Food insecurity among international migrants during COVID-19: A scoping review

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Abstract

Background: The SARS-CoV-2 coronavirus and the measures imposed to control it have increased food insecurity globally, particularly among populations in vulnerable situations. Food insecurity, in turn, has repercussions on health, exacerbating pre-existing inequalities. This scoping review maps the literature describing associations between the COVID-19 pandemic and food insecurity among migrants, with a particular view toward health.

Methods: The search was performed in four electronic databases: Embase, Medline, Web of Science and PsychINFO, and included studies published by November 30th, 2022. Papers written in English and covering topics of food (in)security, international migrants, and COVID-19 were included. Forty-six studies were selected from the 909 references initially extracted. Selected studies were charted in an Excel sheet, analysed and findings were reported.

Results: The migrant populations described originated most often from Latin America (11/46) and were located in North America (21/46). Refugees and asylum seekers were the most represented migrant groups (20/46). The main challenges described were financial hardship (28/46), the effect of migrants' documentation status on using public food aid (13/46), and the suspension of or reduction in humanitarian assistance due to the economic recession (7/46). The impact of food insecurity on migrants' mental and physical health was described in 26 of the 46 studies.

Conclusion: Authorities in all destination countries should focus their attention and efforts into ensuring nutrition security for migrants in a holistic way, including their economic and legal integration, to be better prepared for health crises in the future.

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List of Acronyms and abbreviations

UN	United Nations
COVID-19	Coronavirus disease 2019
FAO	Food and Agriculture Organization
SDGs	Sustainable Developmental Goals
LMICs	Low- and middle-income countries
IOM	International Organization of Migration
NGOs	Non-Governmental Organizations
PRISMA-ScR	Preferred Reporting Items for Systematic review and Meta-Analysis extension for Scoping Review
EBDM	Evidence-Based Decision-Making
MeSH	Medical Subject Headings
US	United States
FIES	Food Insecurity Experience Scale
PoU	Prevalence of Undernutrition
CFS	Committee on World Food Security

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1. Background and Rationale

The following is a short story about a migrant family inspired by the migrant population around me. Although it is not a real story, it still describes the challenging situation of migrants related to food security**.**

Fatimah is 35 years old Sudanese female. Four years ago, she was living in a small village in western Sudan with her husband and two children. They lived there as a part of an extended family of 20 members. Their home was a large courtyard with small scattered rooms built from mud and straw and one shared toilet. The family had a small farm, and during the rainfall season, they worked planting some vegetables and sorghum. At the end of the season, they used to harvest and sell a part of the crop in the local market, getting money to buy their essentials and storing the rest in their house. In the other part of the year, Fatima's husband travelled to the capital city to work temporarily, as he was the family's main breadwinner. He used to work in building and construction for a relatively small wage, and he sent most of the money back to his family in the village. Fatima has a primary education; she knows how to read and write. Her two children used to go to a nearby primary school managed by some educated village persons who volunteered to teach the village's children. Regarding their nutrition, Fatima used to cook locally available ingredients, either those they grew themselves or food they bought from the local market. According to that, their food lacked diversity most of the time. Mainly, the meal consisted of sorghum bread and vegetable stew. Also the meal was shared between a large number of people making the individual's portion inadequate, particularly for children. The village had a small primary health care centre with a nurse and midwife and a shortage of equipment and supply. Consequently, many village inhabitants were forced to spend four hours by car to go to the hospital in the nearest city when they were very sick or needed advanced medical help. Then, a tribal conflict began in the village and its surrounding area, and armed groups from different tribes started fighting within the civil population. Unfortunately, most lost their properties, such as homes, farms and livestock, including Fatima and her family. They lived in shelters with hundreds of people in a nearby town that was relatively safe. There, they received humanitarian aid from the United Nations (UN), which provided food and clothes to them. However, these assistances were not enough for the whole family, making Fatima and her husband sometimes sacrifice their

