

The COVID-19 Pandemic worsened household characteristics influencing food insecurity in Sub-Saharan Africa: A Systematic Review

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Abstract: Sub-Saharan Africa bears the greatest burden of food insecurity in the world. The emergence of COVID-19 and its related restrictions pose further threats to food insecurity. Therefore, a systematic review was conducted to assess the rate and available evidence on factors associated with household food insecurity in SSA during the pandemic. Three bibliographic databases and two search engines were searched on 30 October 2023 covering the period between March 2020 and October 2022. Peer-reviewed papers reporting the prevalence and/or factors of household food insecurity were eligible for inclusion. The STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) tool was used to assess the quality of articles included in this report. Twenty-nine publications from twelve countries were included in this review. Food insecurity experience and household food insecurity access scales were the most used instruments for assessing household food insecurity. Household food insecurity during the pandemic ranged from 11.2% to 98.8% in SSA, with an average of 53.7%. COVID-19 restrictions were reported in six papers to be associated with food insecurity. Existing factors, such as lower education, older ages of household heads, and low household income, persisted during the pandemic. Also, increased food prices and the lack of alternative livelihood activities for households increased their vulnerability to food insecurity during the pandemic. COVID-19 pandemic and its related restrictions worsened the existing factors associated with household food security. Even though the review found no major changes in the prevalence of food insecurity in SSA, the unfolding effects of COVID-19 could make things worse if no steps are taken to provide social protection and agricultural support services to households.

Keywords: food insecurity, hunger, households, COVID-19, and sub-Saharan

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1. INTRODUCTION

Food security is a human rights issue (WFP, 1975), yet 30.4% of people around the world are food insecure (FAO, IFAD, UNICEF, WFP, & WHO, 2021). Food insecurity has persisted for nearly a century (Akram-Lodhi, 2009), and it is only getting worse with each passing year. The proportion of the food insecure population has increased by 3.8 percentage points between 2014 and 2020 (FAO et al., 2021), equivalent to 2.37 billion people in 2020. This amounted to a 320 million increase in just one year (FAO et al., 2021). Currently, 59.6% (798.8m) and 66.2% (724.4m) of the population in Africa and Sub-Saharan Africa (SSA) are food insecure, respectively (FAO et al., 2021). Food insecurity negatively impacted the body weight of over 11.4 million people in the SSA causing malnutrition (FAO et al., 2021).

The high cost of healthy foods has also worsened the plight of low-income earners in urban communities and increased their vulnerability to inadequate food (Adusei, 2021). As a result, urban dwellers in SSA have resorted to cheap and unhealthy foods leading to a sharp increase in overweight and obesity (Tochie, Mbonda, Fonkwo, & Aletum, 2019). Besides the health implications, food insecurity is linked to the slow progress and development of SSA (Aryee et al., 2021). For example, food insecurity was associated with riots, violence and communal tensions in some parts of SSA (FAO et al., 2021; Hendrix & Brinkman, 2013). According to the African Centre for Strategic Studies (ACSS), almost all countries facing the heaviest burden of food insecurity in SSA are currently involved in some form of conflict (ACSS, 2021). Hence, addressing food insecurity could play a crucial role in consolidating the democratic achievements of SSA and enhancing its development (Aryee et al., 2021). In recent times, governments and donor agencies working across SSA have embarked on a series of interventions to improve food security (Dodo, 2020). These interventions include the distribution of grains and foodstuffs and improving access to farm inputs (Ayanlade & Radeny, 2020; Bouwens, 2020), enhancing the capacity of smallholder farmers (Ayanlade & Radeny, 2020), and buffer stock initiatives to protect farmers against production losses (Devereux, 2016).

Despite these interventions, food insecurity is worsening in Africa (Abdul Mumin & Abdulai, 2020). No country in SSA or Africa is on track to achieving the Sustainable Development Goal 2 of ending hungry and eradicating malnutrition by 2030. The global impact of COVID-19 has threatened to deepen hunger and undermine the existing successes in achieving food security and ending hunger in SSA (OCHA, 2021). COVID-19 and its movement restrictions has adversely disrupted the entire agriculture value chain (Adusei, 2021; Ayanlade & Radeny, 2020) and caused job losses among low-income earners (Adusei, 2021), which could limit physical and economic access to food.

Few reviews, however, have been conducted on household food insecurity during the COVID-19 pandemic. Earlier reviews published were either country-specific (Abdul Mumin & Abdulai, 2020) or were published before COVID-19 fully impacted on SSA (Drammeh, Hamid, & Rohana, 2019; Fraval, Hammond, Bogard, Ng'endo, van Etten, Herrero, Oosting, de Boer, Lannerstad, & Teufel, 2019). Some of these reviews were focused on the impact of genomic research on food security (Aryee et al., 2021) or COVID restrictions on planting seasons (Ayanlade & Radeny, 2020). Therefore, this systematic review aims to assess the current situation of food insecurity and its associated factors among households in SSA during the pandemic. Harmonizing the findings from different studies in SSA will help assess the commitment and progress of individual nations toward the attainment of the SDG-2. Lastly, assess the relationship between women and food insecurity in the sub-region during the pandemic. Preferred Reporting Items for Systematic and Meta-Analysis was used because of its comprehensiveness, wide use and rigour (Page et al., 2021; Pahlevan-Sharif, Mura, & Wijesinghe, 2019) to conduct the study.

