heart disease	(Winham et al., 2008)
Akamu (cornmeal porridge) (Maize, Sorghum or Millet)	Cornmeal, water	Carbohydrates, fibre, thiamin, magnesium, potassium, vitamin C	Hypertension, heart disease	(Popoola et al., 2019) Innocent et al., 2020)
Abacha (African Salad)	Cassava, ugba (ukpaka) seeds, onions, peppers, palm oil	Fibre, vitamins A and C, calcium	Hypertension, heart disease	(Olaosebikan et al., 2023) (Okoduwa & Abdulwaliyu, 2023)
Pepper soup	Assorted meat or fish, pepper soup spices (ginger, garlic, chilli, etc.), onions, seasoning	Protein, vitamins B1 and B12, iron, magnesium	Heart disease, hypertension	(Tchokouaha et al., 2015)
Pounded Yam and Oha Soup (<i>Pterocarpus mildbraedii</i> , African Rosewood)	Yam, Oha leaves, onions, tomatoes, pepper, palm oil, assorted meat or fish	Protein, healthy fats, and vitamins and minerals such as vitamin A, iron, and magnesium. Oha leaves are a source of vitamins and minerals.	Heart disease, diabetes, certain cancers	(Okerulu et al., 2017)
Asun	Spicy grilled peppered goat meat. Rich in proteins, fats, and various spices.	Protein, iron, zinc	Heart disease, diabetes, certain cancers	(Ahmed et al., 2023)(Akharaiyi & Isunu, 2015)
Kilishi	Air-dried spiced meat snack. Provides proteins and fats.	Protein, iron, zinc	Heart disease, hypertension	(Chukwu & Imodiboh, 2009)
Nkwobi	Spicy cow's foot or goat meat dish. Rich in proteins and fats.	Protein, vitamins B1 and B2, calcium, iron	Heart disease, diabetes, certain cancers	(Elekwa et al., 2017)
Ojojo	Fried water yam cakes. Provides energy and some nutrients.	Fibre, vitamin C, potassium	Heart disease, hypertension	(Shittu & Olaitan, 2014)(Okafor et al., 2021)
Ukwa (African Breadfruit)	African breadfruit seeds. A source of energy, proteins, and dietary fibre.	Carbohydrates, fibre, potassium, vitamin C	Heart disease, diabetes, certain cancers	(Ojimelukwe & Ugwuona, 2021)(Nnorom et al., 2015)
Ekpang Nkukwo	Cocoyam and water yam porridge. Provides energy and some nutrients.	Carbohydrates, fibre, potassium, vitamin C	Heart disease, hypertension	(Eyong et al., 2007)

Biochemical Composition and techno-functional Properties of Selected Traditional Nigerian Foods

The diversity and depth of Nigerian cuisine are attributed to the differences in the biochemical makeup and techno-functional characteristics of the raw materials used in their preparation. Nigeria is a diverse country with various ethnic groups, each with a unique

cuisine. However, some common raw materials are used in traditional Nigerian foods. These include cereals (Dabija et al., 2021), legumes (Gulzar & Minnaar, 2017), vegetables (Adebooye & Opabode, 2004), fruits (Ruiz-López, 2023), and animal products (Hocquette et al., 2005). Cereals, such as maize, rice, millet, and sorghum, are staples in the Nigerian diet (**Table 1**) and are often

used to prepare various dishes such as *fufu*, *eba*, and *tuwo*, the main starch component and primary energy source of most Nigerian meals. These grains also provide nutritional fibre to support a healthy digestive system, and minerals like iron and zinc. The content of the consumed TNF are impacted by the cooking process of food. The principal ingredient in *ogi* (corn flour) is carbohydrates and a few minerals and vitamins. You can vary the consistency based on the quantity of water used during preparation, according to your desire, from a thin gruel (*ogi*) to a stiff porridge (*tuwo*) forming the foundation for various accompaniments (Omemu & Bankole, 2015).

Beans, cowpeas, and lentils are legumes, essential plant-based protein sources frequently used in soups and stews in Nigeria. In addition to offering fibre, resistant starch, and complex carbs, they are also a great source of zinc, folate, and iron. They are frequently used to enhance the thickness and texture of soups and stews. It is preferable to mash or blend beans for soups (Gutiérrez-Urbe et al., 2015). To improve the flavour and nutritional content of meals, vegetables like spinach, *okra*, and pumpkin leaves are incorporated. Okra is rich in dietary fibre, folate, magnesium, vitamins C and K, and other nutrients, making it an excellent food source. It contains polyphenols and flavonoids, two types of antioxidant chemicals. Soups and stews become thick due to the mucilaginous texture of okra. The mucilage of okra is a naturally occurring thickening agent in culinary dishes (Mishra et al., 2017).

Ogbono seeds contain proteins and omega-3 and omega-6 fatty acids. Ground *ogbono* seeds contribute to the

flavour of the food and work well as a thickening ingredient in soups (Bamidele et al., 2015). Red palm oil is mainly composed of saturated and unsaturated lipids. Rich in tocopherols, tocotrienols, and other forms of vitamin E. It gives food a distinct flavour and colour. It's safe to use in high-temperature cooking, enhancing colour, taste and nutrition of foods (Corley, 2009). Fruits, such as mangoes, bananas, and pineapples, are often eaten as snacks or used to prepare desserts. They are rich in antioxidants and vitamins, especially vitamin C. They offer natural sweetness and are added to desserts to give them flavour. They are excellent snacks (Vincente et al., 2014). Soups and stews use animal items such as beef, poultry, and fish. They are abundant in animal protein sources, such as fish, poultry, and meat. They improve taste and texture and are high in micronutrients (Hocquette et al., 2005). Traditional foods' many elements, including fibre, protein, vitamins, and minerals, can help prevent or treat chronic non-communicable diseases (NCDs).

