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Dietary Fiber Content of Nigerian Staple Foods and Its Public Health Implications: A Systematic Review

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Systematic Review

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Abstract

Background

Dietary fiber is an essential component of a healthy diet, associated with reduced risk of cardiovascular disease, type 2 diabetes, obesity, and colorectal cancer. In Nigeria, the nutrition transition—shifting from traditional high-fiber staples to refined, low-fiber foods—has accelerated the burden of non-communicable diseases (NCDs). However, comprehensive data on the fiber content of commonly consumed Nigerian staples are scattered, and public health messaging around fiber remains weak.

Objective

This review synthesizes available evidence on the dietary fiber content of major Nigerian staple foods (cassava, yam, maize, rice, sorghum, millet, plantain, sweet potato, and their processed products) and discusses the public health implications for NCD prevention.

Methods

A systematic search of PubMed, Scopus, ScienceDirect, Google Scholar, and ResearchGate was conducted for studies published between 2000–2026 following PRISMA guidelines. Included studies reported crude or dietary fiber content of Nigerian staples. Data were extracted and presented in comparative tables, and findings were integrated within current dietary guidelines and NCD epidemiology in Nigeria.

Results

Unprocessed staples vary widely in fiber content: whole grains (sorghum: 6–10%; millet: 7–12%; maize: 2–4%), roots/tubers (sweet potato: 2.5–3.5%; cassava root: 1.5–2.5%; yam: 1.5–2.5%; plantain: 2–4%). Processing reduces fiber markedly: white rice (0.4–1.0%), cassava garri (1.5–3.0%), yam flour (1.0–2.0%), and maize meal (1.0–2.0%). Traditional fermentation and retention of bran/peels increase fiber content. Current estimated daily fiber intake among Nigerian adults (10–15 g/day) falls below the recommended 25–30 g/day. Low fiber intake is associated with rising NCD prevalence: diabetes (5.8% adults), hypertension (32%), and colorectal cancer (increasing incidence).

Conclusion

Nigerian diets are becoming dangerously low in fiber due to reliance on refined staples. Promoting consumption of whole grains, unprocessed roots/tubers, and fiber-retaining processing methods (e.g., sweet potato garri, unpeeled yam flour) is a cost-effective public health strategy. Food-based dietary guidelines should include explicit fiber targets and encourage diversification of carbohydrate sources.

1. INTRODUCTION

1.1 The Role of Dietary Fiber in Health

Dietary fiber - indigestible plant carbohydratesis widely recognized as a critical component of a healthy diet. Soluble fiber (e.g., β-glucans, pectins) lowers serum cholesterol and modulates postprandial glucose, while insoluble fiber (e.g., cellulose, lignin) promotes laxation and colonic health (Slavin, 2013; Anderson et al., 2009). High fiber intake is consistently associated with reduced risk of cardiovascular disease (CVD), type 2 diabetes, obesity, stroke, and colorectal cancer (Reynolds et al., 2019; Veronese et al., 2018).

The recommended daily fiber intake for adults is 25–30 g (or 14 g per 1,000 kcal) (IOM, 2005). However, global intakes average only 15–20 g/day, with lower values in low- and middle-income countries undergoing nutrition transition (Stephen et al., 2017).

1.2 The Nigerian Nutrition Transition

Nigeria, like many sub-Saharan African countries, is experiencing a rapid nutrition transition. Traditional diets - rich in whole grains, roots, tubers, legumes, and vegetables - are being replaced by energy-dense, refined, low-fiber foods, often accompanied by increased sugar, fat, and animal products (Popkin et al., 2012). This shift is driven by urbanization, rising incomes, and the availability of processed convenience foods.

Simultaneously, Nigeria faces a dual burden: persistent under-nutrition (stunting, wasting, micronutrient deficiencies) and a rapidly growing epidemic of non-communicable diseases (NCDs). The prevalence of diabetes in Nigerian adults is estimated at 5.8%, hypertension at 32%, and obesity at 12% (IDF, 2021; Adeloye et al., 2015). Colorectal cancer, once rare, is now among the top ten cancers in Nigeria (Jedy-Agba et al., 2016). Low dietary fiber intake is a modifiable risk factor for all these conditions.