meal to feed their children. Moreover, due to poor hygiene and inadequate, low-quality food, Fatima's children had recurrent infections and chronic morbidity, affecting their growth and development. After a while, Fatima and her family got the opportunity to travel to Norway as refugees. Upon arrival, they found themselves in an apartment within a building that prepared for hosting refugees and other people with similar experience. Fatima started to talk with her neighbours and developed a social network. The whole family underwent a medical examination and got the necessary medical care. They stayed in these refugees' housing for about one year, then, they settled in one of the municipalities in Norway. Fatima and her husband enrolled in the introduction programme, a paid program offered for migrants to learn about the Norwegian language and society and to familiarise them with the country's system and work market. During the day, Fatima and her husband were learning Norwegian, and their children were in kindergarten and school. Although they lived in Norway, Fatima regularly cooked traditional meals for her family. She looked for food items familiar to her as in her home country and prefers not to introduce new ingredients. However, such goods were not constantly available in Norway. In addition, limited knowledge of the Norwegian language and worries regarding some types of food created barriers that prevented Fatima and her family from having a diet with more variety. At the beginning of 2020, the first case of COVID-19 was reported in Norway, and, as in many countries around the world, a package of measures was imposed to control the spread of the virus and minimize the number of infected people. This new situation profoundly impacted Fatima's family. Fatima's husband lost his job as a taxi driver early in the pandemic due to the closure of restaurants, preventing gatherings and postponing flights. Therefore, Fatima's husband could not be paid by the taxi company owner and started receiving money from the municipality that was much less than his previous income. Children also stayed at home without outdoor activities after the closure of schools and kindergartens. Fatima felt stressed as responsibilities increased, and she could not enjoy some free time with her friends like before the pandemic. All this generated psychological distress among family members. In addition, they worried about running out of food before receiving money, so they reduced the number of meals and their amount. Fatima was anxious and depressed. She knew they were not eating good enough but did not want to ask the social services in fear for the children being taken away from her. Fatima's story is one of the thousands of stories reflecting the hardships and challenges migrants faced to ensure food security for themselves and their families.

Despite the international efforts and policies to promote food access, much work is needed to address food issues worldwide, particularly in light of a public health crisis such as the COVID-19 pandemic.

1.1 What is Food security and why is it crucial?

Food security is a fundamental human right. According to Food and Agriculture Organization (FAO) in 1996, food security is achieved when "all people, at all times, have the physical and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life". The concept of food security is built on four pillars: food availability, physical and economic access to food, food utilization and consistency of these three elements over time (1).

Food security is directly connected to the first and second sustainable developmental goals (SDG): "no poverty" and "zero hunger". In addition, food security is closely related to the third goal, “good health and well-being”, which is explained more in section 1.2. Moreover, there is a relation between food security and the fourth SDG “quality education,” as children raised in food-insecure households have poor physical health, impaired cognitive abilities and learning skills compared to those living in food-secure households (2, 3). The sixth SDG, “clean water and sanitation”, is also important to maintain food security as in households with good hygiene, the likelihood of family members getting infectious diseases is less than in households without it. This also implies that families will have more money to spend on food, and being healthy will improve their absorption and utilization of nutrients (4).

Other SDGs, such as “gender equality” and “climate change”, are also related to food security. When women and girls can get their food in an optimum way that keeps them healthier and enhances their potential, they can attain higher education and compete in the job market (4, 5). In addition, empowered mothers might be more able to make better nutritional choices regarding feeding their children and participate in achieving food security for their families. Regarding climate change, elevated temperatures, rising sea levels, fluctuation of rainfall and soil degradation might lead to more frequent natural disasters like floods and drought, which negatively affect the agricultural activity and damage animal resources. As a result, ensuring food security could be challenging due to lacking elements such as food quality, availability, and increasing food prices (6). Based on all that, we can say that food security has a key role in achieving the 2030 SDGs, as it interferes and intersects with several of them.