Traditional Nigerian dishes have varying nutritional values, although many are high in fat and protein, moderate in calories, and high in carbohydrates. Essential vitamins and minerals like iron, calcium, potassium, and vitamins B1 and B2 are also present in them. Additionally, several traditional Nigerian dishes are rich in fibre, which is crucial for preserving digestive health. The cooking methods of these traditional foods are important in nutrient retention and are outlined in **Table** below.

Table 2: Cooking Methods and Nutrient Retention

Cooking Method	Nutrient Retention
Boiling	Retains most water-soluble vitamins but may lead to nutrient loss in water
Grilling	Retains nutrients and adds flavour without added fat
Roasting	Retains nutrients and adds flavour without added fat
Frying	This can lead to nutrient loss and an increase in unhealthy fats.

Selected Traditional Nigerian Foods and their Preparation Methods

Traditional Nigerian foods (**Table 3**) are often prepared using various methods such as boiling, frying, and roasting. Soups and stews are commonly prepared by boiling meat or fish with vegetables and spices to create a flavourful broth. Snacks, such as *puff-puff* and *chin-chin*, are often fried in oil. The preparation methods used in traditional Nigerian foods can impact their nutrient content. For example, boiling vegetables can lead to losing some nutrients, while roasting or grilling can help retain nutrients.

The impact of preparation methods on nutrient content can vary depending on the food and the specific method used. For example, some cooking methods, such as boiling, steaming, or stir-frying, may help retain nutrients, while others, such as deep-frying or grilling, may result in nutrient loss due to heat or oil exposure. However, a variety of vital elements, including vitamins

A and C, iron, magnesium, and other essential and non-essential nutrients, can be provided by employing a variety of raw materials, such as vegetables, meat, or fish, and healthy fats like peanut spice mix or palm oil.

Okra

A member of the *Malvaceae* family, okra (*Abelmoschus esculentus*) (**Table**) is a flowering plant grown in tropical and warm climates. It is noteworthy for being among the world's vegetable species that can withstand heat and drought (Xu et al., 2020). This vegetable, which has a high annual production of six million tons worldwide, is used frequently and offers a variety of nutrients and bioactive substances that may promote health, especially in glucose management and blood sugar control (Yang et al., 2023). It contains various essential nutrients for our health, such as amino acids, unsaturated fatty acids, vitamins, and minerals. The okra's mucilage binds cholesterol and bile acid-carrying toxins dumped into it by the liver (Habtamu et al., 2014).

Due to its high carbohydrate content, okra was used as a mucilaginous food additive against gastric irritative and inflammatory diseases. The anti-adhesive qualities of

okra were assumed to be due to a combination of glycoproteins and highly acidic sugar compounds making up a complex three-dimensional structure.

Table 3: Impact of cooking method on the nutrient content of traditional Nigerian foods

Food	Raw Materials	Preparation Method	Impact on Nutrient Content	References
Jollof rice	Rice, tomatoes, onions, peppers, vegetable oil, seasoning, chicken or beef	Rice is parboiled before being cooked with vegetables and meat	Parboiling helps retain some of the rice's nutrients, such as thiamine, but may also result in some nutrient loss due to water exposure. Vegetables and meat provide fibre, vitamins, and minerals.	(Chijioke et al., 2023)(Okanlawon et al., 2023)
Egusi soup	Egusi seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted fish, and meat or fish	Egusi seeds are ground into a paste and cooked with vegetables, meat or fish, and spices.	Cooking can cause some nutrient loss, but using vegetables, meat or fish, and palm oil provides protein, healthy fats, and vitamins and minerals such as vitamin A, iron, and magnesium.	(Olubi, 2018; Olubi et al., 2021)
Ogbono soup	Ogbono seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted fish, and meat or fish	Ogbono seeds are ground into a paste and cooked with vegetables, meat or fish, and spices.	Cooking can cause some nutrient loss, but using vegetables, meat or fish, and palm oil provides protein, healthy fats, and vitamins and minerals such as vitamin A, iron, and magnesium.	(Bamidele et al., 2015)(Kiin-Kabari & Akusu, 2017)
Fried rice	Rice, vegetables (carrots, peas, etc.), onions, peppers, vegetable oil, seasoning, chicken or shrimp	Rice is parboiled before being stir-fried with vegetables, meat or shrimp, and seasoning.	Parboiling helps retain some of the rice's nutrients, such as thiamine, but may also result in some nutrient loss due to water exposure. Vegetables and meat or shrimp provide fibre, vitamins, and minerals.	(Jemikalajah, 2018)
Suya	Skewered meat (beef, chicken, or goat), peanut spice mix	Meat is marinated in a peanut spice mix and grilled	Grilling helps retain some of the meat's nutrients, such as protein, but may also result in nutrient loss due to heat exposure. The peanut spice mix provides healthy fats and vitamins B6 and B12.	(Ike & Ogwuegbu, 2020)
Efo-egusi soup	Egusi seeds, leafy vegetables (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted fish, and meat or fish	Egusi seeds are ground into a paste and cooked with vegetables, meat or fish, and spices.	Cooking can cause some nutrient loss, but using vegetables, meat, fish, and palm oil provides protein, healthy fats, and vitamins and minerals such as vitamin B6 and magnesium.	(Dada et al., 2021; Mensah et al., 2008)
Tuwo masara (corn pudding)	Corn flour, water	Corn flour is mixed with boiling water and stirred until it forms a pudding-like consistency.	Using boiling water may cause nutrient loss, but corn flour provides carbohydrates, fibre, and thiamine.	(Wao, 2012)
Bitter leaf soup	Bitter leaf, onions, tomatoes, pepper, palm oil, assorted meat or fish	Bitter leaf is boiled with onions, tomatoes, pepper, palm oil, and meat or fish	Boiling can cause some nutrient loss, but using bitter leaves, vegetables, meat or fish, palm oil provides fibre, vitamins A and C, and iron.	(Agbogidi & Akpomorine, 2013; Yakubu & Amuzat, 2012)

