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Conflict-Driven Food Insecurity in Sudan After the 2023 Conflict: A Systematic Review of Determinants and Barriers to Achieving Sustainable Development Goal 2

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Systematic Review

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Abstract

Food insecurity in Sudan has escalated dramatically following the outbreak of the 2023-armed conflict, exacerbating longstanding political, economic, and environmental vulnerabilities. This systematic review synthesizes current evidence on the determinants of conflict-driven food insecurity and examines their implications for public health and progress toward Sustainable Development Goal 2 (Zero Hunger).

A systematic search was conducted across PubMed, PsycINFO, ProQuest, and Google Scholar using Boolean combinations of keywords related to Sudan, food insecurity, determinants, and the 2023-armed conflict. Studies published from April 2023 onward reporting quantitative, qualitative, or mixed-methods findings were eligible for inclusion. Fifteen studies met the inclusion criteria and were critically appraised using the appropriate Critical Appraisal Skills Programme (CASP) tools. A narrative synthesis combined with thematic analysis was used to integrate evidence across heterogeneous study designs.

Six interconnected themes emerged: conflict-driven destruction of food systems; economic collapse and hyperinflation; socio-demographic vulnerabilities; agricultural system failure; environmental and climate-related shocks; and barriers to humanitarian access and health-system functioning. Collectively, the evidence demonstrates that food insecurity in Sudan is driven by interacting systemic failures rather than isolated food shortages, undermining the four pillars of food security: availability, access, utilization, and stability.

The findings indicate that meaningful progress toward SDG 2—particularly Targets 2.1, 2.2, and 2.4—will remain unlikely without improvements in security, humanitarian access, agricultural recovery, and macroeconomic stabilization. The review also identifies important gaps in post-2023 household- and nutrition-level evidence, limiting the effective design and targeting of interventions. Coordinated humanitarian action, strengthened surveillance systems, and integrated public health and policy responses are urgently needed to reduce food insecurity and support Sudan's long-term recovery.

Introduction

Sudan, despite its substantial agricultural potential and extensive irrigated farmland, has experienced persistent food insecurity driven by longstanding political instability, structural inequalities, economic deterioration, and repeated episodes of armed conflict. Post-independence governance, characterized by alternating civilian and military regimes, colonial legacies, entrenched elite control, and weak institutional capacity, undermined agricultural development, weakened rural livelihoods, and contributed to unequal resource distribution and chronic underinvestment in food systems.

The outbreak of large-scale armed conflict between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) in April 2023 marked a major escalation of Sudan's humanitarian crisis. Fighting rapidly spread from Khartoum into key agricultural regions, including Al Jazirah, resulting in widespread destruction of farmland, looting of markets and storage facilities, and the disruption of transport and trade networks. These effects were particularly evident in the Gezira Scheme, where decades of declining public investment, elite capture, and deteriorating irrigation infrastructure had already reduced agricultural productivity and increased population vulnerability before the current conflict (Abd Elkreem & Jaspars, 2025).

Sudan's current food security crisis has developed against a backdrop of pre-existing vulnerabilities. Earlier conflicts in Darfur, Blue Nile, and South Kordofan disrupted agricultural production and rural livelihoods for many years, while national nutrition assessments conducted before the 2023 conflict reported high levels of child stunting (36.3%), underweight (29.1%), and wasting (13.6%), reflecting persistent structural deficiencies in food security and public health (Abu-Manga et al., 2021; Dahab et al., 2020). In addition, socioeconomic factors—including household income, educational attainment, household size, gender, and livelihood type—have consistently influenced food security outcomes across Sudan, particularly in Kassala and Eastern Sudan (Mohamed Nour & Abdalla, 2021; Elamin et al., 2025).

The 2023 conflict substantially intensified these longstanding challenges. By late 2023 and 2024, sorghum and millet production had declined by approximately 40%, with losses approaching 50% in Al Jazirah (Abd Elkreem & Jaspars, 2025; OHCHR, 2024). Community kitchens and Emergency Response Rooms, which had played a vital role in local food distribution, were forced to reduce or cease operations because of insecurity, disrupted supply chains, funding shortages, and communication blackouts (OHCHR, 2024; Goldhagen et al., 2024). Simultaneously, large-scale displacement left an estimated 12–14 million people uprooted and between 25 and 30 million requiring humanitarian assistance, while United Nations assessments indicated that more than half of Sudan's population was experiencing IPC Phase 3 or higher food insecurity, with several areas approaching famine conditions (OHCHR, 2024; Goldhagen et al., 2024).