1.3 The Need for a Fiber-Focused Review

Despite the public health importance of fiber, there is no comprehensive synthesis of fiber content in Nigerian staple foods. Individual studies have reported proximate composition (including crude fiber) for cassava garri, yam, maize, rice, sorghum, millet, plantain, and sweet potato (Edet et al., 2023; Bello et al., 2026; Akpoghelie et al., 2025). However, these data are scattered, and no review has compared fiber levels across staples, examined the effect of processing, or translated findings into actionable public health recommendations.

1.4 Aim of This Review

This review aims to: (i) collate and synthesize available data on the dietary (crude) fiber content of major Nigerian staple foods, in both unprocessed and processed forms; (ii) compare fiber levels across staples and processing methods; (iii) estimate current fiber intake in relation to recommendations; and (iv) discuss public health implications and strategies for increasing fiber consumption in Nigeria.

2. METHODS

2.1 Search Strategy

A literature search was conducted in PubMed, Google Scholar, and African Journals Online (AJOL) using keywords: “dietary fiber” OR “crude fiber” OR “fibre” AND “Nigeria” AND “staple” OR “cassava” OR “yam” OR “maize” OR “rice” OR “sorghum” OR “millet” OR “plantain” OR “sweet potato.” Studies published from 2000 to 2026 were included.

2.2 Inclusion and Exclusion Criteria

- Original research reporting crude or dietary fiber content of Nigerian staple foods (raw or processed).
- Studies using AOAC or equivalent analytical methods.
- Studies on non-staple food were excluded
- Studies without peer-reviewed were also excluded
- Studies where full text was unavailable after contacting authors and duplicate publications of the same data were also excluded.

2.3 Data Extraction and Synthesis

Fiber content (mean, range, standard deviation) was extracted along with processing method and variety. Data were summarized descriptively and presented in comparative tables.

3. RESULTS

3.1 Fiber Content of Unprocessed Nigerian Staples

Table 1 presents the crude fiber content of raw (unprocessed) staple crops commonly consumed in Nigeria. Values are reported on a dry weight basis unless otherwise specified.

Table 1
Crude Fiber Content of Unprocessed Nigerian Staple Rops.

Staple Crop	Part Consumed	Crude Fiber (%) – Fresh Weight	Crude Fiber (%) – Dry Weight	Key point
Cassava (*Manihot esculenta*)	Root	1.2–2.0	1.5–2.5	Bitter varieties slightly higher
Sweet potato (*Ipomoea batatas*)	Root	1.8–2.8	2.5–3.5	Orange-fleshed vs. white: similar fiber
Yam (*Dioscorea spp.*)	Tuber	1.0–2.0	1.5–2.5	D. rotundata, D. alata
Plantain (*Musa paradisiaca*)	Fruit (green)	2.0–3.5	3.0–4.5	Unripe; ripe slightly lower
Maize (*Zea mays*)	Grain (whole)	2.0–3.0	2.5–4.0	Bran and germ intact
Sorghum (*Sorghum bicolor*)	Grain (whole)	4.0–7.0	6.0–10.0	Rich in insoluble fiber
Millet (*Pennisetum glaucum*)	Grain (whole)	5.0–8.0	7.0–12.0	Pearl millet common
Rice (*Oryza sativa*)	Grain (brown)	1.5–2.5	2.0–3.5	Bran layer intact
Rice (*Oryza sativa*)	Grain (white, polished)	0.3–0.8	0.4–1.0	Polished, bran removed

Sources

Compiled from Edet et al. (2023), Bello et al. (2026), FAO (2018), Adeleke & Abiodun (2010), Ogunka-Nnoka et al. (2019), and others.

Key observations:

- **Whole grains** (sorghum, millet) have the highest fiber content (6–12% dry weight).
- **Roots and tubers** have moderate fiber (1.5–3.5%), with sweet potato > cassava ≈ yam.
- **Green plantain** is relatively high in fiber (3–4.5% dry weight).
- **Polished white rice** is the lowest (0.4–1.0%).

3.2 Effect of Traditional Processing on Fiber Content

Processing methods commonly used in Nigerian households significantly alter fiber content, as shown in Table 2.

Table 2
Effect Of Traditional Processing On Fiber Content Of Nigerian Staples.

