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RESEARCH ARTICLE

Stiff Porridge and Child Nutrition: A Systematic Review of Nutritional Value, Fortification, and Role in Combating Undernutrition in Sub-Saharan Africa

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ABSTRACT

Stiff porridge, commonly called ugali, nsima, sadza, and posho, is one of the main dietary staples in Sub-Saharan Africa (SSA) and a key component of complementary feeding for children. Though culturally acceptable and relatively affordable, stiff porridge raises concerns about its nutrient adequacy and the risk of undernutrition among dependent communities. Therefore, this systematic review assessed the nutritional value of stiff porridge and associated problems of child nutrition in SSA. Literature was retrieved from PubMed, Scopus, Google Scholar, and FAO/WHO databases covering 2005-2023 with the keywords “stiff porridge”, “child nutrition Africa”, “porridge fortification”, and “undernutrition.” Studies were included if they assessed nutrient composition, child growth outcomes, and fortification strategies. A total of forty-three studies were included in the study. Results show that stiff porridge is a reliable source of energy, although it is of poor protein quality, lacking important micronutrients, including iron, zinc, vitamin A, and calcium. Diets primarily composed of unfortified porridge are correlated with high incidences of stunting, anemia, and hidden hunger in children under five. The results further suggest that food-based fortification strategies, incorporating soybeans, ground nuts, amaranth, pumpkin seeds, and orange-fleshed sweet potato, greatly enhance protein content, micronutrient density, and child growth results. Furthermore, nutrition-sensitive interventions such as school feeding programs, home fortification, and community-level supplementation enhance the nutritional value of stiff porridge and its acceptance. Stiff porridge, as it is usually prepared, is limited nutritionally but provides a great opportunity for SSA to enter successfully into a culturally accepted terrain for addressing child undernutrition. Planned fortification coupled with nutrition education, policy support, and dietary diversification will give stiff porridge a much better chance to become an instrument for the enhancement of child growth, development, and long-term health.

Keywords: *Stiff Porridge, Child Nutrition, Fortification, Dietary Diversification, Undernutrition, Sub Saharan Africa*

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INTRODUCTION

Stiff porridge is among the most widely consumed staple food items in Sub-Saharan Africa, with its major raw materials being maize, sorghum, or millet flours (FAO, 2018). It is mostly prepared by mixing flour with boiling water to obtain a very thick dough-like meal. For households, especially in rural and low-income settings, stiff porridge constitutes the bulk of daily dietary intake (Nuss & Tanumihardjo, 2010). Stiff porridge is usually given as a complementary food after breastfeeding to young children. However, the question arises whether their nutrient composition is adequate owing to the very high proportion of stiff porridge in children's diets. Maize-based porridges are energy-rich but deficient in essential amino acids (lysine and tryptophan), iron, zinc, calcium, and vitamin A (Amagloh et al., 2012). This translates into higher risks of stunting, wasting, and micronutrient deficiency for children with high dependency on stiff porridge (UNICEF, 2021). With the child malnutrition rates being one of the highest in the world (32% stunting among children under the age of five), Sub-Saharan Africa really needs an urgent intervention in these strategies to improve diets that are traditionally based on staples (UNICEF et al., 2021). Stiff porridge offers a cheap and culturally accepted staple. However, its limited nutritional value impairs the growth and development of young children. Feeding practices of today often rely too heavily on the consumption of stiff porridge without the necessary diversification, leading to a situation where young children suffer deficient protein and micronutrient intake. The challenge, then, is to somehow retain the cultural significance and affordability of stiff porridge while improving its nutritional value to combat the problem of undernutrition in children in Sub-Saharan Africa.