2. METHODS

2.1 Search Strategy

This systematic review was conducted using articles from Scopus, Google scholar, PubMed, and other open sources (google and yahoo search engines) on October 30, 2022. Additionally, some institutional websites such as FAO and the Africa Center for Strategic Studies [ACCS] were also utilized in the current study.

2.2 Search Terms

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement of reporting (Page et al., 2021). Search terms were used to identify the relevant literature, and these included: "food security", or "food insecurity", or "hunger", or "factors associated with food insecurity" "food insecurity among women" and "households in Sub-Saharan Africa" (Table 2). The systematic review covered studies conducted and published from the beginning of COVID-19 until October 30, 2022, and consisted of journal articles, and other published reports by established and well recognized institutions in English language.

2.3 Screening of Articles

Two reviewers conducted independent evaluation of the titles, abstracts, and then the full articles retrieved

from the search using the eligibility criteria. Discrepancies emanating from the evaluation of the two reviewers were shared with a third reviewer for a separate evaluation at each step of the process for possible inclusion or exclusion (Figure 1).

2.4 Selection Criteria for the Review

Only papers that met the inclusion criteria were included in the review: first, the papers measured the extent to which individuals, children, women, adults, farmers, and caregivers faced food insecurity or hunger within the context of households, secondly, and/or the papers included the factors associated with food insecurity among participants in sub-Saharan Africa, data for the papers were collected after the first quarter of 2020 when COVID-19 reached the shores of most countries in sub-Saharan Africa, and finally, the papers were published in English (Figure 1). The systematic review included both quantitative and qualitative studies

2.5 Study Quality Assessment

Inbuilt filtering features within the databases were used as the first step of reducing bias. Also, the reviewers then selected the papers that met the eligibility criteria. Strengthening the reporting of observational studies in epidemiology (STROBE) tool was used for the final selection of the papers and reports included in this systematic review (Von Elm et al., 2014).

2.6 Data Synthesis

The findings in the papers were graded by the study characteristics (authors, year of publications, country, study population, design used and sample size). For the main outcome variable (food insecurity), the study reported the type of assessment tools used in the study and the proportion of the sample population who were food insecure, and outlined the factors associated with food insecurity in these studies. These were presented in tabular format to show the results of the individual studies and syntheses, together with the other details of the papers and reports (Table 1, 2 and 3).

3. Results

3.1 Search Results

The procedure for the screening of the titles, abstracts, and the final evaluation of the full text of the papers is outlined in figure 1. The results of the 29 papers included in the study were summarized using an excel spread sheet and illustrated on the tables. Most of the papers were published in the order of 2021, 2022 and 2020.

3.2 Study design

All the papers included in the systematic review were observational studies: 94% were quantitative, 3% qualitative and 3% reports. The papers covered 1 each in Benin, Ghana, Uganda, Mali, Liberia, 2 each in Kenya, Rwanda, 5 in Ethiopia and 9 in Nigeria. Three other papers were conducted in multiple countries in SSA and 3 institutional reports 2 from the FAO and 1 from the African Centre for Strategic Studies were included in the review. The sample sizes ranged from 113 to 14,942 participants across the papers included in the study.

3.3 Prevalence of Food Insecurity

Food security continues to be a significant issue but a far fetch responsibility for the continent of Africa, especially SSA. Across the length and breadth of SSA, countries continue to battle with food shortages and inadequacies. The results in table 1 showed the findings from 29 papers from twelve different countries. The review found wider and higher rates of food insecurity in almost all published data in countries from SSA. Household food insecurity access scale (HFIAS) and food insecurity experience scale (FIES) remained the dominant scales used by the papers to measure food insecurity both at the household and individual level. These papers covered both urban and rural communities, and a few others were conducted in established settings like school campuses. Specifically, on the assessment tools, 57.7% (15) of the papers used HFIAS to measure food insecurity, and 15.4% (4) also used FIES.