Staple	Processing Method	Fiber (% dry weight)	Change Relative to Raw	Reference
Cassava → Garri	Fermentation + dewatering + roasting	1.5–3.0	Slight increase (concentration)	Edet et al., 2023; Bello et al., 2026
Cassava → Fufu	Fermentation + boiling + pounding	1.0–2.0	Slight decrease	Akpoghelie et al., 2025
Yam → Yam flour (Elubo)	Peeling, drying, milling	1.0–2.0	Moderate decrease	Adeleke & Abiodun, 2010
Yam → Boiled yam	Boiling (peeled)	1.0–1.8	Minimal change	Ogunka-Nnoka et al., 2019
Maize → Maize meal (Ogi, pap)	Wet milling, fermentation, sieving	0.8–1.5	Large decrease (bran removed)	Okafor et al., 2012
Sorghum → Sorghum meal	Milling, sometimes decortication	3.0–6.0	Moderate decrease (if bran removed)	Afolabi et al., 2018
Plantain → Plantain flour	Drying, milling (unripe)	2.5–4.0	Minimal loss	Ayo-Omogie&Omonkhua, 2015
Sweet potato → Sweet potato garri	Fermentation + dewatering + roasting	2.8–3.2	Slight increase (concentration)	Bello et al., 2026
Rice → Boiled white rice	Polishing + boiling	0.3–0.8	No change (already low)	FAO, 2018

Key observations:

- **Fermentation and roasting** (as in garri) can slightly concentrate fiber due to loss of moisture and other solids.
- **Sieving or decortication** (removing bran) dramatically reduces fiber, especially in maize ogi and white rice.
- **Boiling** has minimal effect on fiber content (fiber is heat-stable).
- **Sweet potato garri** retains higher fiber than cassava garri (3.0% vs. 2.7%).

3.3 Estimated Daily Fiber Intake in Nigeria

Few Nigerian studies have directly measured dietary fiber intake. However, using food consumption surveys and typical portion sizes, estimates can be derived.

Typical adult daily diet (rural, traditional):

- Breakfast: Maize ogi (1 cup) + millet porridge → ~3–5 g fiber
- Lunch: Garri with soup (small fish, vegetables) → ~4–6 g fiber
- Dinner: Boiled yam or plantain with vegetable soup → ~4–6 g fiber
- **Total**: 11–17 g/day

Typical adult daily diet (urban, modern):

- Breakfast: White bread, tea, sugar → ~1–2 g fiber
- Lunch: White rice with stew → ~1–2 g fiber
- Dinner: Noodles or fast food → ~2–3 g fiber
- Snacks: Biscuits, soft drinks → ~0–1 g fiber
- **Total**: 4–8 g/day

These estimates indicate that even traditional diets may fall short of the recommended 25–30 g/day, and modern urban diets are severely deficient.

3.4 Fiber Intake and NCD Prevalence

Table 3 summarizes the relationship between estimated fiber intake and NCD burden in Nigeria.

Table 3
Fiber Intake and NCD Prevalence in Nigeria.

NCD	Estimated Prevalence (Adults)	Established Relationship with Low Fiber Intake
Type 2 diabetes	5.8% (IDF, 2021)	Strong inverse association (Reynolds et al., 2019)
Hypertension	32% (Adeloye et al., 2015)	Moderate inverse association (Evans et al., 2015)
Obesity (BMI ≥ 30)	12% (WHO, 2018)	Inverse association (Slavin, 2013)
Colorectal cancer	Age-standardised rate: ~6/100,000 (Jedy-Agba et al., 2016)	Strong inverse association (Aune et al., 2011)
Coronary heart disease	Estimated 2–3%	Strong inverse association (Threapleton et al., 2013)

The continuous rising NCD in Nigeria coincides with declining fiber intake, consistent with global epidemiological patterns.

4. DISCUSSION

4.1 Main Findings and Interpretation

This review provides the first comprehensive synthesis of dietary fiber content in Nigerian staple foods. Key findings include:

1. **Unprocessed staples vary widely**: Whole grains (sorghum, millet) are excellent fiber sources (6–12%), while roots/tubers provide moderate amounts (1.5–3.5%). Polished white rice is very low in fiber (< 1%).
2. **Processing generally reduces fiber**: Sieving (e.g., ogi), decortication (e.g., white rice), and peeling (e.g., yam flour) remove fiber-rich bran and peels. Fermentation and roasting (garri) cause minimal concentration effects.
3. **Sweet potato garri has higher fiber than cassava garri**: 3.0% vs. 2.7%, consistent with the original comparative study (Bello et al., 2026).
4. **Current fiber intake is inadequate**: Even traditional diets may provide only 11–17 g/day, and urban diets fall to 4–8 g/day, well below the 25–30 g/day recommendation.
5. **Low fiber intake is a modifiable risk factor for NCDs**: Nigeria's rising NCD burden is partly contribute to the nutrition transition and reduced fiber consumption.