The deterioration of food security has been compounded by inflation, currency depreciation, market disruption, disease outbreaks, and the collapse of essential health services. In many displacement settings, households rely almost exclusively on cereal-based diets with limited access to protein and other nutrient-rich foods, increasing the risk of malnutrition and adverse health outcomes. These interconnected crises demonstrate that food insecurity in Sudan extends beyond insufficient food production and reflects the interaction of political, economic, agricultural, environmental, and health-system failures.

Although numerous humanitarian reports and academic studies have documented different aspects of Sudan's food crisis, the available evidence remains fragmented. Few studies have systematically synthesized how conflict-related destruction, economic instability, agricultural decline, environmental pressures, humanitarian access constraints, and pre-existing structural inequalities interact to influence household food insecurity during the ongoing conflict.

Therefore, this systematic review aims to synthesize the available evidence on the determinants of food insecurity in Sudan following the outbreak of the 2023 armed conflict. Specifically, it examines how displacement, agricultural disruption, economic deterioration, weakened health systems, environmental shocks, and structural inequalities collectively influence food availability, access, utilization, and stability. By situating these findings within the framework of Sustainable Development Goal 2 (Zero Hunger), this review seeks to provide evidence that can inform public health policy, humanitarian programming, and future research aimed at strengthening food security and supporting Sudan's long-term recovery.

By integrating evidence across multiple sectors, this review provides a comprehensive synthesis to support policy development, humanitarian planning, and post-conflict recovery efforts in Sudan.

Methodology

Study Design

This study was conducted as a systematic review to synthesize the available evidence on the determinants of food insecurity in Sudan following the outbreak of the 2023-armed conflict. The review incorporated quantitative, qualitative, and mixed-methods studies to provide a comprehensive understanding of the factors contributing to food insecurity within the context of ongoing conflict and humanitarian crisis.

Search Strategy

A comprehensive literature search was undertaken using PubMed, PsycINFO, and ProQuest, selected for their broad coverage of public health, social science, and interdisciplinary research. Google Scholar was searched as a supplementary source to identify relevant grey literature, including humanitarian reports, working papers, and preprints.

Searches combined controlled vocabulary, where available, with free-text keywords using the Boolean operators AND, OR, and NOT. Search terms included country-related terms ("Sudan", "Sudanese"), food security terms ("food insecurity", "food security", "hunger", "starvation", "malnutrition", "undernutrition", "dietary diversity", "food availability", and "food access"), conflict-related terms ("2023 armed conflict", "war", "crisis", "displacement", and "humanitarian crisis"), and determinant-related terms ("determinants", "drivers", "factors", "predictors", and "causes"). Phrase searching and truncation were applied where appropriate to maximise retrieval of relevant studies. Searches were restricted to publications from April 2023 until June 2026 to capture evidence generated during the ongoing conflict and humanitarian crisis.

Eligibility Criteria

Studies were eligible for inclusion if they:

1. Focused on Sudan or Sudanese populations.
2. Examined food insecurity, hunger, malnutrition, or food availability and access.
3. Investigated determinants, drivers, predictors, or contributing factors associated with food insecurity.
4. Were published from April 2023 onwards.
5. Reported quantitative, qualitative, or mixed-methods findings.
6. Were peer-reviewed articles, humanitarian assessments, reports, or grey literature with sufficient methodological detail.

Studies were excluded if they:

1. Did not focus on Sudan or Sudanese populations.
2. Did not address food insecurity or its determinants.
3. Were published before April 2023.
4. Consisted solely of editorials, opinion articles, commentaries, or publications lacking empirical evidence.
5. Focused exclusively on agricultural production without examining food security outcomes.
6. Were published in languages other than English.
7. Did not examine conflict-related, household-level, or structural factors associated with food insecurity.

Quality Assessment

The methodological quality of included studies was assessed using the appropriate Critical Appraisal Skills Programme (CASP) checklists according to study design. CASP was selected because it provides structured criteria for evaluating study aims, methodological rigor, data collection procedures, validity, and the applicability of findings across diverse research designs.

Data Extraction and Synthesis

Data were extracted using a standardized data extraction table designed to ensure consistency across studies. Information recorded included study objectives, design, methodology, participant characteristics where applicable, principal findings, and methodological quality assessment.

Given the heterogeneity of the included evidence, statistical meta-analysis was not appropriate. Instead, a narrative synthesis was undertaken alongside thematic analysis to integrate findings across quantitative, qualitative, and mixed-methods studies. Through iterative coding and comparison, six overarching themes were identified: conflict-related disruption of food systems, economic collapse, social vulnerability, agricultural system failure, environmental and climate-related pressures, and barriers to humanitarian access and health-system functioning.