Food	Raw Materials	Preparation Method	Impact on Nutrient Content	References
Pounded yam & Egusi soup	Yam, Egusi seeds, leafy vegetables & (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish	Yam is peeled, chopped, and boiled before pounded into a dough-like consistency. Egusi seeds are ground into a paste and cooked with vegetables, meat or fish, and spices.	Boiling and pounding may cause some nutrient loss, but using vegetables, meat, fish, and palm oil provides protein, healthy fats, and vitamins and minerals such as vitamin A, iron, and magnesium.	(Olubi et al., 2021) (Awoyale et al., 2020)
Moi-Moi	Beans, onions, peppers, vegetable oil, seasoning	Beans are soaked, ground into a paste, and mixed with onions, peppers, and seasoning before being steamed in banana leaves or foil.	Steaming helps retain some of the beans' nutrients, such as protein and fibre, but may also result in nutrient loss due to heat exposure. The use of vegetables and seasoning provides vitamins and minerals.	(Amagwula et al., 2022) (Ogundele et al., 2015)
Akara	Black-eyed beans, onions, peppers, vegetable oil	Beans are soaked, ground into a paste, mixed with onions and peppers, and deep-fried in vegetable oil.	Deep-frying can cause some nutrient loss, but using beans, onions, and peppers provides fibre, vitamins, and minerals.	(Winham et al., 2008)
Eba (garri) & Egusi soup	Garri (cassava flour), Egusi seeds, leafy vegetables & (spinach, kale, etc.), onions, tomatoes, pepper, palm oil, assorted meat or fish	Garri is mixed with boiling water and stirred until it forms a dough-like consistency. Egusi seeds are ground into a paste and cooked with vegetables, meat or fish, and spices.	Boiling and stirring may cause some nutrient loss, but using vegetables, meat, fish, and palm oil provides protein, healthy fats, and vitamins and minerals such as vitamin A, iron, and magnesium.	(Olaosebikan et al., 2023) (Olubi et al., 2021) (Awoyale et al., 2021)

Preparation of Okra

Okra (Sorapong, 2012) is a multipurpose vegetable that is frequently used in many different cuisines all over the world. It is also referred to as ladyfinger or gumbo. There are several ways to cook it, such as frying, boiling, or adding it to soups and stews. The following is a basic recipe for okra.

Ingredients:

- Fresh okra
- Water (for washing)
- Salt (optional)
- Lemon or vinegar (optional, for reducing sliminess)

Steps:

- Select crisp, firm, vividly green okra pods that are firm to the touch.
- Run cool water over the okra to wash away any debris or contaminants. If necessary, wash the surface gently with a brush.
- Cut each okra pod's two ends off with a knife. In doing so, any difficult parts are reduced.
- For about half an hour before cooking, some people soak okra in water with vinegar or lemon juice to lessen its sliminess. It is not necessary to complete this step.

Boiling: Heat some water in a pot. If desired, add a small pinch of salt. - Boil the trimmed okra for three to five minutes or until tender but still slightly firm. After draining, serve the okra. **Frying:** In a pan over medium

heat, warm up the oil. - Slice or cut the okra into desired portions. - Add the okra and fry it in the hot oil until it becomes crispy and golden brown. - Remove it from the oil before serving and lay it on a paper towel to absorb extra oil. **Sautéing:** Add a small amount of oil to a pan over medium heat. - Fill the pan with chopped or sliced okra. - Sauté the okra for five to seven minutes, stirring now and then, until it is soft and beginning to brown. Okra is frequently used as a thickening agent in soups and stews. Just cook the okra slices until tender while the soup or stew simmer.

Okra can be eaten as a main course in various cuisines, added to salads and soups, or served as a side dish. Okra should not be overcooked to keep it from getting slimy. Before cooking, patting the okra dry can help lessen its sliminess. Try varying the sauces and spices to make the okra taste better. Savour your mouthwateringly prepared okra, whichever your palate and cooking habits dictate.

Biological activities

Okra (*Abelmoschus esculentus*) is a vegetable, popular in many different cuisines and has several biological activities that may contribute to its health benefits. It is also referred to as ladyfinger or gumbo. Okra is rich in vital nutrients, such as vitamins (like C, K, and some B vitamins), minerals (like potassium and magnesium), and dietary fibre (Gemede, 2015). These are some of the noteworthy biological activities connected to okra. Flavonoids and polyphenols are two examples of the many antioxidants found in okra. These substances aid in the body's defence against free radicals, reduce

oxidative stress, and possibly decrease the risk of chronic illnesses. Okra's anti-inflammatory qualities might be attributed to its bioactive compounds and antioxidants. Numerous chronic diseases are associated with inflammation, so eating foods with anti-inflammatory properties may benefit health. Certain studies suggest that okra may aid with blood sugar regulation (Gemedé, 2015; Shittu & Olaitan, 2014; Sorapong, 2012). The soluble fibre in okra slows down sugar absorption, lowering blood glucose levels. The antioxidant and fibre content of okra may help heart health. Fibre decreases cholesterol, and antioxidants reduce oxidative stress, both of which can protect the heart (Gemedé, 2015). Mucilage, a gelatinous substance in okra, may help soothe and lubricate the digestive tract. This (Mishra et al., 2017; Sorapong, 2012)

Health benefits and impact on chronic non-communicable diseases

It also includes bioactive substances such as fibre, polysaccharides, polyphenols, and flavonoids (Bawa & Badrie, 2016; Kumar et al., 2013). Proanthocyanidins and quercetins, two types of flavonoids present in okra, have been demonstrated to block the actions of the enzymes α -amylase and α -glucosidase potently. By doing this, scientists may be able to slow down the body's absorption of sugar by inhibiting its fast breakdown. This may benefit Blood sugar control (Shen et al., 2019; Zhang et al., 2018; Tian et al., 2015). Additionally, okra is a rich source of antioxidants, notably polyphenols, which have been shown to lower blood glucose levels by enhancing insulin and oxidative stress resistance (Tian et al., 2015). It has also been discovered that the soluble fibre in okra, which includes components like pectin, guar gum, and carboxymethyl cellulose, considerably slows down the pace at which glucose enters the bloodstream. This may help with blood sugar regulation. Moreover, studies have demonstrated that okra-derived polysaccharides improve body weight, glucose tolerance, and hormone insulin levels (Khatun et al., 2010; Fan et al., 2013).