The data demonstrated households' food insecurity ranged from 11.2% to 92.7% across SSA. Except for FAO et al. (FAO et al., 2021), FAO et al., (FAO, 2020) and Sanga et al., (Sanga, Sidibé, & Olabisi, 2021), 13,998 (35.3%) out of 39,700 participants in all the papers experienced food insecurity during the period of the pandemic. However, the average percentage food insecurity across all the papers included was 53.7% (table 3). In the two FAO reports available, the rates of food insecurity for 2020 and 2021 were 56.8% and 66.2%, respectively (FAO, 2020; FAO et al., 2021). On average, 46.6% of rural dwellers experienced food insecurity from the period of 2020 to 2022, as compared with 63.9% in urban dwellers. Similarly, 62.9% of participants in papers done in both rural and urban settings reported food insecurity. School-based studies showed that 80.4% of the students experienced food insecurity. The household hunger score reported rates of food insecurity ranging from 15.6% to 61.1% as compared with 68.1% with the use of food consumption score. The use of HFIAS and FIES observed prevalence range of 11.2% to 98.8% and 31% to 92.7% rates of food insecurity. Average percentages of food insecurity per assessment tools are presented in table 5; HFIAS (64%), FIES (46.4%), hunger score (38.4%), RFSA (43.7%),

FGT (23.2%) and consumption score (68.1%) (Table 3).

3.4 Factors Associated with Food Insecurity

Factors that were associated with food insecurity included COVID-19 restrictions and household characteristics. In total 22 factors were found to have limited the ability of households to access adequate food during the pandemic. These factors were grouped into six broad categories: socioeconomic or sociodemographic, production challenges and agriculture support services, climate change, covid-19 closures and restrictions, and conflicts and political crisis (Table 4).

Socioeconomic factors

Education was reported in six out of twenty-nine papers to be associated with food insecurity (Table 4). Household heads with lower status of education had limited access to food for their members. (Charles Shapu, Ismail, Ahmad, Lim, & Abubakar Njodi, 2020; Dasgupta, Bhattacharjee, & Das, 2016; Gwada, Ouko, Mayaka, & Dembele, 2020; Ibukun & Adebayo, 2021; Kara & Kithu, 2020; Ogunniyi et al., 2021). Lower household income was also identified as a significant factor for household food insecurity (G. Danso-Abbeam, L. J. Baiyegunhi, M. D. Laing, & H. Shimelis, 2021; Dasgupta et al., 2016; Gwada et al., 2020). Again, households with little income including remittances or alternatively lacked livestock to trade had limited access food during the pandemic (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021). Households with off-farm income had better savings to avert food shortages at home during the period. The third most important sociodemographic factor for food insecurity in the papers was the age of the household heads. Five out of twenty-nine papers reported older ages (above 50 years) of the household heads, two reported dependency ratio and one reported marital status, associated with food insecurity in the study (Charles Shapu et al., 2020; Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Davis, Amorim, Dahn, & Moon, 2021; Gwada et al., 2020).

Agricultural and its related factors

Household heads who were involved in farmer-based groups or cooperation activities (Kassy, Ndu, Okeke, & Aniwada, 2021; Ogunniyi et al., 2021), and had access to farm extension visits (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Gwada et al., 2020), and who adopted crop and livestock diversification (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Gideon Danso-Abbeam, Gilbert Dagunga, et al., 2021) had better chances of being food secure compared to households without the above-mentioned factors. Some households were challenged by the non-availability or high cost of farm inputs (Sanga et al., 2021), and the

lack of access to credit facilities (Ogunniyi et al., 2021; Sanga et al., 2021) to increase production, while others were limited by the size of the farm land available to them for food production (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Sanga et al., 2021).

Climate change factors

The effects of climate change on food production at the household level persisted during the pandemic; Drought, shorter rainfall and climate variability including higher temperatures were identified to be associated with food insecurity in three out of twenty-nine papers (ACSS, 2021; Adusei, 2021; FAO et al., 2021).

Direct COVID-19 Closures and Restrictions

In table 4 six out of twenty-nine papers found movements and boarder restrictions, disruption in food supply chain and planting seasons, and COVID-19-related issues to be associated with food insecurity (ACSS, 2021; Adusei, 2021; FAO et al., 2021; Maredia et al., 2022; Tabe-Ojong, Gebrekidan, Nshakira-Rukundo, Börner, & Heckelei, 2022; Umutoiwase et al., 2022)

Conflicts

The last category of food insecurity related factors was the influence of ethnic conflicts and political crisis (Table 4). Both the Africa Center for Strategic Studies and the FAO found that countries with protracted ethnic and political conflicts were the hardest hit in terms of food insecurity (ACSS, 2021; FAO et al., 2021). Countries such as Sudan, Mali, D.R. Congo and Burkina Faso which experienced the heaviest burden of food insecurity were actively involved in some forms of conflicts (ACSS, 2021).