This combined analytical approach enabled the integration of evidence from diverse study designs and facilitated a comprehensive understanding of how multiple interacting factors contribute to food insecurity in Sudan following the outbreak of the 2023 armed conflict.

Study Selection

The study identification, screening, eligibility assessment, and inclusion process were summarised using a PRISMA flow diagram.

Results

Overview of the Evidence Base

Fifteen studies met the inclusion criteria and were included in the final synthesis. Although the evidence comprised cross-sectional surveys, nutrition assessments, humanitarian reports, political-economy analyses, and systematic reviews, consistent patterns emerged regarding the principal determinants of food insecurity in Sudan following the outbreak of the 2023 armed conflict. Thematic analysis identified six interconnected themes: (1) conflict-driven disruption of food systems, (2) economic collapse and market breakdown, (3) social and demographic vulnerabilities, (4) agricultural system failure, (5) environmental and climate-related pressures, and (6) barriers to humanitarian access and health-system collapse.

Theme 1: Conflict-Driven Disruption of Food Systems

Armed conflict emerged as the dominant driver of food insecurity across the included studies. Fighting between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) resulted in widespread destruction of agricultural land, markets, seed banks, storage facilities, and food warehouses, particularly in Al Jazirah, Darfur, and Khartoum (Sudan's Catastrophe, 2024; FEWS NET, 2024). The RSF's occupation of Wad Medani in December 2023 severely disrupted the sorghum, millet, and wheat harvests, contributing to an estimated 40–50% decline in national crop production (FAO, 2024; Hoffmann, 2024).

Multiple studies reported that more than 18 million people experienced acute food insecurity during 2024, with several regions approaching famine conditions (WFP, 2024; OCHA, 2024). Conflict-related displacement affected an estimated 12–14 million people, disrupting livelihoods and limiting access to food and agricultural production (WHO, 2025). The deterioration of nutritional services was reflected in rising rates of severe acute malnutrition, with case-fatality rates increasing from 6% to 12% during early 2024 because of interrupted therapeutic feeding programmes and unequal food distribution (Hunger in the Shadow of Conflict, 2024).

Theme 2: Economic Collapse, Inflation, and Market Breakdown

Economic deterioration consistently emerged as a major determinant of food insecurity. Hyperinflation, currency depreciation, market disruption, and the collapse of trade routes substantially reduced household purchasing power and food affordability (Hunger in the Shadow of Conflict, 2024). Attacks on markets in Khartoum, Al Jazirah, and Darfur, combined with seasonal flooding, further disrupted supply chains and limited market access (UN Experts, 2024).

Several studies demonstrated that Sudan's experience closely resembled that of other conflict-affected and sanctioned settings, including Zimbabwe, Syria, and Iran, where inflation, declining incomes, and reduced dietary diversity collectively intensified food insecurity (Economic Sanctions Review, 2021). These findings indicate that economic collapse acts alongside armed conflict to accelerate household food insecurity.

Theme 3: Social and Demographic Vulnerabilities

Pre-existing social and demographic inequalities significantly influenced household vulnerability before the conflict and became more pronounced during the humanitarian crisis. Female-headed households experienced substantially higher levels of food insecurity than male-headed

households, with only 17% classified as food secure compared with 39.9% of male-headed households (Red Sea State Study, 2021). Furthermore, 94.3% of female-headed households were living below the poverty line.

Household size and educational attainment also influenced food security outcomes. Food insecurity affected 84.3% of households containing nine or more members, while food security increased progressively with educational attainment, rising from 13.4% among households without formal education to 48.5% among those with higher education (Red Sea State Study, 2021). These findings demonstrate that longstanding structural inequalities reduced household resilience during the conflict.

Theme 4: Agricultural System Failure

The reviewed evidence demonstrated that Sudan's agricultural sector was already experiencing structural decline before the 2023 conflict because of deteriorating irrigation systems, reduced mechanisation, withdrawal of government support, rising production costs, and substantial post-harvest losses reaching approximately 33% (Solar Foods, 2021). The conflict accelerated these existing weaknesses. Wheat and sorghum production in Al Jazirah declined by almost 50% following the RSF offensive, while national harvests during 2023–2024 were estimated to be approximately 40% below average (Sudan's Catastrophe, 2024; FAO, 2024). These findings indicate that conflict intensified pre-existing agricultural vulnerabilities rather than creating them independently.