Okra's nutritional makeup and potential health advantages make it a food that may positively affect chronic non-communicable diseases (NCDs). It's crucial to remember that while including okra in a balanced diet may improve general health, each person's reaction is unique, and dietary considerations are only one part of an all-encompassing strategy for managing and avoiding NCDs. Okra may help prevent chronic non-communicable diseases in the following ways: Because okra contains soluble fibre, it may help improve blood sugar management by slowing down the absorption of sugar. Those who have diabetes or are at risk for the disease would significantly benefit from this attribute. The fibre, antioxidants, and other nutrients in okra may contribute to heart health by helping to lower cholesterol levels and reduce oxidative stress, which is associated with cardiovascular diseases. The high fibre content in okra can promote a feeling of fullness, aiding in weight management by reducing overall calorie intake. Okra contains compounds with anti-inflammatory properties, which may help reduce inflammation in the body.

Chronic inflammation is a common factor in many NCDs, including heart disease and certain types of cancer. The mucilage in okra has a soothing effect on the digestive tract, potentially benefiting individuals with gastrointestinal issues. This can contribute to overall digestive health (Gemedé, 2015).

Okra's antioxidant content can help neutralise free radicals, reducing oxidative stress. Chronic oxidative stress is implicated in the development of various NCDs. Some studies suggest that okra may have anti-cancer properties, possibly inhibiting the growth of specific cancer cells. While more research is needed in this area, bioactive compounds in okra hold promise for cancer prevention. Traditionally, okra has been used for its potential benefits in respiratory and joint health, possibly due to its anti-inflammatory properties. It's important to emphasise that while okra can be a healthy addition to a diet, an overall healthy lifestyle, including regular physical activity, avoidance of tobacco, and moderate alcohol consumption, is crucial for preventing and managing chronic non-communicable diseases. Individuals with specific health conditions or concerns should consult healthcare professionals or registered dietitians for personalised advice (Mishra et al., 2017).

Beans (*Phaseolus spp.*)

Among the many varieties of *Phaseolus* spp include black beans, kidney beans, chickpeas, and lentils (Broughton et al., 2003). Beans are a valuable part of vegetarian and vegan diets and an excellent plant-based protein source. Tossed salads, casseroles, stews, and soups are just a few recipes that can use beans. For those who follow a vegetarian or vegan diet, beans are a great plant-based source of protein. Beans have a high content of oligosaccharides, which cause flatulence in the consumer (Broughton et al., 2003). These can be decreased by rinsing and soaking dry beans before cooking. These pre-cooking steps have the additional benefit of increasing the digestibility of the beans on consumption (Winham et al., 2008). One practical choice is canned beans. To cut down on sodium, give them a thorough rinse. Combining beans with whole grains results in a complete protein by enriching the meal's nutritional value (Gulzar & Minnaar, 2017).

Preparation and uses

Beans are adaptable enough to be used in various recipes and can be prepared in multiple ways. Here is an essential guide on cooking beans, along with some typical applications:

Ingredients:

- Dried beans (e.g., black beans, kidney beans, chickpeas)
- Water
- Salt (optional)
- Soaking time (varies depending on the bean type)

After removing dirt or stones, spread out the dried beans on a clean surface. With cold water, rinse the beans. Give the beans the total suggested amount of time to soak in water. Depending on the kind of bean, the soaking period can vary but usually lasts between 4 and 12 hours. In

addition to shortening cooking time, this helps soften the beans. When the beans are ready to cook, drain and rinse them. Fill a pot with water and add the drained and soaked beans. Lower the flame once the mixture reaches a boiling point and let the beans soften over low heat. Bean types vary in cooking times, ranging from 30 minutes to more than an hour. Enhance the flavour of the beans by adding herbs, spices, and salt while cooking (Recipes, 2014).

Beans are a traditional component of soups and stews, contributing texture, fibre, and protein. Chilli, minestrone, or black bean soup are a few examples. To add more protein to salads, add beans. Black beans, kidney beans, and chickpeas are all delicious in salads. Seasonal cooked beans with garlic, herbs, and olive oil and serve as a side dish (Recipes, 2014). Mash or blend cooked beans to make dips like black bean dip or hummus (made from chickpeas). Mash beans and add breadcrumbs, spices, and herbs to make vegetarian patties or burgers. Tacos and burritos frequently have beans as a filler. For a flavourful addition, use seasoned black beans or refried beans. Pureed beans can increase baked goods' moisture and nutritional value (Siddiq et al., 2010).

Beans can be added to casseroles with other vegetables, grains, and proteins. Add spices to black beans or chickpeas and roast them for a crispy, healthy snack. Canned beans are more convenient and need less preparation time than dried beans. Rinse them before using them to reduce the sodium content. Try a range of bean varieties to discover flavours and textures you enjoy. Cooked beans can be refrigerated for a few days or frozen for extended storage. You can reap the nutritional benefits of beans through creative cooking techniques and contribute to a rich and satisfying gastronomic experience (Winham et al., 2008).

Biological activities

Many health benefits of beans are attributed to their biological activities. Along with other vital elements like protein and dietary fibre, beans are a great source of iron, magnesium, and potassium, among other minerals and vitamins. As a fantastic plant-based source of protein, beans are an excellent addition to vegetarian and vegan diets. Protein is essential for immune response, muscle growth, and body repair. Because beans are high in fibre, they help prevent constipation, encourage regular bowel movements, and increase feelings of fullness. Note that different types and varieties of beans can have various biological activities. Individuals may also react differently to other dietary components. Maintaining general health and well-being can be enhanced by including a range of beans in a balanced diet (Winham et al., 2008).