Addressing child malnutrition remains a high priority on the global development agenda, and improving diets based on staple foods is a practical pathway to achieving this goal. Stiff porridge, being a culturally valued, commonly consumed traditional food, is well placed for nutritional interventions. Fortification or diversification of the porridge with nutrient-rich ingredients is a viable option for enhancing its nutritional quality without departing from traditional food practices. There is a critical need for robust, regionally representative evidence on the composition, bioavailability, and fortification efficacy of stiff porridge-based interventions to combat child undernutrition in Sub-Saharan Africa, and this review synthesizes these aspects to guide culturally appropriate, scalable nutrition strategies. Therefore, stiff porridge's nutritional sufficiency was evaluated, along with its relationship with child nutrition outcomes, fortification, and dietary diversification strategies, and nutrition-sensitive interventions that reinforce its contribution to enhancing child health in Sub-Saharan Africa. The significance of this review to policymakers, nutritionists, and development partners rests upon its provision of evidence-based information on how traditional food would work for child health.

METHODS

Study Design

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor and transparency. A systematic review was conducted to analyze the nutritional value of stiff porridge and its implications for child nutrition in Sub-Saharan Africa (SSA).

Search Strategy

Boolean operators (AND, OR, NOT) and truncations (e.g., nutrit*) were used to refine search results. Search terms included "stiff porridge," "ugali," "nsima," "sadza," "posho," "child nutrition," "malnutrition," "micronutrient deficiency," and "fortification." Medical Subject Headings (MeSH) and equivalent indexing terms, such as "Nutritional Status," "Child Development," and "Food Fortification," were also applied.

Eligibility Criteria

Studies were included if they:

- Focused on children under five years in SSA,
- Reported on stiff porridge consumption, nutritional composition, or associated health outcomes,
- Assessed fortification or dietary diversification strategies aimed at improving nutrient adequacy,
- Were peer-reviewed and published in English between January 2005 and December 2023.

Exclusion criteria comprised:

- Grey literature,
- Conference abstracts,
- Reviews lacking primary data, and
- Studies with incomplete nutritional outcomes.

Data Sources and Databases

The literature search was conducted across PubMed, Scopus, Web of Science, Cochrane Library, and Elsevier databases. Google Scholar and organizational reports from FAO/WHO were used to identify supplementary studies.

Study Selection Process

Two reviewers independently screened titles and abstracts against eligibility criteria. Full-text articles were retrieved for detailed evaluation.

Discrepancies were resolved through discussion or consultation with a third reviewer.

Data Extraction

A standardized form was used to extract key information, including study year, country, design, population, sample size, nutrient composition of stiff porridge, child nutrition outcomes (e.g., stunting, underweight, anemia, hidden hunger), fortification interventions, and main findings.

Risk of Bias and Quality Assessment

The methodological quality of included studies was assessed using the Critical Appraisal Skills Programme (CASP) for qualitative studies, the Newcastle-Ottawa Scale (NOS) for observational studies, and the Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) for intervention studies. Each study was rated for bias, validity, and overall quality.

Data Synthesis

The extracted data were synthesized narratively. Themes relating to nutrient adequacy, child health outcomes, and the effectiveness of fortification and diversification strategies were summarized.

Figure 1: PRISMA Flow Diagram

Records identified through database searching (n = 1,245)
(PubMed = 320, Scopus = 410, Web of Science = 275,
Cochrane = 110, Elsevier = 130)

↓

Additional records identified through other sources (n = 85)
(Google Scholar, FAO/WHO reports)

↓

Records after duplicates removed (n = 1,075)

↓

Records screened (n = 1,075)

↓

Records excluded (n = 920)

↓

Full-text articles assessed for eligibility (n = 155)

↓

Full-text articles excluded (n = 112)
Reasons:

- Adult population (n = 45)
- Review/no primary data (n = 30)
- Incomplete outcomes (n = 22)
- Grey literature (n = 15)