Theme 5: Environmental and Climate-Related Pressures

Environmental hazards further compounded conflict-related food insecurity. Flooding across eastern and northern Sudan destroyed crops, disrupted planting seasons, contaminated water supplies, and reduced market accessibility (UN Experts, 2024). Remote-sensing analyses also demonstrated extensive flood-related damage, reductions in arable land, and long-term climate pressures affecting agricultural productivity (GIS-based Flood Analysis, 2024). These environmental pressures acted as threat multipliers, amplifying the effects of conflict on food production and household food security.

Theme 6: Humanitarian Access Barriers and Health-System Collapse

Humanitarian access was substantially constrained by attacks on aid convoys, blocked transport routes, and interference with relief operations by armed groups (UN Experts, 2024; WHO, 2025). Community kitchens operated by Emergency Response Rooms declined from approximately 300 to 100 functioning sites because of insecurity, funding shortages, and telecommunications disruptions (FEWS NET, 2024).

Simultaneously, the collapse of Sudan's health system contributed to worsening nutritional outcomes through interrupted vaccination programmes, untreated infectious disease outbreaks, and reduced therapeutic feeding services. By 2024, approximately 4.9 million children under five years of age and pregnant or lactating women were experiencing acute malnutrition, representing a 22% increase compared with 2023 (WHO, 2025).

Summary of Findings

Across the included studies, food insecurity was consistently driven by the interaction of multiple, mutually reinforcing crises rather than by food shortages alone. Armed conflict functioned as the primary catalyst by disrupting agricultural production, displacing populations, and damaging food systems. These effects were intensified by economic collapse, structural social inequalities, environmental pressures, barriers to humanitarian access, and the deterioration of health services. Collectively, the evidence demonstrates that Sudan's food insecurity is a multidimensional crisis requiring integrated humanitarian, public health, agricultural, and economic responses.

Critical Appraisal of Included Studies

The methodological quality of the included studies varied, reflecting the diversity of the available evidence. Overall, the review incorporated high-quality national nutrition surveys, cross-sectional analytical studies, humanitarian assessments, policy analyses, and organizational reports. This combination of evidence was considered appropriate for examining the determinants of food insecurity during an active humanitarian crisis; however, the heterogeneity of study designs necessitates cautious interpretation of the findings.

Several strengths were consistently identified across the evidence base. National nutrition surveys provided representative anthropometric measurements and reliable prevalence estimates that established important baseline indicators of food insecurity and malnutrition. Regional studies and political-economy analyses contributed valuable contextual understanding of the structural, political, and socioeconomic drivers of food insecurity that could not be captured through quantitative surveys alone. Furthermore, recent reports produced by the World Health Organization, United Nations agencies, and humanitarian organizations provided timely evidence on rapidly evolving conditions during the 2023–2025 conflict, enabling triangulation across multiple data sources.

Despite these strengths, several methodological limitations were evident. A large proportion of the included studies employed cross-sectional or descriptive designs, limiting the ability to establish causal relationships between armed conflict and nutritional outcomes. Although the observed associations were highly consistent across studies, causality cannot be definitively inferred from individual investigations. In addition, several

humanitarian and policy reports provided limited methodological detail regarding sampling strategies, data collection procedures, or risk-of-bias assessment, reducing the transparency and reproducibility of their findings.

Geographical and temporal limitations were also identified. Several studies focused on specific regions, including Kassala, the Red Sea State, Shendi, and Al Jazirah, limiting the generalizability of their findings to the national population. Furthermore, a number of important datasets were collected before the outbreak of the 2023 armed conflict and therefore served primarily as baseline evidence for understanding pre-existing vulnerabilities rather than direct measures of conflict-related food insecurity.

As the conflict continues to be ongoing, additional studies continue to emerge. Although some recently published evidence may not have been captured within the review period, the consistency of findings across the included studies suggests that the principal conclusions of this review remain robust.

Overall, the methodological quality of the included studies was considered appropriate for their respective research objectives. Cross-sectional surveys were effective for estimating the prevalence of food insecurity and malnutrition, while qualitative studies, policy analyses, and humanitarian reports provided important insight into the structural and contextual drivers of the crisis. The use of narrative synthesis alongside thematic analysis enabled the integration of evidence from diverse study designs, reducing reliance on individual studies while strengthening confidence in the recurring themes identified across the literature.

A standardized data extraction table was developed to summarize the key characteristics of each included study. Information extracted included the authors, year of publication, study objectives, study design, data collection methods, principal findings, and the outcomes of the Critical Appraisal Skills Programme (CASP) assessment. This process enhanced the transparency and consistency of the review and provided the foundation for the narrative synthesis presented in the Results section.