4. DISCUSSION

4.1 Prevalence of Food Insecurity

Even though food security is deemed a human right issue (WFP, 1975), many people remain food insecure and malnourished (FAO, 2021). The FAO recently developed the food insecurity experience scale (FIES) to replace other older metrics like the hunger score (FAO, 2021), to precisely measure people's actual food experiences in their homes around the world (FAO, 2018; Saint Ville, Po, Sen, Bui, & Melgar-Quiñonez, 2019). But regardless of the assessment tool used, over half of the population (53.7%) of SSA were food insecure in this review, across different demographic groups. This prevalence of food insecurity showed no difference from those reported before the COVID-19 era (Abrahams & Lund, 2021; FAO, 2020, 2021). Although COVID-19 threatened to affect all sectors of the economy and directly impact the livelihoods of households (Abrahams & Lund, 2021), the evidence on the ground currently does not support this assertion in the area of food insecurity (FAO, 2020, 2021). Even though COVID-related restrictions affected the supply of farm outputs at the initial

stages and put some segments of the population out of jobs (Abrahams & Lund, 2021; Adusei, 2021), the unfolding impact on household food insecurity has not been so different from what is already known about food insecurity in SSA. Partly because COVID-19 and its associated restrictions disproportionately impacted Africa (Pillay & Barnes, 2020; Wright & Merritt, 2020), particularly Sub-Saharan Africa, where the majority of the workforce engaged in food production are in the rural settings (Abrahams & Lund, 2021; FAO, 2017). Many of the papers in the review were conducted in rural areas, which could also explain why there was a comparable pattern of food insecurity before and during the COVID-19. As these households were probably still able to meet their routine food needs due to the limited impact of COVID-19 on rural settings. It was also likely that households resorted to their savings for provisions including food items within the pandemic period (Dudzai & Wamara, 2021; Orindaru et al., 2021), and so did not experience any immediate impact on their food security situation.

In a similar systematic review Gebremichael et al. (2021) observed almost the same prevalence (60.9%) of food insecurity in East Africa during the pandemic era. The rates of food insecurity in other individual countries before the pandemic: 61% in Kenya (Mwangi et al., 2020) and 60.5% in Ethiopia (Mekonnen, Tessema, Ganewo, & Haile, 2021) are consistent with the review. Studies in other countries like Nigeria, Benin, and Kenya, however, recorded a much higher rates (88-92%) of food insecurity even before the pandemic (Gwada et al., 2020; Houessou, 2021). The rate observed in the review is consistent with a global study (60%) involving 147 countries (Pereira, Handa, & Holmqvist, 2021), but comparatively lower than the rates in West and Central Africa (80.81%), East and Southern Africa (92.18%) and Horn of Africa (96.81%) (Pereira et al., 2021). The finding is, however, almost twice the rate in Middle East and North Africa (31.05%) (Pereira et al., 2021). Although COVID-19 threatened to worsen the situation in SSA, the current prevalence of food insecurity is relatively the same as the pre-pandemic era. This is consistent with the finding of another initial review which concluded that there is currently no need for new global food security objectives due to the pandemic (Éliás & Jámbor, 2021), but the unfolding impact could be dire for subgroups such as women. For example, women within the SSA experienced slightly higher level of food insecurity (60-67%) compared to the overall average prevalence in the review (Salau, Olalere, & Afolabi, 2022; Tafese, Reta, Mulugeta, & Anato, 2022). This represented about 13% percentage point increase as compared with 4% recorded in 2021 by Njuki, (Njuki, 2022), and consistent with the FAO report that women face higher prevalence (10%) of food insecurity than men due to the current impact of COVID-19 (FAO et al., 2021).

4.2 Factors Associated with Food Insecurity

COVID-19 Closures and Movement Restrictions

The full extent of the impact of COVID-19 pandemic on the livelihoods of households is difficult to ascertain now. The impact of the pandemic continues to unfold and may last beyond the few coming years (FAO et al., 2021). However, the available data suggest that COVID-19 might negatively impact on the food supply chain and may worsen the prevalence of malnutrition across the world (Adusei, 2021; FAO et al., 2021). In SSA, public health safety protocols such as boarder closures and movement restrictions interrupted the supply chain in an already food deficit subregion (Ozturk, 2017), which relied heavily on food imports (Ayanlade & Radeny, 2020). Within individual countries also, markets were either closed or restructured to reduce the populations and activities in order to curb the spread of the virus (Adusei, 2021; Ayanlade & Radeny, 2020). This caused unintended spikes in market prices of staple foods. Others within the informal and private sector lost their jobs (Adusei, 2021; Ayanlade & Radeny, 2020). These compounded the ability of households to acquire adequate food for their members due to the losses in incomes and weakening food supply chain (Adusei, 2021). In some instances, the protocols interrupted the planting seasons of farmers especially in urban centers, where there was strict adherence to the safety protocols (Ayanlade & Radeny, 2020)

Socioeconomic factors

The older age of household heads on the physical availability of adequate food is one of the important variables documented across numerous research (Charles Shapu et al., 2020; Davis et al., 2021). This supports the finding that in SSA, older heads of households are more vulnerable to food insecurity (Adesoye & Adepoju, 2020; Mekonnen et al., 2021; Mengistu, Degaga, & Tsehay, 2021; Mota, Lachore, & Handiso, 2019; Olufemi & Oladele, 2021). For food production, household farmers relied significantly on manual labour (Ayanlade & Radeny, 2020). As a result, as the heads of households got older, they were less physically capable of providing manual labour to generate enough food from the farms. This is due to the fact that aging is linked to a loss in muscular mass and strength (Wilkinson, Piasecki, & Atherton, 2018). Drammeh et al. [18] and other studies also support this finding that elderly household heads were less physically capable of engaging in off-farm activities to supplement their income and meet the demands of their family members, thereby exposing them to food insecurity (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Mota et al., 2019).