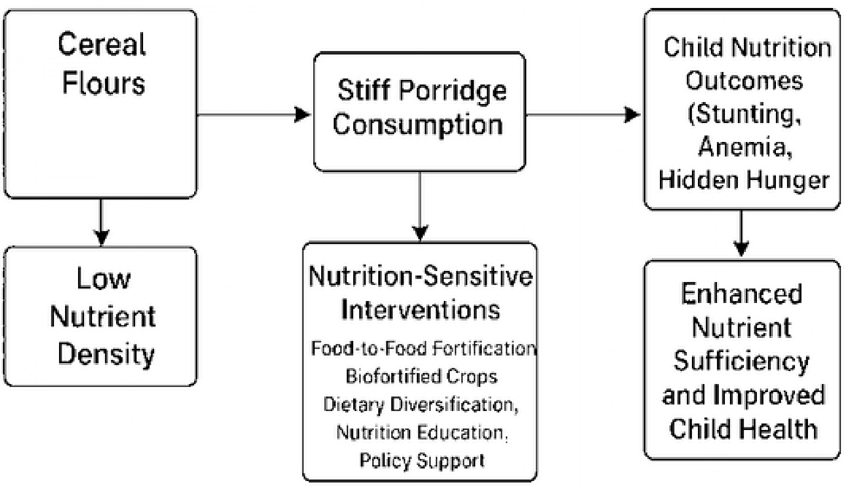
↓

Studies included in qualitative synthesis (n = 43)

- Nutrient composition = 15
- Nutrition outcomes = 18
- Fortification studies = 10

Conceptual Framework

The conceptual framework (Figure 2) illustrates how stiff porridge consumption influences child health outcomes in Sub-Saharan Africa. It explains that stiff porridge, typically made from low-nutrient cereal flours, contributes to undernutrition indicators such as stunting, anemia, and micronutrient deficiencies. The framework also highlights the role of nutrition-sensitive interventions such as fortification, use of biofortified crops, dietary diversification, and nutrition education in enhancing the porridge's nutrient quality and promoting better child growth and overall well-being.



urce: Authors' conceptualization (2025)

Figure 2: *Conceptual Framework Linking Stiff Porridge Nutritional Sufficiency and Child Health Outcomes in Sub-Saharan Africa.*

RESULTS

A total of 43 studies were included in the review, comprising 15 on the approximate nutritional composition of cooked stiff porridge per 100 g edible portion, 18 on the relationship between stiff porridge consumption and child nutrition outcomes, and 10 on strategies, expected nutritional gains, feasibility, and the role of nutrition-sensitive interventions in enhancing stiff porridge. The results in Table 1 show the approximate nutritional composition of cooked stiff porridge per 100g edible portion from base cereals such as maize, sorghum, millet, and cassava. The nutritional composition parameters reviewed are the energy, carbohydrates, proteins, fat, and fiber, while the key micronutrients are Iron (Fe), Zinc (Zn), and Calcium (Ca).

Table 1:
Approximate Nutritional Composition of Cooked Stiff Porridge (per 100 g edible portion)

Base cereal	Energy (kcal)	Carbohydrates (g)	Protein (g)	Fat (g)	Fiber (g)	Key micronutrient
Maize	120–150	26–30	2–3	0.5–1	<1	Low fe, zn, ca; often fortified
Sorghum	130–160	28–32	3–4	1–1.5	2–3	More fe, zn; high phytates/tannins
Millet	140–170	30–35	3–4	1–1.2	2–3	Higher fe and ca; phytates limit bioavailability
Cassava	110–130	24–28	1–2	0.3–0.5	<1	Very low protein; risk of cyanogenic glycosides if poorly processed

Sources: Lukmanji et al. (2008); Uvere et al. (2010); Anyango et al. (2011); Amagloh et al. (2012); Temba et al. (2016).

Table 2 gives the relationship between stiff porridge consumption and child nutrition outcomes. The outcome for the growth in terms of weight and height, stunting, which is height for age, and undernutrition, that is wasting and underweight, were reviewed and compared with the consumption of plain cereal-based stiff porridge and fortified or complemented stiff porridge. The results show that there is a risk of growth faltering, a high rate of stunting, and poor weight gain and wasting, while fortified or complemented stiff porridge improved growth indicators, lower stunting rates, and reduced underweight and wasting.