Health Benefits and Impact on Chronic non-communicable diseases

Given their rich nutrient content, beans, a diverse group of legumes, provide several health benefits. The addition of beans to your diet may have particular benefits as well as improvements in general health. The soluble fibre in

beans achieves lower cholesterol and a lower risk of cardiovascular disease. Beans contain magnesium and potassium, which help maintain normal blood pressure. Healthy food for people with diabetes or those at risk, beans' complex carbohydrates and fibre help to stabilise blood sugar levels. The satiety induced by the protein and fibre content of beans helps regulate appetite and weight control and in addition to encouraging regular bowel movements, the high fibre content guards against constipation. The fibre serves as a prebiotic by supporting the growth of advantageous gut bacteria. Eating beans regularly has been associated with a lower risk of developing chronic illnesses such as type 2 diabetes, heart disease, and prostate cancer. Beans' antioxidants neutralise free radicals to shield cells from oxidative stress and lower inflammation. Some beans' mineral content, like that of chickpeas, aids in maintaining strong bones (Gutiérrez-Urbe et al., 2015).

The nutritional makeup of beans and their many health benefits can help lower the prevalence of chronic non-communicable diseases (NCDs), often known as lifestyle-related disorders. Soluble fibre in beans reduces LDL cholesterol levels and heart disease risk. Magnesium and potassium, which are included in beans, assist cardiovascular health and blood pressure regulation. Beans can help stabilise blood sugar levels because of their fibre and complex carbs, which makes them good food for people with diabetes or at risk for the disease. Beans' high protein and fibre content increases satiety, which helps regulate appetite and aids in weight management. Beans' high fibre content promotes digestive health and may lower the risk of colorectal cancer. It's possible that antioxidants can prevent cancer as well. Compounds with anti-inflammatory qualities found in beans may help lessen inflammation brought on by respiratory conditions. Certain beans, like chickpeas, have mineral content that includes calcium, magnesium, and phosphorus, which helps maintain healthy bones. Beans, particularly those with a lot of iron, can help treat and prevent anemia caused by iron deficiency (Gutiérrez-Urbe et al., 2015).

You can reap the nutritional and flavour benefits of a diverse range of beans when you incorporate them into your diet. Include a variety of nutrient-rich foods in a balanced diet, including beans. When boiling, steaming, or baking beans, you can maintain their nutritional value. These are healthy cooking methods. Consider portion sizes and limit your intake if you have any dietary restrictions. While including beans in a diet can be beneficial when treating chronic non-communicable diseases, it's important to consider lifestyle factors, nutritional patterns, and individual health conditions. It is best to seek individualised advice from registered dietitians or medical professionals if you have specific health concerns (Gulzar & Minnaar, 2017).

Red Palm Oil

Oil taken out of the fruit of the oil palm tree is called red palm oil (*Elaeis guineensis*) (Sambanthamurthi et al., 2000). Because carotenoids, such as beta-carotene, a precursor to vitamin A, are present in red palm oil, it has a rich, reddish-orange colour. Many cuisines use red

palm oil as a cooking oil, especially in indigenous oil palm areas. It gives food a unique flavour and colour. It provides food richness and colour when used to make soups, stews, and sauces. Red palm oil has a unique flavour that may affect the finished product's taste, yet it can be used for baking and frying. The environmental impact of palm oil production is a concern despite the nutritional benefits of red palm oil. There is a connection between the growth of oil palm plantations and habitat destruction, deforestation, and environmental stress. The Roundtable on Sustainable Palm Oil (RSPO) certifications and other sustainable palm oil production methods are designed to address these problems in the palm oil industry. Moderation is essential when consuming any food item. While red palm oil can be included in a balanced diet, people should consider their general dietary habits, medical conditions, and environmental impact when preparing meals. Keeping up with the most recent findings and suggestions regarding red palm oil is advised (Tan et al., 2009).

Preparation and uses

In many culinary traditions, red palm oil is frequently used, particularly in areas where palm trees are grown. It is rich in reddish-orange colour and has a distinct flavour. Bottles or jars are a typical packaging for red palm oil. It may solidify at lower temperatures because of its high monounsaturated and saturated fat content. If this occurs, liquefy the oil by submerging the container in warm water. It is best to thoroughly shake or stir red palm oil before using it. This allows the carotenoids and other ingredients that might settle at the bottom to be distributed evenly. Red palm oil is frequently used as a cooking oil in various recipes. It gives food a distinct flavour and colour. It is particularly well-liked in Brazilian, Southeast Asian, and West African cuisines. An essential component of many classic soups and stews is red palm oil. It is frequently added at the start of cooking to give the food flavour and colour. Malaysian laksa and Nigerian stew made with palm oil are two examples. It can be used to make tasty gravies and sauces. The oil gives the food a unique flavour and richness. Drizzle with red palm oil to add taste and colour to cooked rice or grains. In West Africa, it's frequently used in recipes like jollof rice. Apply a final coating of red palm oil to steamed or sautéed veggies. It gives the veggies a bright colour and another layer of flavour. Fish and meat flavours are enhanced by red palm oil (Oguntibeju et al., 2009).

Biological activities

In addition to its potential health benefits, red palm oil demonstrates several biological activities. Because beta-carotene is a precursor to vitamin A, red palm oil has a higher concentration. Strong antioxidant beta-carotene maintains healthy skin, eyesight, and immune system. Tocotrienols and tocopherols, two vitamin E forms, are present in red palm oil. Potentially anti-inflammatory phytonutrients can be found in red palm oil. Despite its saturated fat content, red palm oil has an even distribution of unsaturated fats. Red palm oil's vitamin E supports the healing of wounds and is suitable for the skin. Although further research is needed to fully

understand these mechanisms, red palm oil's antioxidant and phytonutrient content may have potential anti-cancer effects. Research on the possible neuroprotective benefits of red palm oil's tocotrienols has supported the brain's health (Ajuwon et al., 2013; Ayeleso et al., 2014; Oguntibeju et al., 2009). Elastic bone health is enhanced by the minerals found in red palm oil, such as phosphorus and calcium. Though red palm oil may have health benefits, each person's reaction is different, so keep that in mind (Sambanthamurthi et al., 2000).