Lower educational status of household heads was widely reported to be a significant barrier for food security.

This is consistent with the 2020 comprehensive food security and vulnerability analysis report (WFP, FAO, GSS, & MoFA, 2020). This is probably because education increases receptivity and utilization of modernized farming system, including the adoption of technological inputs, fertilizer application and crop-income diversification to secure households' physical access to food (Mota et al., 2019; Nyangasa, Buck, Kelm, Sheikh, & Hebestreit, 2019). Uneducated household heads were probably less likely get appropriate resources in terms of access to loans or inputs from farm dealers to increase food production, or they may have retired from formal employment and are facing a reduction in income.

The availability of household assets such as livestock provided adequate buffer against food insecurity (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Gwada et al., 2020). In the event of crop failures, households resorted to their livestock for alternative income to purchase food. Additionally, households obtained partly their household food sources directly from the animal products such as milk and meat to sustain its members. Some households also obtained manure from their livestock which was used to fertilize their farm lands for improved crop yield against food insecurity (Makara & Kowalski, 2018).

The lack of alternative livelihood activities significantly impacted on food security at the household level. Income from household savings and off-farm jobs enabled households to acquire additional food, cultivate larger farmlands, and diversified and intensified their farming activities to increase food production. This finding is consistent with another study conducted in SSA before the pandemic which reported that households with off-farm income were more likely to be food secure particularly in poorer regions and female-headed households (Dzanku, 2019). This is probably because, women are more likely to spend their extra income on basic needs such as food for the family than men (Carranza & Niles, 2019; Quisumbing, Brown, Feldstein, Haddad, & Peña, 1996). This also meant that households with lower income status were unable to acquire the needed food or make the needed investment in their farms. The situation was further compounded by reduced remittances from friends and other family members, higher dependency ratio and increased food prices (ACSS, 2021; Adusei, 2021; Mekonnen et al., 2021; Nigusso & Mavhandu-Mudzusi, 2021; Nyangasa et al., 2019).

Lastly, marital status provided protection against food insecurity for some households (Davis et al., 2021). This is because both spouses helped each other contribute to the food needs for their households (Nyangasa et al., 2019; Oluma, Abadiga, Mosisa, Etafa, & Fekadu, 2020). Additionally, husbands offer a form of social protection for women to access land for farming purposes which could have been a protective factor against food insecurity. The evidence suggests that women on their own, have poorer access and control of

resources including land (Dasgupta et al., 2016). In many instances however, women directly contributed more to household food security than men, due to the peculiar role they play along the food chain (Ibnouf, 2011; Rao, 2006). The situation was, however, different with the absence or death of the husbands. This is largely so, because other existing socioeconomic factors such as income and education vary by gender, which ultimately impact on their physical access to food (Lutomia, Obare, Kariuki, & Muricho, 2019). This was evident in the recent FAO report indicating women face 10% higher prevalence of food insecurity than men due to the current impact of COVID-19 (FAO et al., 2021).

Agricultural and its related factors

Food production in Africa continue to linger for quite a long time now (FAO, 2018). Subsistence farming is the main means of households' food production for the larger population of SSA (FAO, 2017). So, one of the major ways households' farmers get support for farming is through forming cooperation or farmers-based organizations. These cooperation significantly protected households against food insecurity (Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Gwada et al., 2020). Households in farming cooperation attracted new technologies, information and skills from government and other agencies which insulated them from the impact of food shortages (G. Danso-Abbeam, L. J. S. Baiyegunhi, M. D. Laing, & H. Shimelis, 2021; Gebre & Rahut, 2021). These farmers easily adapted to climate variabilities by switching to improved and new crops-livestock diversification and also were able to access farm inputs like seeds, fertilizers, plough servicing than their other counterparts (Gebre & Rahut, 2021). They equally attracted extension visits to help them navigate through the challenges for improve food productions (Endiris, Brehanie, & Ayalew, 2021; Gwada et al., 2020; Olufemi & Oladele, 2021).

The size of households' farmland influenced the amount of food available for their members (Fraval, Hammond, Bogard, Ng'endo, van Etten, Herrero, Oosting, de Boer, Lannerstad, Teufel, et al., 2019; Gute & Nkosi, 2021; Twongyirwe et al., 2019). Larger farmlands enabled households to grow a wider variety of crops against the impact of bad weather. They also generated extra income from leasing parts of the lands to other users (Mekonnen et al., 2021). Smaller farmland limited not only the types of crops households could grow on the field but also, determine the farm yield for household consumption (G. Danso-Abbeam et al., 2021; Mota et al., 2019). The activities of local lending agencies compounded the situation of food insecurity (Ogunniyi et al., 2021; Sanga et al., 2021). In some instances, these agencies offer loans at exorbitant interest rates as high as 75%. Meaning that the limited foods produced had to be sold to repay the loans, while others lost their farm lands

to the lenders, leaving them in persistent food shortages (Mota et al., 2019).