Table 1: summarizes the characteristics of the included studies

Author(s) & Year	Title of Study	Aim of Study	Study Design/Methods	Main Findings	Critical Appraisal (Strengths & Weaknesses)	CASP Tool Used
Child Malnutrition, 2024	*Child malnutrition is a devastating consequence of the conflict in Sudan*	Assess impact of 2023 conflict on child malnutrition and access to therapeutic feeding	Commentary / situational analysis Uses secondary data, UNICEF/WHO reports, and field observations	Conflict doubled SAM case-fatality (6%→12%); destruction of Samil RUTF factory.	**Strengths:** Up-to-date conflict data; triangulates multiple humanitarian sources. **Weaknesses:** Not primary research; lacks systematic methodology	CASP Checklist – Qualitative/Commentary
UN Experts, 2024	*Sudan faces one of the worst famines in decades*	Report famine risk, hunger scale, and conflict-driven starvation tactics	Humanitarian briefing/ Event documentation, field reports, IPC data	97% of IDPs face severe hunger; forced starvation tactics; flooding worsens the crisis	**Strengths:** Real-time situational detail. **Weaknesses:** No formal sampling; descriptive only	CASP Checklist – Reporting Studies
Hunger in the Shadow, 2024	*Analyzing malnutrition & humanitarian challenges*	Evaluate malnutrition trends and humanitarian barriers.	Analytical report/ Mixed evidence (nutrition data + conflict analysis).	SAM fatality doubled; 18 million acutely food insecure; grassroots aid essential.	**Strengths:** Integrated quantitative + qualitative data. **Weaknesses:** Methods are partially unclear	CASP Qualitative
Economic Sanctions Review, 2021	*Economic shocks & household food insecurity*	Assess how inflation and income shocks worsen food insecurity	Systematic review/Review of international cases	Inflation → reduced dietary diversity, meal frequency	**Strengths:** Strong comparators. **Weaknesses:** Not Sudan-specific, but relevant context	CASP Systematic Review
Sudan's Catastrophe, 2024	*Food & power dynamics in Gezira*	Examine structural and political drivers of food insecurity.	Political-economy analysis/ Document review + policy analysis	RSF invasion cut harvest by 40–50%; destruction of markets & seed bank	**Strengths:** Deep structural insight. **Weaknesses:** Not quantitative	CASP Qualitative
Kassala Study, 2021	*Determinants of food security in Kassala*	Analyze household determinants using HFIAS	Cross-sectional quantitative/ Survey of households (HFIAS)	Income, education, land ownership, and food insecurity	**Strengths:** Validated tools (HFIAS). **Weaknesses:** Pre-war data	CASP Cross-Sectional
Nutrition Assessment, 2021	*Assessment of under-five nutrition in Sudan*	Measure stunting, wasting, and underweight	National cross-sectional survey/ Anthropometry across all 18 states	Stunting 36.3%, wasting 13.6%	**Strengths:** Large national dataset. **Weaknesses:** Pre-conflict baseline	CASP Cross-Sectional
Armed Conflict & Malnutrition, 2020	*Conflict as a determinant of child underweight*	Examine the effect of conflict exposure on malnutrition	Multilevel analysis/ MICS data, multivariate modelling	Conflict increases odds of underweight	**Strengths:** Strong statistical methods. **Weaknesses:** Older dataset	CASP Cohort/Cross-sectional
WHO PHSA, 2025	*Sudan Public Health*	Summarize the health &	WHO health assessment/ multi-	12.8 million displaced; 4.9	**Strengths:** Authoritative;	CASP Reporting