4.2 Comparison with Global Recommendations and Other Populations

The World Health Organization recommends a minimum of 25 g/day of dietary fiber for adults (WHO, 2003). The average Nigerian adult, especially in urban areas, consumes less than half that amount. By comparison, populations with traditional high-fiber diets (e.g., rural Africans, Papua New Guineans) have fiber intakes of 30–50 g/day and very low rates of NCDs (O'Keefe, 2016). The Maasai, despite high animal fat intake, consume significant fiber from plant foods and have lower NCD rates than urbanized Nigerians (though genetics also play a role).

4.3 Public Health Implications

Immediate strategies to increase fiber intake in Nigeria:

1. **Promote whole grains**: Encourage consumption of whole maize, sorghum, and millet rather than refined flours. For ogi (pap), retain the bran fraction or add back fibre-rich ingredients.
2. **Diversify carbohydrate sources**: Increase the proportion of sweet potato, plantain, and whole yam (with peel, when possible) relative to white rice and cassava garri.
3. **Optimize processing methods**: For garri, use sweet potato (higher fiber) and consider adding back fibre-rich pulp or vegetable powders. For yam flour, include dried peel (after cleaning) to increase fiber.
4. **Consumer education**: Public health campaigns should highlight fiber benefits and simple messages (e.g., "Eat whole grains, leave the peel on plantains, choose brown rice").
5. **Food-based dietary guidelines**: Nigeria's current dietary guidelines lack specific fiber targets. Revision should include daily fiber recommendations and practical examples of high-fiber staples.

6. **School feeding programs**: Integrate fiber rich staples (sweet potato porridge, whole maize meal, millet gruel) to establish healthy preferences early.

4.4 The Role of Sweet Potato Garri in Increasing Fiber Intake

The original Garri study (Bello et al., 2026) demonstrated that sweet potato garri has significantly higher crude fiber (3.03%) than cassava garri (2.73%). While the absolute difference is modest (0.3 percentage points), in a population that consumes 300–500 g of garri per day, this translates to an additional 1–1.5 g of fiber daily. Combined with other dietary changes, this could help close the fiber gap. More importantly, promoting sweet potato garri as an alternative sends a signal that dietary diversification is desirable and feasible.

4.5 Limitations of the Review

Although this review followed a systematic approach and comprehensive search straregy, it has certain limitations. Firstly, the included studies primarily focus on crude fiber values, which are known to more advanced enzymatic methods. In addition, there was limited data distinguishing between soluble and insoluble fiber fractions, which possess distinct physiological benefits. Furthermore, while the intake estimates presented are consistent with typical dietary patterns in Nigeria, they are derived from observational data rather than standardized national nutritional surveys. Despite these constraints, the evidence compiled is robust and provides a valid basis for public health recommendations and policy development.

5. CONCLUSION

Dietary fiber intake in Nigeria is dangerously low, especially in urban areas, contributing to the rising burden of diabetes, hypertension, obesity, and colorectal cancer. Traditional staples such as whole grains (sorghum, millet), sweet potato, plantain, and unrefined roots provide moderate to high fiber, but processing methods (polishing, sieving, decortication) often remove the fiber-rich components. Sweet potato garri offers a modest but meaningful increase in fiber compared to cassava garri, and its promotion aligns with broader dietary diversification strategies.

Public health interventions should focus on:

- Revising national dietary guidelines to include explicit fiber targets.
- Promoting whole grains and minimally processed staples.
- Encouraging the production and consumption of sweet potato garri and other fiber-enhanced traditional foods.
- Implementing school and workplace feeding programmes that prioritise high-fiber meals.

A minimal increase in daily fiber intake - from the current 10–15 g to 20–25 g - could significantly reduce NCD risk and improve digestive health in Nigeria, at minimal cost.

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