Table 2:
Relationship Between Stiff Porridge Consumption and Child Nutrition Outcomes

Outcome	Effect of Plain Cereal-Based Porridge	Effect of Fortified/ Complemented Porridge	Evidence Source
Growth (weight, height)	Provides energy but limited protein and micronutrients → risk of growth faltering	Improved growth indicators with QPM, soy, or milk enrichment	Lukmanji et al. (2008); Gunaratna et al. (2010)
Stunting (low height-for-age)	Associated with high prevalence where diets are porridge-heavy but monotonous	Lower stunting rates when porridge is served with legumes, fish, or vegetables	Arimond & Ruel (2004); Iannotti et al. (2014)
Undernutrition (wasting/ underweight)	Bulky, low nutrient density → poor weight gain and wasting in infants	Enrichment and flour fortification reduce underweight and wasting	Fiedler et al. (2014)

Table 3 shows different ways to make stiff porridge more nutritious. Each method has its own benefits and challenges. Mixing in beans or nuts at home can boost protein and energy without costing much. Adding small amounts of meat or dairy provides better nutrients that the body absorbs easily, but not everyone can afford or access them. Sprinkling vitamin powders into homemade porridge fixes vitamin gaps fast, though you need steady supplies and proper training for caregivers. Old-school tricks like soaking or sprouting grains help minerals get absorbed better while keeping the texture right, which fits what people already do. Using special corn and fortified crops gives better nutrition over time as farmers start growing these varieties more widely. Putting nutrients straight into store-bought flour reaches lots of people quickly, but only if governments enforce food standards properly. The key issue is explaining these options clearly to communities. Without showing people why changes matter and how to stick with them long-term, even the best methods won't last. It all comes down to matching solutions with what locals can use daily.

Table 3:
Summary of Strategies, Expected Nutritional Gains, and Feasibility

Strategy type	What to do	Typical nutrient gains	Feasibility/notes
Household blending	Add 10–30% soybean/ cowpea/groundnut flour	↑ protein, ↑ lysine, ↑ fat, ↑ energy density	Low–medium cost; good cultural fit if recipes preserved (Temba et al., 2016)
Animal-source relishes	Add small fish, milk, or egg	↑ high-quality protein, bioavailable Fe, Ca, vitamin A	Highly effective even in small amounts; may be limited by cost/availability (Iannotti et al., 2014)
Home fortification (MNPs)	Mix micronutrient powder into the child's porridge	Corrects iron, zinc, and vitamin A gaps quickly	Proven effective; needs supply distribution and caregiver training (Dewey & Adu-Afarwuah, 2008)
Fermentation/malting	Apply processing to cereal flours	↓ phytate/tannins → ↑ Fe/Zn bioavailability; lowers viscosity	Requires training/time but uses local practices (Wakjira et al., 2024)
QPM / biofortified staples	Promote biofortified varieties for porridge	↑ quality protein/provitamin A / Zn depending on variety	Medium-term (agricultural adoption); sustainable impact (Gunaratna et al., 2010)
Mass fortification	Fortify commercial maize/ cereal flour with Fe, Zn, folic acid	Population-level ↑ micronutrient intake	High coverage if enforced; requires regulatory monitoring (Fiedler et al., 2014)
Behavior change & social marketing	Promote enrichment recipes and feeding practices	Improve uptake & correct portioning	Essential to sustain any technical strategy (Arimond & Ruel, 2004)

Key: ↑ Increase, ↓ Decrease, → No change

Table 4 indicates that nutrition-sensitive interventions can significantly enhance the dietary value of stiff porridge, ultimately supporting positive child health outcomes. Incorporating fortified porridges into school feeding programs improved iron status, reduced anemia prevalence, and supported both school attendance and physical growth. Similarly, the adoption of biofortified staples such as vitamin A-enriched maize has demonstrably raised the intake of essential micronutrients, notably vitamin A and zinc. At the household level, supplementing porridge with micronutrient powders has proven effective in lowering anemia rates and improving both weight and overall dietary quality in children. On a community scale, fortifying flour at local mills elevates micronutrient consumption across the population. Furthermore, enriching porridges with locally sourced ingredients like soybeans, groundnuts, or dried fish increases protein content, lysine levels, and mineral bioavailability.