Author(s) & Year	Title of Study	Aim of Study	Study Design/Methods	Main Findings	Critical Appraisal (Strengths & Weaknesses)	CASP Tool Used
	Situation Analysis	nutrition impacts of the 2023 conflict	sectoral data synthesis	million children/pregnant women acutely malnourished	multi-source. **Weaknesses:** Limited methodological detail	
Red Sea State Study, 2021	*Food insecurity & poverty dynamics*	Evaluate poverty, gender, displacement, and food security	Cross-sectional survey/ Household survey	100% refugees are food-insecure; 17% female-headed households are food secure	**Strengths:** Strong socioeconomic detail. **Weaknesses:** Localized	CASP Cross-Sectional
Solar Foods Case, 2021	*Solar drying & agriculture resilience*	Assess postharvest losses & resilience solutions	Case study/ Field data + nutritional analysis	33% post-harvest losses; facility destroyed in the 2023 conflict	**Strengths:** Shows resilience pathways. **Weaknesses:** Small sample	CASP Qualitative
Shendi Camps Study, 2024	*Living conditions in temporary camps*	Assess WASH, shelter, and food consumption	Cross-sectional survey/ Household questionnaires	92% rely on grains; low dietary diversity	**Strengths:** Specific & recent. **Weaknesses:** Not nationally generalizable.	CASP Cross-Sectional
Fadola et al., 2025	*Coping strategies & food consumption (FCS, HDDS)*	Examine coping strategies & food consumption in Sudan	Quantitative cross-sectional/ FCS & HDDS scores	Reduced dietary diversity & coping under stress	**Strengths:** Uses validated food metrics. **Weaknesses:** Limited geographic scope	CASP Cross-Sectional
Environmental GIS Study, 2024	*Floods & environmental shocks*	Assessing flood impacts on food systems	Remote-sensing analytical study/ GIS spatial modelling	Large-scale flood damage reduced arable land	**Strengths:** Objective remote-sensing data. **Weaknesses:** Environmental focus only	CASP Quantitative Analytical
Child Malnutrition (editorial)	*Conflict & child malnutrition*	Advocate for urgent nutrition response	Editorial/commentary/ Narrative synthesis	Highlights RUTF shortages, rising SAM	**Strengths:** Timely; context rich. **Weaknesses:** No primary methodology	CASP Qualitative

Discussion

This systematic review demonstrates that food insecurity in Sudan following the outbreak of the 2023-armed conflict is best understood as the consequence of interacting political, economic, agricultural, environmental, and health-system failures rather than as an isolated consequence of reduced food production. Across the included studies, armed conflict consistently emerged as the principal catalyst, yet the evidence indicates that its effects were amplified by longstanding structural vulnerabilities that existed before April 2023. These findings suggest that the current humanitarian emergency reflects the cumulative failure of multiple interconnected systems rather than a single-sector crisis.

The synthesis identified armed conflict as the dominant driver of food insecurity because it simultaneously disrupted agricultural production, displaced populations, destroyed markets and storage facilities, interrupted trade routes, and severely restricted humanitarian access. However, the review also demonstrates that conflict alone does not adequately explain the scale of Sudan's food insecurity. Economic collapse, hyperinflation, currency depreciation, and widespread livelihood loss substantially reduced household purchasing power, limiting food access even where food remained physically available. This interaction between conflict-related disruption and economic deterioration illustrates that food insecurity is shaped by both supply- and demand-side pressures, reinforcing the multidimensional nature of the crisis.

The findings further demonstrate that Sudan's food insecurity cannot be separated from its underlying structural vulnerabilities. Longstanding inequalities affecting women, rural populations, displaced communities, and households with limited educational attainment consistently reduced resilience before the current conflict and became substantially more pronounced during the humanitarian emergency. Rather than creating entirely new patterns of vulnerability, the conflict exposed and intensified pre-existing social, political, and economic inequalities that had weakened household food security for many years.

Environmental pressures emerged as additional threat multipliers within an already fragile system. Flooding, climate variability, and declining agricultural productivity further reduced food production and disrupted local markets at a time when conflict had already constrained farming activities and humanitarian operations. These findings reinforce the importance of considering environmental shocks as interacting determinants of food insecurity rather than independent drivers operating separately from conflict.

A further contribution of this review is the identification of the close relationship between food insecurity and health-system collapse. Across the included studies, deteriorating nutritional outcomes occurred alongside disrupted vaccination programmes, reduced therapeutic feeding capacity, shortages of essential medicines, and outbreaks of communicable diseases. These findings suggest that food insecurity and public health deterioration should not be viewed as parallel humanitarian challenges but as mutually reinforcing processes. Malnutrition increases vulnerability to disease, while collapsing health services reduce the capacity to prevent and treat nutrition-related illness, creating a cycle that further accelerates population vulnerability.

Taken together, the evidence supports a systems perspective on food insecurity. Rather than acting independently, conflict, economic instability, agricultural decline, environmental pressures, structural inequalities, and health-system disruption interact continuously to reinforce one another. This systems-level interpretation represents an important contribution of the present review because it demonstrates that interventions targeting a single determinant are unlikely to achieve sustained improvements without simultaneously addressing the broader structural conditions that maintain food insecurity.