Health Benefits and Impact on Chronic non-communicable diseases

Numerous health benefits are provided by the nutritional composition and presence of bioactive substances in red palm oil. Among its numerous carotenoids is beta-carotene, one of red palm oil's powerful antioxidants. Because antioxidants can counteract free radicals in the body, oxidative stress and inflammation are lessened. Red palm oil contains beta-carotene, which the body uses to make vitamin A. The immune system, skin, and eyesight depend on vitamin A to stay healthy (Oguntibeju et al., 2009; Tan et al., 2009). Despite its saturated fat content, red palm oil has an even distribution of saturated and unsaturated fats. Based on certain research, the impact of this equilibrium on cardiovascular health may be neutral or even positive. Tocotrienols—a type of vitamin E—found in red palm oil can potentially lower LDL (bad) cholesterol and aid in regulating cholesterol. Red palm oil's bioactive components may reduce inflammation by acting as anti-inflammatory agents. Red palm oil's fat-soluble vitamins, A and E, may improve the body's ability to absorb fat-soluble nutrients, thereby boosting vitamin absorption overall. The skin benefits from vitamin E, which is present in red palm oil and may aid in the healing of wounds. There is evidence from certain studies that red palm oil has antimicrobial qualities that could help in the fight against specific infections. Research on the possible neuroprotective benefits of red palm oil's tocotrienols has supported the brain's health (Corley, 2009; Ajuwon et al., 2013).

As with any dietary component, red palm oil may affect chronic non-communicable diseases (NCDs), which are frequently impacted by dietary and lifestyle choices. Due to its balanced fatty acid profile, red palm oil may have neutral or even beneficial effects on cardiovascular health. Red palm oil is a mixture of saturated and unsaturated fats (Corley, 2009). Further research has been done on the possible benefits of red palm oil's tocotrienols, a type of vitamin E, for controlling cholesterol. Given that oxidative stress and inflammation are linked to the emergence of numerous chronic illnesses, such as cancers and cardiovascular diseases, red palm oil's antioxidant and anti-inflammatory qualities may help lower these levels (Oguntibeju et al., 2009). Research shows that red palm oil contains phytonutrients and carotenoids that may help control blood sugar levels. Those who have type 2 diabetes or are at risk for it may find this helpful. A sufficient diet of vitamin A is necessary for healthy skin, eyesight, and immune system performance. The beta-carotene found in red palm oil is a precursor to vitamin

A. The possible neuroprotective properties of tocotrienols in red palm oil have been investigated; these effects may be pertinent to disorders affecting the nervous system. Elastic bone health is enhanced by the minerals found in red palm oil, such as phosphorus and calcium. Research indicates that red palm oil might have antimicrobial qualities, which could boost immunity (McKevith, 2005).

Ogbono Seeds (*Irvingia gabonensis*)

In Nigerian cooking, the "*Ogbono*" seed prepares the famed "*Ogbono* soup." Another name for it is "*Ogbono* seeds" or "*Apon*" (Bamidele et al., 2015). "The *Irvingia gabonensis* tree produces *Ogbono* seeds, native to West and Central Africa. The vast, oblong fruits that grow on the tree are picked for their seeds. *Ogbono* seeds are rich in healthy fats, protein, and fibre. Minerals, including calcium, magnesium, and phosphorus, are also present. The soup gets a unique texture from the addition of powdered seeds. *Ogbono* soup, a traditional Nigerian dish usually served with fish, meats, and vegetables, is made with these seeds. *Ogbono* seeds are often ground into fine powder. The powder is then added to thicken the soup. *Ogbono* soup has various ingredients, including green vegetables, meats, seafood, and spices. *Ogbono* seeds have a distinctly nutty flavour. When cooked, they give soups a rich, robust flavour. *Ogbono* seeds have potential health benefits because they are an excellent source of dietary fibre and healthy fats. You may obtain *ogbono* seeds in African or speciality grocery stores (Kiin-Kabari & Akusu, 2017).

Preparation of Ogbono Soup

Ingredients:

- 1 cup *ogbono* seeds (ground)
- Assorted meats (beef, goat meat, tripe, etc.)
- Fish (dry fish, stockfish, or fresh fish)
- Vegetables (ugu leaves, spinach, or other greens)
- Palm oil (optional)
- Onions
- Pepper
- Seasoning cubes
- Salt
- Water

Instructions:

Grind the *ogbono* seeds into a fine powder using a dry mill or blender. Cut the various meats into bite-sized pieces after cleaning them. If stockfish or dry fish are used, soak them in warm water to soften them. Add onions, pepper, seasoning cubes, and salt to the meats and fish to season them. Place the fish, meats, and enough water to cover them in a pot. Simmer until the fish is done and the meats are soft. Because of its versatility, you can alter *ogbono* soup by adding extras like crayfish or okra. Certain variants might incorporate extra components like locust beans or periwinkle to enhance the flavour. If necessary, add additional water. Add palm oil to the pot to add flavour to the soup. Depending on your preference, change the amount.

The ground *ogbono* should be combined with a small amount of water in a different bowl to create a smooth paste. Stir constantly to avoid lumps, and gradually add the *ogbono* paste to the pot. Keep cooking the soup over medium heat, stirring frequently to keep it from sticking. Let the *ogbono* dissolve so that the soup gets thicker. Smooth and slightly viscous is the desired consistency. Adjust the seasoning if more salt, pepper, or seasoning cubes are needed. You can adjust the soup's consistency by adding extra water if it's too thick. When the vegetables are added to the pot, stir thoroughly. Cook the vegetables until they are soft but retain their colour. To let the flavours combine, simmer the soup for an additional few minutes, taste and adjust the soup.