Climate change factors

Households' food security was significantly affected by climate change variables. Among the many reasons, adequate mechanisms and capacity of household are lacking to enable them to cope with the multiple impact of the climate change (Atanga & Tankpa, 2021; FAO, 2018). Almost all the households in Sub Saharan Africa depend mainly on rainfall for food production (Atanga & Tankpa, 2021) and the slightest variation in weather pattern significantly affect planting season leading to low yield. In some instances, extreme rainfall results in high volumes of water, destroying farm lands and crops (ACSS, 2021; Sanga et al., 2021). Rain-fed agriculture is proven however, to be unsustainable to meeting the food needs of the increasing population of SSA (Abou Zaki, Torabi Haghghi, Rossi, Xenarios, & Kløve, 2018; Lamptey, 2022). Evidently only 5% of farm lands are irrigated (Lamptey, 2022). Households with access to climate variability information and irrigation facility were proven to cope better and had improved physical access to food during the pandemic (Gebre & Rahut, 2021; Mengistu et al., 2021)

Conflicts

During COVID SSA witnessed several conflicts and in some instances, human lives were destroyed including crops, livestock, and homes (Dincecco, Fenske, & Onorato, 2019; FAO, 2018). This resulted in emergency food insecurity situations in some parts of SSA like Sudan, Zimbabwe, DRC and Mali (ACSS, 2021; FAO, 2018). Ethnic conflicts and political crisis also limited the ability of state institutions and other agencies to provide the needed support to produce or increase food production in the affected countries (ACSS, 2021). The relationship between conflict and food insecurity is well documented (ACSS, 2021; FAO, 2018).

5. CONCLUSION

In SSA, food insecurity is a continuous issue. COVID-19 pandemic and its related restrictions worsened the existing factors associated with household food security. Especially, food supply chain and crop seasons were disrupted by COVID-19, and many people lost their jobs. Even though the review found no major changes in the prevalence of food insecurity in SSA, the unfolding effects of COVID-19 could make things worse if no steps are taken to provide social protection and agricultural support services to households.

Conflict of Interest

The authors declare that the research was

conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

Conceptualization, F.Z.T. and A.N.O.; methodology, S.A.; software, F.Z.T.; validation, A.N.O.; formal analysis, F.Z.T.; investigation, F.Z.T.; resources, S.A.; data curation, S.A.; writing—original draft preparation, F.Z.T. and A.N.O.; writing—review and editing, S.A.; visualization, F.Z.T.; supervision, A.N.O. All authors have read and agreed to the published version of the manuscript.

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Appendices

Table 1: Prevalence of food insecurity in sub-Saharan Africa during COVID-19.

Authors	Year	Design	Target group	Study location	Sampling protocol	Instrument	Sample Size	Prevalence
ACSS,	2021	-	Population	Urban	-	-	-	-
Adusei,	2021	Cross-sectional study	Household farmers	Urban	Purposive sampling	FIES	50	16 (31%)
Arinaitwe <i>et al.</i> ,	2021	Cross-sectional	HIV men	Rural	Systematic sampling	HFIAS	252	189 (75%)
Charles Shapu <i>et al.</i> ,	2020	Cross-sectional	Adolescents' girls	School setting (urban)	Simple random	HFIAS	612	567 (92.7%)
Danso-Abbeam <i>et al.</i> ,	2021	Cross-sectional	Farmers	Rural	Multi-stage	FIES	534	195 (36.5%)
Dasgupta <i>et al.</i> ,	2021	Cross-sectional	Households	Rural & Urban	Simple random	Hunger score	14,942	2,337 (15.6%)
Davis <i>et al.</i> ,	2021	Cross-sectional	Students	School setting (urban)	Purposive sampling	Food consumption	113	77 (68.1%)
FAO <i>et al.</i> ,	2021	Survey	Households	Rural & urban	-	FIES	-	(66.2%) *
FAO <i>et al.</i> , (FAO, 2020)	2020	Survey	Households	Rural & urban	-	FIES	-	(56.8%) *
Gwada <i>et al.</i> ,	2020	Cross-sectional	Households	Rural	Multi-stage sampling	HFIAS	201	145 (72%)
Houessou <i>et al.</i> ,	2021	Empirical studies	Gardeners / Farmers	Rural & Urban	Multi-stage cluster	RFSA	240	211 (88%)
Ibukun & Adebayo,	2021	Survey	Households	Rural & Urban	Simple random	FIES	1950	1716 (88%)
Kara & Kithu,	2020	Cross-sectional	Households	Rural	Simple random	HFIAS	2259	253 (11.2%)
Kassy <i>et al.</i> ,	2021	Cross-sectional	Households	Rural	Multi-stage sampling	Hunger scale	800	489 (61.1%)
Neme <i>et al.</i> ,	2021	Cross-sectional	HIV adults	Rural	Systematic sampling	HFIAS	305	166 (54.3%)
Ogunniyi <i>et al.</i> ,	2021	Cross-sectional	Farmers	Rural	Multi-stage	FGT	250	58 (23.2%)
Sanga <i>et al.</i> ,	2021	Cross-sectional	Farmers	Rural	Snow balling	-	16*	-
Tirfessa <i>et al.</i> ,	2020	Cross-sectional	Households	Rural	Purposive sampling	HFIAS	273	108 (39.7%)
Salau <i>et al.</i> ,	2022	Cross-sectional	Women (Gari processors)	Rural	Multi-stage sampling	USDA module	120	73 (60.8%)
Tafese <i>et al.</i> ,	2022	Cross-sectional	Mothers	Rural	Simple random	HFIAS	371	249 (67%)
Tabe-Ojong <i>et al.</i> ,	2022	Cross-sectional	Households	Rural	Stratified sampling	HFIAS	1762	728 (41.3%) ^a
Maredia <i>et al.</i> ,	2022	Cross-sectional	Households	Rural & Urban	Simple random	RFSA	4000	1560 (39%) ^b