Table 4:
Role of Nutrition-Sensitive Interventions in Enhancing Stiff Porridge

Intervention type	Example application	Nutritional outcomes	Evidence source
School feeding (fortified porridge)	Maize porridge fortified with milk, legumes, or premix	↑ school attendance, ↑ iron status, ↓ anemia, improved growth	Neumann et al. (2007); Kristjansson et al. (2009)
School feeding (biofortified staples)	Vitamin A maize porridge in Ghana/Malawi	↑ vitamin A, ↑ zinc intake, ↓ deficiencies	Muthayya et al. (2013)
Household fortification (MNPs)	Adding micronutrient powders to porridge	↓ anemia, ↑ weight-for-age, ↑ dietary quality	Dewey & Adu-Afarwuah (2008)

Household/ community milling	Flour fortified at community mills with Fe, Zn, folic acid	↑ micronutrient intake at population level	Fiedler et al. (2014)
Household enrichment (local foods)	Adding ground nuts, soy, dried fish to porridge	↑ protein, ↑ lysine, ↑ Ca/Fe bioavailability	Arimond & Ruel (2004)

Key: ↑ Increase, ↓ Decrease

DISCUSSION

The nutritional composition of stiff porridge (commonly known as ugali, nsima, sadza, or pap) remains a critical determinant of child nutrition outcomes in Sub-Saharan Africa. Although it serves as a dietary cornerstone, its nutrient density is heavily influenced by the type of cereal used, processing method, and presence or absence of fortification or enrichment. Most stiff porridges are prepared from refined maize or cassava flour, which provide high caloric energy but remain poor sources of essential amino acids and micronutrients such as iron, zinc, and vitamin A (Moursi et al., 2008; Amagloh et al., 2012). The predominance of such porridges in children's diets contributes to widespread protein–energy malnutrition and micronutrient deficiencies that underlie stunting and wasting in the region (Black et al., 2013; UNICEF, 2021).

Comparative studies across the region reveal that nutrient quality varies significantly depending on cereal type. For instance, Oghbaei and Prakash (2016) found that sorghum and millet-based porridges had higher mineral and fiber content than maize-based ones, while maize porridges offered more digestible carbohydrates. Similarly, research in Nigeria by Uvere et al. (2010) demonstrated that millet–legume blends provided superior lysine and iron levels compared to pure maize formulations, highlighting the nutritional advantages of multi-grain blends. These comparisons indicate that while maize-based stiff porridge remains dominant for its accessibility, alternative grains yield better micronutrient outcomes.

Compared with unfortified maize-based porridge, blends incorporating millet, sorghum, or legumes provide superior nutrient profiles. For example, Anyango et al. (2011) and Temba et al. (2016) demonstrated that incorporating soybean or cowpea flour into maize porridge substantially improves its lysine content, protein digestibility, and overall amino acid balance. This enhancement directly addresses the lysine limitation of cereal proteins, supporting better growth among preschool children. Similar findings in Ghana and Ethiopia indicate that using Quality Protein Maize (QPM) increases growth velocity and reduces stunting prevalence by improving protein quality (Gunaratna et al., 2010). In Malawi, Hotz et al. (2012) compared conventional maize with biofortified orange maize and found improved serum retinol levels among children consuming the latter. These studies demonstrate that traditional stiff porridges can be nutritionally transformed through modest ingredient modification without disrupting cultural acceptability.