The findings also have important implications for achieving Sustainable Development Goal 2 (Zero Hunger). Although SDG 2 focuses on ending hunger, improving nutrition, and promoting sustainable agriculture, the evidence synthesized in this review indicates that progress towards these objectives depends upon broader advances in governance, peace, economic stability, health-system resilience, and climate adaptation. The Sudanese experience therefore illustrates the interdependence of the Sustainable Development Goals and demonstrates that progress towards Zero Hunger cannot be achieved in contexts where conflict continues to undermine institutions, livelihoods, and public services.

From a global health perspective, Sudan represents a clear example of how local armed conflict generates international public health consequences. Large-scale displacement, increased humanitarian demand, regional population movement, disruption of agricultural production, and deterioration of health services extend the effects of the crisis beyond national borders. These findings reinforce the need for integrated global health strategies that combine emergency nutrition programmes with primary healthcare, livelihood protection, agricultural recovery, social protection, and long-term health-system strengthening.

Several methodological limitations within the existing evidence base should also be considered when interpreting these findings. Most included studies employed cross-sectional, descriptive, or humanitarian assessment designs, limiting the ability to establish causal relationships between conflict exposure and food insecurity over time. In addition, several humanitarian reports provided limited methodological detail regarding sampling procedures or data quality, restricting formal assessment of potential bias. The scarcity of longitudinal household-level studies further limits understanding of how families adapt, recover, or experience changing food security throughout prolonged conflict. Future research should therefore prioritise prospective household studies, stronger methodological reporting, and longitudinal monitoring capable of capturing the evolving determinants of food insecurity in conflict-affected settings.

Despite these limitations, the consistency of findings across multiple study designs, data sources, and geographical settings strengthens confidence in the principal conclusions of this review. National nutrition surveys, humanitarian assessments, political-economy analyses, environmental studies, and peer-reviewed research consistently identified the same interconnected drivers of food insecurity, supporting the robustness of the thematic synthesis despite methodological heterogeneity.

Overall, this review demonstrates that addressing food insecurity in Sudan requires substantially more than emergency food assistance alone. Sustainable progress will depend upon coordinated action to restore agricultural production, strengthen health systems, protect livelihoods, improve humanitarian access, stabilise markets, and address the structural inequalities that continue to undermine household resilience. Without integrated, multisectoral responses that recognise the interconnected nature of these determinants, meaningful progress towards Sustainable Development Goal 2 is likely to remain unattainable.

More recent IPC and United Nations assessments indicate that these trends have continued beyond the review period, with approximately 19.5 million people facing acute food insecurity (IPC Phase 3 or above) during 2026 and multiple areas remaining at risk of famine because of ongoing conflict, displacement, and restricted humanitarian access. These findings further support the conclusion that conflict remains the principal driver of Sudan's food insecurity.

Conclusion

This systematic review demonstrates that food insecurity in Sudan following the outbreak of the 2023-armed conflict is the product of multiple interacting determinants rather than a single humanitarian or agricultural crisis. The evidence shows that armed conflict, economic collapse, agricultural disruption, environmental pressures, structural inequalities, and the deterioration of health and humanitarian systems operate simultaneously to undermine all four dimensions of food security: availability, access, utilization, and stability. Together, these interconnected factors have substantially intensified existing vulnerabilities and accelerated one of the world's most severe food security emergencies.

A key contribution of this review is the demonstration that Sudan's food insecurity should be understood as a systems-level crisis in which conflict amplifies longstanding political, economic, environmental, and social weaknesses rather than acting as an isolated driver of hunger. This perspective highlights the need for integrated responses that extend beyond emergency food assistance to include agricultural recovery, health-system strengthening, market stabilization, social protection, climate resilience, and improved humanitarian access.

Achieving Sustainable Development Goal 2 (Zero Hunger) in Sudan will require coordinated multisectoral action that addresses both the immediate humanitarian consequences of the conflict and the structural conditions that continue to sustain food insecurity. Without sustained investment in peace, governance, resilient food systems, and equitable public health interventions, meaningful progress towards ending hunger is likely to remain unattainable. The findings of this review provide an evidence base to inform future research, humanitarian programming, and public policy aimed at supporting Sudan's long-term recovery and strengthening resilience against future crises.

Future research should prioritize longitudinal household studies, strengthened nutritional surveillance, and evaluations of recovery interventions to better inform evidence-based policy and humanitarian programming in post-conflict Sudan.

Achieving Sustainable Development Goal 2 in Sudan will require coordinated, multisectoral strategies that integrate humanitarian assistance with agricultural recovery, health system strengthening, economic stabilization, and long-term peacebuilding to build resilient and sustainable food systems.

Declarations

Funding
This research received no external funding.

Ethics approval and consent to participate
Not applicable. This study is a systematic review of published literature and did not involve human participants, animals, or identifiable personal data.