3.	Folayan <i>et al.</i> ,	2022	Cross-sectional	Adults	Urban	Convenience sampling	RFSA	4471	1288 (28.8%)
4.	Umutoniwase <i>et al.</i> ,	2022	Cross-sectional	HIV patients	Urban	Stratified sampling	RFSA	220	42 (19.1%)
5.	Adeomi <i>et al.</i> ,	2022	Cross-sectional	Adolescents & Preschoolers	-	Multi-stage sampling	HFIAS	1200	568 (47.3%)
6.	Debele <i>et al.</i> ,	2022	Cross-sectional	Pregnant women	Urban	Systematic random sampling	HFIAS	441	78 (17.7%)
7.	Otekunrin,	2022	Cross-sectional	Farming Households	Rural	Multi-stage sampling	HFIAS	352	320 (90.9%)
8.	Negese <i>et al.</i> , (Negesse <i>et al.</i> , 2022)	2022	Cross-sectional	Households	-	Multi-stage sampling	HFIAS	3532	2120 (60%)
9.	Omachi <i>et al.</i> ,	2022	Cross-sectional	Preschoolers	Rural	Multi-stage sampling	HFIAS	450	445 (98.8%)

^a and ^b represent average percentage from three and five different countries in their respective studies, - and * mean that the sections were excluded from the analysis due to data challenges

Table 2: Search terms use for relevant articles

Subjects	Exposure	Outcomes
(Children; women; farmers; adults; students; adolescents; caregivers; households)	(“female-headed”; “male-headed”; “household-heads”; “women”; “households”)	(“food security”; “food insecurity”; “hunger”; “predictors of food insecurity”; “determinants of food insecurity”; “determinants of hunger”)
	AND	
	(“sub-Saharan Africa”; “Africa”; “West Africa”; “low-and-middle income countries”; “rural setting”; “urban centers”)	

Table 3: Summary of percentage averages by assessment tool and year of publication

Assessment Tool	Average Percentage
Food insecurity experience scale	55.5%
Household food insecurity access scale	59.5%
Hunger Score	38.4%
Food Consumption Score	68.1%
Rapid food security access scale	43.7%
Foster–Greer–Thorbecke (FGT)	23.2%
USDA model	60.8%
Year of Publication	Average Percentage
2020	54.5%
2021	55.2%
2022	51.9%
Study Setting	
Rural	46.6%
Urban	63.9%
Both rural and urban	62.9%
Average for all studies	53.71%

Table 4: Factors Associated households' food insecurity in SSA during COVID-19

Factors	Authors	Frequency
Socioeconomic/demographic Factors		
High household dependency ratio	(Davis et al., 2021; Salau et al., 2022)	2
Marital status	(Davis et al., 2021)	1
Older household heads (Age)	(Charles Shapu et al., 2020; Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Davis et al., 2021; Gwada et al., 2020; Salau et al., 2022)	5
Inadequate / lack of remittances	(Gwada et al., 2020)	1
Wealth status	(Kassy et al., 2021)	1
Increased food price	(ACSS, 2021; Adusei, 2021)	2
Low household income (Livestock)	(Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Dasgupta et al., 2016; Gwada et al., 2020; Negesse et al., 2022; Umutoniwase et al., 2022)	5
Lower educational status of household head	(Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Dasgupta et al., 2016; Gwada et al., 2020; Ibukun & Adebayo, 2021; Kara & Kithu, 2020; Ogunniyi et al., 2021)	6
Climate Changes Related Factors		
Drought/short rainy season/ climate variability; temperature.	(ACSS, 2021; FAO et al., 2021; Sanga et al., 2021)	3
Production Challenges and Agriculture Support Services		
Farming groups / cooperatives	(Kassy et al., 2021; Ogunniyi et al., 2021)	2
Extension visits	(Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Gwada et al., 2020)	2
Lack or high farm inputs prices	(Sanga et al., 2021)	1
Smaller land size	(Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021; Sanga et al., 2021)	2
lack of access to credit	(Ogunniyi et al., 2021; Sanga et al., 2021)	2
Lack of alternatives livelihood activities (Savings, off-farm income etc.)	(Gideon Danso-Abbeam, Lloyd JS Baiyegunhi, et al., 2021)	1
Covid-19 Closures and Restrictions		
COVID-related restrictions	(ACSS, 2021; Adusei, 2021; FAO et al., 2021; Maredia et al., 2022; Tabe-Ojong et al., 2022; Umutoniwase et al., 2022)	6
Conflict / political crisis		
Ethnic conflicts and political crisis	(ACSS, 2021; FAO et al., 2021)	2