Biological activities

Irvingia gabonensis, commonly known as *ogbono* seeds, has biological activities related to its nutritional makeup and possible health advantages. *Ogbono* seeds are a good source of dietary fibre and healthy fats. They offer protein derived from plants. The cardiovascular system may benefit from *ogbono* seeds' heart-healthy fat content. Dietary fibre supports heart health and cholesterol control. Vitamin E is present in *ogbono* seeds. *Ogbono* seeds contain certain plant compounds that may have anti-inflammatory qualities. Minerals like calcium and phosphorus are found in *ogbono* seeds. *Ogbono* seeds may possess antimicrobial attributes that could aid the body in fighting off specific infections. The antioxidant content of *ogbono* seeds may play a role in their potential anti-cancer effects. Nutrient-dense *ogbono* seeds provide essential vitamins and minerals that support optimum metabolic performance. It's important to remember that although *ogbono* seeds have shown promise in several health-related areas, individual outcomes may vary (Kayode et al., 2010).

Health Benefits and Impact on Chronic non-communicable diseases

Ogbono seeds have been connected to several potential health benefits. They come from the tree *Irvingia gabonensis*. It's essential to remember that while certain studies and conventional applications have backed up these advantages, additional investigation is needed to offer conclusive evidence. Because of their high fibre and good fat content, *ogbono* seeds may aid in weight management by reducing overall food consumption and promoting feelings of fullness. *Ogbono* seeds have a high fibre content that may help reduce blood sugar levels, making them beneficial for persons with diabetes or at risk. Heart-healthy lipids and dietary fibre may cooperate to lower cholesterol and enhance heart health (Kayode et al., 2010). *Ogbono* seeds' high nutritional fibre content supports digestive health by promoting regular bowel movements and preventing constipation. *Ogbono* seeds contain vitamin E, an antioxidant that helps to scavenge free radicals and may reduce inflammation and oxidative stress in the body. Two elements in *ogbono* seeds, calcium and phosphorus, support strong bones and may help prevent osteoporosis. The anti-inflammatory qualities of some plant chemicals in *ogbono* seeds may aid in treating illnesses involving inflammation. Nutrient-dense *ogbono* seeds provide

essential vitamins and minerals that support optimum metabolic health. Ogbono seeds may have anti-cancer properties due to their antioxidant qualities (Bamidele et al., 2015).

More research is required to fully comprehend the impact of ogbono seeds on chronic non-communicable diseases (NCDs). Ogbono seeds have shown encouraging results regarding heart health, blood sugar regulation, and weight control. However, more studies are required to pinpoint the precise impact of these seeds on chronic non-communicable diseases. An individual's whole dietary habits must be considered when assessing the effect of ogbono seeds on non-communicable chronic illnesses. A balanced diet must include a wide variety of nutrient-dense foods. Each person responds differently to various food ingredients. Depending on age, genetics, and overall health, ogbono seeds can affect health differently. The potential health advantages of ogbono seeds are noteworthy; nonetheless, additional research is necessary to furnish tangible evidence of their distinct impact on chronic non-communicable diseases (NCDs). People with pre-existing medical conditions or chronic NCD concerns should consult qualified dietitians or other healthcare professionals for individualised guidance. When considering dietary interventions from a holistic perspective, it is imperative to consider lifestyle factors, general eating patterns, and specific health issues (Bamidele et al., 2015; Kayode et al., 2010).

Ogi (Corn Flour)

Typically made from corn, *pap*, or *akamu*, *ogi* is a famous Nigerian cuisine prepared from fermented grain (Popoola et al., 2019). It has the smooth, velvety texture of porridge. *Ogi* can be served as a light meal or for breakfast, and its flavour is often enhanced by adding various toppings. *Ogi* is a popular morning food that provides a satisfying and complete start to the day. You can eat it as a light meal or snack at any time of day. Many people consider *ogi* a comfort dish, especially throughout the winter. *Ogi* is sometimes provided during ceremonies and events honouring traditional customs. Nigerians love *ogi*, and it's a staple in other African countries, but the preparation and names vary. It is adaptable, enabling people to personalise the taste and consistency to suit their tastes (Omemu & Bankole, 2015).

Preparation and uses

Ingredients:

- Cornmeal or corn flour (white or yellow corn)
- Water
- Sugar or sweeteners (optional)
- Flavourings (optional, e.g., vanilla or cinnamon)
- Milk or evaporated milk (optional)

Instructions:

The cornmeal should first be submerged in water overnight. The fermentation process starts with this step. Let the mixture ferment after it has been soaked. Depending on the desired degree of fermentation, this

process can take anywhere from 24 to 48 hours. *Ogi*'s unique sour taste comes from a natural fermentation process in cornmeal. To get a smooth consistency, blend the fermented cornmeal with water. You can change the cornmeal-to-water ratio to get the thickness that you want. Pour the blended mixture into a pot and simmer over medium heat. To avoid lumps forming, stir constantly. If desired, add sugar or other sweeteners to the *ogi*. To enhance the flavour, incorporate flavourings like cinnamon or vanilla. Cook the *ogi* until the desired thickness is achieved. Some people like their consistency thicker, while others prefer it thinner. After cooking, *ogi* is prepared for serving. It tastes good either way, with or without toppings. You can add evaporated milk or milk to *Ogi* to make it creamier. To give the porridge more sweetness, sweeten it with sugar or other sweeteners—top *Ogi* with sliced fruits like mango, bananas, or berries for extra taste and nutrients. Add chopped nuts or seeds like chia or peanuts to crunch it. For added flavour, sprinkle on nutmeg or cinnamon (Omemu & Bankole, 2015).