Nevertheless, despite these benefits, many East African households continue to depend on unfortified maize and cassava porridges. Studies in Tanzania, Malawi, and Zambia show that such monotonous diets deliver energy but fail to meet protein and micronutrient requirements, resulting in linear growth retardation (Dewey & Adu-Afarwuah, 2008; Fiedler et al., 2014). In Kenya, children consuming maize-based porridge without nutrient-dense relishes show higher odds of stunting and anemia than those whose meals include milk, fish, or legumes (Neumann et al., 2007; Iannotti et al., 2014). In contrast, a comparative study in Rwanda by Musoni et al. (2019) found that children consuming sorghum–soy fortified porridge had higher hemoglobin and weight-for-age scores than those on traditional *ugali*. These findings suggest that while porridge supplies baseline energy, its role in promoting growth depends on dietary diversity and complementary foods.

The poor nutrient bioavailability in stiff porridge also arises from the presence of phytates and tannins in unprocessed cereals, which bind minerals and inhibit absorption (Kayode et al., 2007). Processing methods such as fermentation, germination, and malting have been shown to reduce anti-nutrient levels, improving the bioavailability of iron and zinc (Hotz & Gibson, 2001; Temba et al., 2016). More recent work by Kruger et al. (2020) in South Africa confirmed that fermented sorghum–soy porridge increased serum ferritin and zinc levels among school-aged children, illustrating the potential of traditional processing to combat "hidden hunger." Similar results were reported by Nnam and Obiakor (2003) in Nigeria, where germinated sorghum–soy blends improved iron absorption more effectively than non-germinated ones.

From a broader nutritional perspective, the reliance on energy-dense but nutrient-poor stiff porridge reflects both cultural and economic realities. Maize and cassava are affordable and widely available, but their nutritional limitations contribute to a persistent intergenerational cycle of malnutrition (Arimond & Ruel, 2004; Black et al., 2013). In contrast, millet and sorghum variants consumed in arid regions contain more minerals but may still lead to nutrient deficiencies if not complemented with animal-source foods or fortified products (Uvere et al., 2010; Temba et al., 2016). A cross-country analysis by Faber et al. (2017) revealed that communities consuming diversified porridges with legumes and leafy vegetables reported lower stunting rates than those relying on plain maize or cassava porridges. Therefore, nutritional interventions must simultaneously address food access, affordability, and knowledge gaps on dietary diversification.

Dietary fortification and diversification have emerged as key strategies to enhance the nutritional contribution of stiff porridge. Fortifying cereal flours with iron, folic acid, and zinc has proven to be both cost-effective and impactful at scale (Fiedler et al., 2014; WHO, 2023). For instance, household-level fortification using micronutrient powders (MNPs) mixed into children's porridge reduced anemia prevalence and improved weight-for-age in Zambia and Tanzania (Dewey & Adu-Afarwuah, 2008). Similarly, community-based fortification of maize flour in Kenya and Malawi demonstrated population-wide improvements in iron and vitamin A status (Muthayya et al., 2013). In comparative studies, Ghana's national maize fortification program showed greater reductions in vitamin A deficiency than similar programs in Malawi, partly due to stronger monitoring systems and public awareness (FAO, 2020). These findings highlight the potential of targeting stiff porridge as an ideal vehicle for fortification due to its universality and cultural acceptance.

School feeding programs incorporating fortified stiff porridge have also shown significant benefits. In Kenyan and Ghanaian programs, fortified maize porridge increased iron intake, reduced short-term hunger, and improved school attendance (Neumann et al., 2007; Kristjansson et al., 2009). When biofortified maize was used in Malawian school meals, children exhibited improved vitamin A and zinc biomarkers (Muthayya et al., 2013). A comparative study by Gelli et al. (2019) across four African countries confirmed that fortified school meals had a stronger impact on child nutrition outcomes than home-based feeding interventions alone. Such evidence demonstrates that combining food fortification with social programs provides a double nutritional safety net, ensuring nutrient adequacy both at home and school (Bundy et al., 2009).