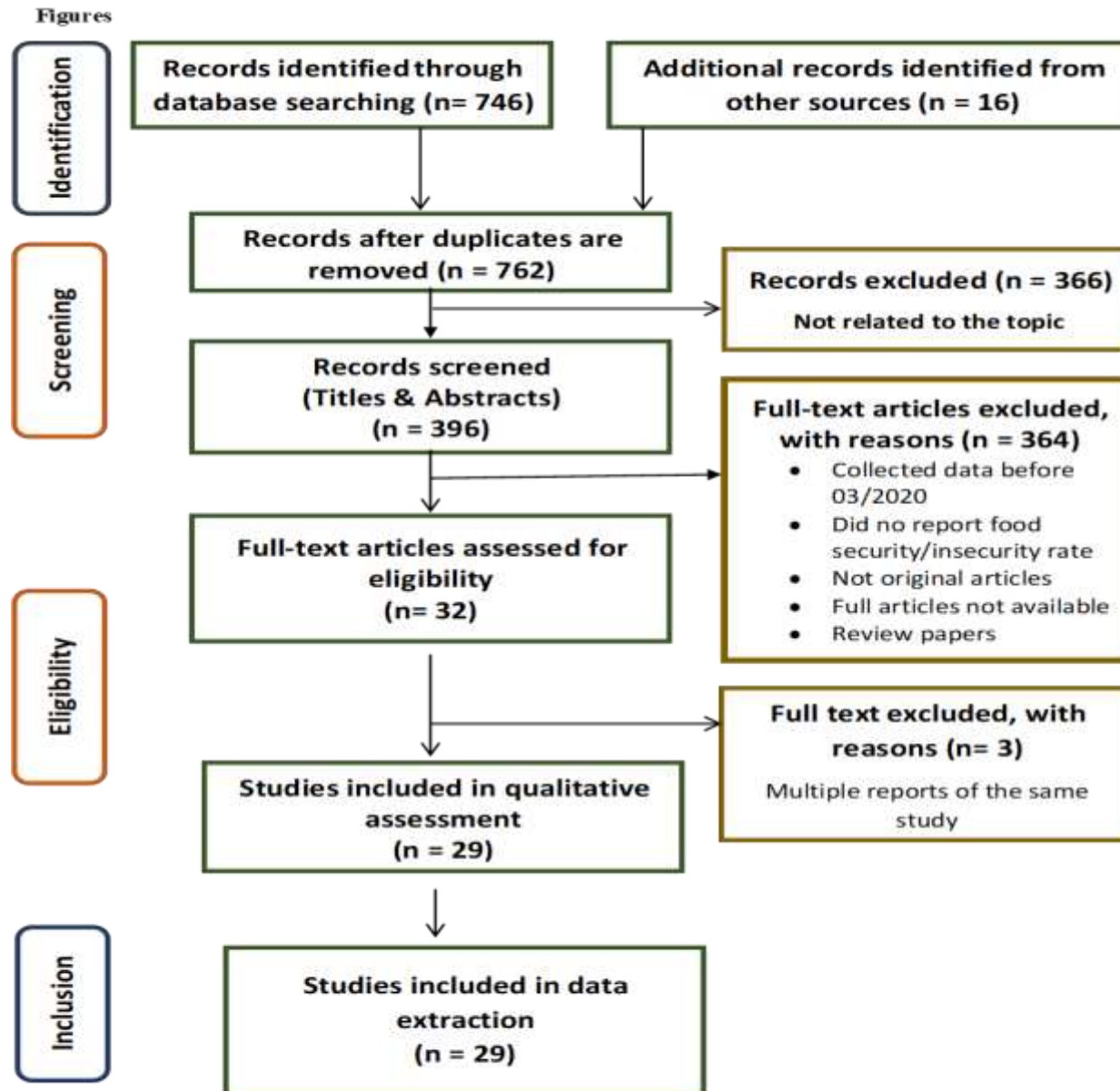


Fig 1 PRISMA flow diagram; adopted and modified from Page et al, (2021)