Biological activities

Ogi, or porridge made from corn flour, is a traditional food with cultural significance. Still, it does not show as many biological activities as some plant extracts or medicinal herbs do. On the other hand, the fermentation process used to make *ogi* promotes specific microbial activities and offers some nutritional advantages. Carbohydrates from corn make up the majority of *ogi*. Though it may not be very much, it does contain some protein. *Ogi* may increase the intake of micronutrients, though the nutritional value varies depending on the type of corn used. The soaking and fermentation processes may enhance the corn's digestibility. The dietary fibre in *ogi*, mainly if it is made from whole grain corn, may help with fullness perception. In addition to being nutrient-dense, *ogi* is culturally significant and takes part in sociocultural activities that promote people's well-being in specific communities. Depending on the type of corn used, how it's prepared, and whether other ingredients are added, *ogi*'s exact nutritional composition can vary. *Ogi* can be a nutrient-dense part of a diet, but to guarantee a diversified and balanced intake of nutrients, it must be consumed in combination with various other foods. Although *ogi* may not have as much biological activity as some functional foods or medicinal plants, its potential is increased by its nutritional value and fermentation process (Popoola et al., 2019). (Popoola et al., 2019).

Health Benefits and Impact on Chronic non-communicable diseases

Ogi, or maize flour porridge, has a high nutritious content and undergoes fermentation while cooking, both of which are health benefits. *Ogi* is a quick and easy way to acquire energy because it's a good source of carbohydrates. Increased fibre content through fermentation is good for the digestive system's health. Constipation can be avoided, and regular bowel motions are encouraged by dietary fibre. Fermentation introduces beneficial microbes that could lead to the development

of probiotics. Probiotics can enhance gut health by promoting a balanced and healthy gut flora.

Ogi's high fibre content promotes a feeling of fullness, which may aid satiety and weight management. Ogi's fibre content and slow digestion make it a healthy option for people with diabetes, as they may help control blood sugar levels. Some nutrients become more bioavailable through fermentation and soaking, making them more accessible for the body to absorb. Beyond its nutritional worth, ogi has cultural significance and may enhance general health by preserving old rituals and developing a sense of cultural connectedness. Omemu and Bankole (2015) state that ogi is a versatile cuisine that can be enhanced in terms of nutritional diversity by using various toppings like nuts, fruits, or spices (Omemu & Bankole, 2015).

Ogi (corn flour porridge) impacts chronic non-communicable diseases (NCDs) due to its nutritional value and potential health benefits associated with intake. Even while ogi may not be a direct treatment for chronic non-communicable diseases (NCDs), including it in a balanced diet can promote health and well-being and may alter some risk factors connected to NCDs. Ogi's high fibre content may help people feel fuller and control their portion sizes, aiding in weight management. The slow-digesting texture and high fibre content of ogi may assist with blood sugar stabilization for people with diabetes or those who may develop it in

Conclusion and Recommendations

Traditional Nigerian foods can be essential to a healthy and balanced diet since they are a rich source of nutrients that can help prevent or treat chronic NCDs like hypertension, diabetes, and cardiovascular disease. To preserve nutrients, it's important to use healthy cooking techniques like boiling, grilling, or roasting. Future studies should concentrate on creating recipes that lower the risk of chronic NCDs while maintaining the nutritional value of traditional Nigerian cuisine.

To ensure a broad spectrum of nutrients, consuming a diverse range of foods such as fruits, vegetables, whole grains, legumes, lean proteins, and healthy fats is suggested. Maintain a healthy weight by controlling portion sizes and calorie intake and paying attention to food's energy density. To optimize intake of nutrients and reduce added sugars, salt, and unhealthy fats, opting for whole, minimally processed foods is good. Drink water to stay well-hydrated throughout the day. There should be restrictions on the amount of sugar-filled drinks and coffee consumed. As part of a balanced diet, occasionally indulge in traditional foods like *ogi*, beans, and red palm oil. To maintain nutritional value, be mindful of the cooking techniques used. Using a range of fruits and vegetables is suggested to create a colourful plate. Various hues represent various nutrient profiles. To promote digestive health and control blood sugar levels, foods high in fibre, such as whole grains, legumes, and vegetables, are good. Select healthy fat sources, limiting trans and saturated fats, such as those in avocados, nuts, seeds, and red palm oil. Make lean protein sources, fish, poultry, legumes, and plant-based

the future. The fibre in ogi may help lower cholesterol and improve heart health. Including whole grains may also benefit the heart. The dietary fibre in ogi promotes regular bowel movements and prevents constipation, which is beneficial for digestive health. Ogi, a staple food that fosters community and preserves cultural traditions, is a cuisine fundamental to culture and can enhance well-being. Owing to its versatility, ogi can be topped with various foods, such as fruits and nuts, which enhances the nutritional content and profile of the diet (Innocent et al., 2020).

It's essential to keep in mind that eating too many traditional Nigerian foods might lead to health problems like obesity and high blood pressure. Therefore, it's necessary to eat them only occasionally. Modern, nutrient-dense foods, including fruits, vegetables, whole grains, and traditional foods, must be balanced. While traditional Nigerian foods, like those listed above, can provide a range of essential nutrients that can help avoid non-communicable diseases, it's crucial to remember that their effects on health can also vary according to dietary patterns, portion sizes, and frequency of consumption. Eating a balanced diet that includes a range of foods from different food groups and regular exercise are typically recommended to maintain excellent health (Mbata et al., 2009; Oyeyinka & Oyeyinka, 2018).

proteins, a priority for your health and the health of your muscles. Reduce how much processed and

packaged food you eat because it contains unhealthy fats, salt, and added sugars.

Engaging in regular physical activity is essential to prevent and treat chronic NCDs. Along with muscle-strengthening exercises, incorporating at least 150 minutes of moderate-intensity aerobic activity per week is beneficial for weight control, cardiovascular health, and general well-being. Since each person has unique dietary demands, it is critical to consider prescription medications, lifestyle decisions, and underlying medical issues when selecting food.

ACKNOWLEDGMENTS

The authors are thankful to Cape Peninsula University of Technology for literature collection facilities.

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