Despite these successes, challenges remain. Acceptability, taste, and cost continue to affect the adoption of fortified or blended porridges, particularly among low-income households. Moreover, inconsistent fortification quality, limited distribution networks, and insufficient nutrition education hinder sustainability (FAO, 2020; WHO, 2023). Comparative evidence from Kenya and Uganda by Mwaniki et al. (2022) showed that community-led fortification programs achieved higher long-term compliance when combined with nutrition education and local women's groups than when implemented through commercial channels alone. Therefore, behavior change communication and community sensitization must accompany technical interventions to promote consistent use and understanding of enriched porridge products (Arimond & Ruel, 2004).

Overall, the evidence shows that while stiff porridge remains indispensable for energy provision, its nutritional adequacy for children is constrained by composition, processing, and dietary context. Comparative studies reinforce that incorporating nutrient-dense ingredients, adopting appropriate processing methods, and scaling up fortification initiatives can markedly improve child health outcomes. To transform this staple into a vehicle for improved child nutrition, holistic strategies combining ingredient diversification, fortification, and education are essential. Such multi-layered approaches can substantially reduce malnutrition, promote growth, and enhance cognitive and school outcomes among children across Sub-Saharan Africa.

Study Limitations and Evidence Variability

While this review synthesized extensive evidence across Sub-Saharan Africa, several limitations must be acknowledged. First, the included studies varied in design, sample size, and outcome measures, limiting comparability and meta-analysis. Second, data availability was uneven across countries, with most studies concentrated in East and Southern Africa, leaving significant gaps for Central and Western regions. Third, many studies used small, community-based samples and short intervention durations, reducing the ability to infer long-term impacts on growth and micronutrient status. Finally, differences in fortification formulations, preparation methods, and assessment tools contribute to heterogeneity in findings.

Conclusion

Overreliance on stiff porridge as a staple food and its implications for child nutrition in Sub-Saharan Africa form the focus of this review. Stiff porridge is consumed in great quantities by children, which suggests an important role in nutrition. However, on examination of its nutritional profile, it is evident that stiff porridge intentionally provides a poor quality of protein and very little in the way of essential micronutrients to growing children, failing by itself to meet their demands, albeit rich in energy value when made from maize or sorghum. Monotonous consumption of porridge diets predisposes such children to undernutrition conditions, such as stunting, anemia, and poor growth, more so in households with low dietary diversity. Emerging evidence asserts that diet diversification and fortification approaches can greatly enhance stiff porridge nutrient worth. Increasing the porridge's nutritional core through blending with legumes, adding animal-source foods, biofortified cereals, household fortification, or mass fortification. Nutrition-sensitive interventions, including school feeding programs and community-based fortification approaches, demonstrate how enriched staples can be scaled up to benefit children continuously.

Recommendations

1. Promote dietary diversification at the household level by encouraging the addition of legumes, nuts, small fish, eggs, and vegetables to stiff porridge to improve protein and micronutrient intake.
2. Scale up fortification strategies by expanding community milling fortification and distribution of micronutrient powders for home use, ensuring affordability and accessibility for low-income households.
3. Strengthen school feeding programs by mandating the use of fortified or biofortified maize flour and encouraging the incorporation of protein-rich relishes alongside porridge.
4. Support agricultural innovation by promoting biofortified maize, sorghum, and millet varieties (e.g., vitamin A and zinc fortified) that improve the nutritional baseline of the staple.
5. Enhance nutrition education and behavior-change communication to increase caregiver knowledge and acceptance of porridge enrichment strategies while preserving cultural preferences.
6. Establish monitoring and policy frameworks to ensure compliance with fortification standards, regulate food safety (e.g., aflatoxin control), and sustain nutrition-sensitive interventions.

Conflict of Interest

The authors declare no conflict of interest.

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