Consent for publication
Not applicable.

Availability of data and materials
The datasets analysed during the current study are derived from publicly available published literature. All studies included in this systematic review are cited in the reference list. No new primary datasets were generated.

Competing interests
The author declares that there are no competing interests.

Author contributions
A.M.M.A. conceived and designed the study, conducted the literature search, screened and selected studies, extracted and synthesized the data, critically appraised the included studies, interpreted the findings, drafted the manuscript, revised the manuscript critically for important intellectual content, and approved the final version.

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Figures

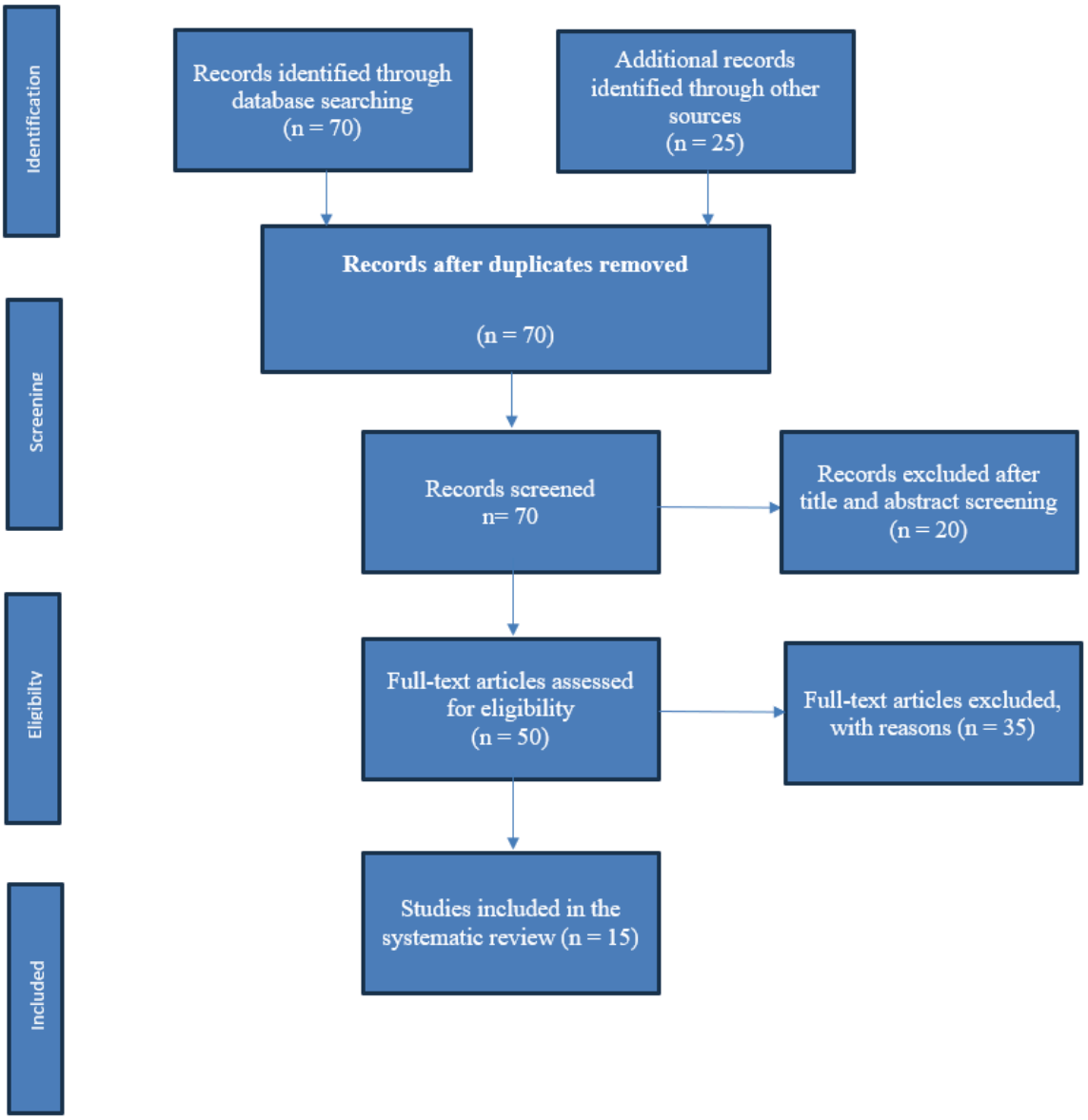


Figure 1

PRISMA 2020 flow diagram of the study selection process.