On the opposite side, food insecurity could be defined as lacking sufficient safe food containing adequate quantities of nutrients that satisfy an individual with both his/her physical and mental health and ensure activity and productivity. To measure the prevalence of food insecurity, the Food and Agriculture Organization (FAO) uses the Food Insecurity Experience Scale (FIES), which is a survey module that includes eight questions that are formulated to reflect individuals' experiences relating to access to and consumption of food in the light of financial constraints and scarcity of resources. Depending on how an individual answers the questions in the FIES, the extent of his/her food insecurity can be classified in three levels according to severity: mild, moderate and severe. A person could be considered mildly food insecure if there are worries about having sufficient food and/or consumption of a diet with limited choices and low variety are reported. Moderate food insecurity is identified when people do not have resources to purchase nutritious food such as fresh fruits and vegetables and compensate for that by eating less expensive, highly calories food with low quality and/or when people are enforced to reduce the frequency of their meals. Finally, lacking food in the household and/or spending a complete day without eating could be classified as severe food insecurity. Moreover, prevalence of undernourishment (PoU) is a tool that measures the percentage of population that consumed insufficient amount of calories in their diet that make them unable to perform their daily activities. FIES and PoU are indicators to evaluate the global progress toward achieving the second SDG (7, 8).

1.1.1 Trends in food insecurity

After many years following a good trend, food insecurity has increased in the last years due to conflicts, exposure to climate variability and extremes, economic recession, and the prohibitive cost of healthy food (9). Moreover, poverty and inequality, especially among populations in vulnerable situations, are leading causes of this rise in food insecurity (10). A study conducted in 2017 in 134 countries across the globe showed that people with low education levels, weak social networks, unemployed, and living in poor households were more likely to experience food insecurity (11).

Usually, food insecurity is expected to occur mostly in low- and middle-income countries (LMIC), where most of the population suffers from poverty, lack of well-developed infrastructure, improper management of resources and low-educated population (12-14). However, food insecurity has also been reported as a growing issue in high-income countries. It is noticed mainly among populations in vulnerable situations, such as poor people, homeless,

refugees and ethnic minorities. This highlights the inequalities in such societies and the urgent need to address the social determinants of food security to ensure better access to affordable, nutritious food in an acceptable way that maintains human dignity (15-18)

In addition to these factors, the corona pandemic and its devastating repercussions on the global economy have significantly worsened food insecurity, and many countries worldwide, particularly the low- and middle incomes ones, are struggling to recover from it. According to all these challenges and obstacles, achieving the sustainable development goal "Zero hunger" by 2030 is still under question (7, 9).

1.1.2 Complexity of food security

As explained above, the FAO classifies food insecurity according to its severity. However, for a better understanding of the concept of food security, it is crucial to be aware of its complexity and multidimensional nature. Therefore, in the present study, we adopted a framework that deals with food security through different levels: individual, household, national and underlying conditions (figure 1) (19).

As shown in the figure below, at the base of the pyramid, we find the underlying conditions that could impact food security. For example, political factors are important for making and maintaining policies for promoting food security. In addition, economic factors deeply affect both the availability and access to food. Moreover, different environmental conditions such as climate change, natural disasters and unsustainable consumption of natural resources could play a central role in food security stability. Population increase, migration, and the high prevalence of disparities among different populations are critical demographic factors related to food security. On the national level, the presence of a resilient food supply chain is vital in establishing food security. This allows for keeping the balance between local farms' production, food imports and exports and wasted food and helps to cope with abrupt and unexpected threats, like pandemics and environmental crises, in the context of well-developed market infrastructures. Regarding the household level, the number of family members, the habits and customs related to food storage, the preparation and consumption, the access to clean water, and the household's hygienic condition are factors associated with food security to be considered. Finally, an individual's health status, eating practices and monthly income plays an essential role in determining food security (4, 20).

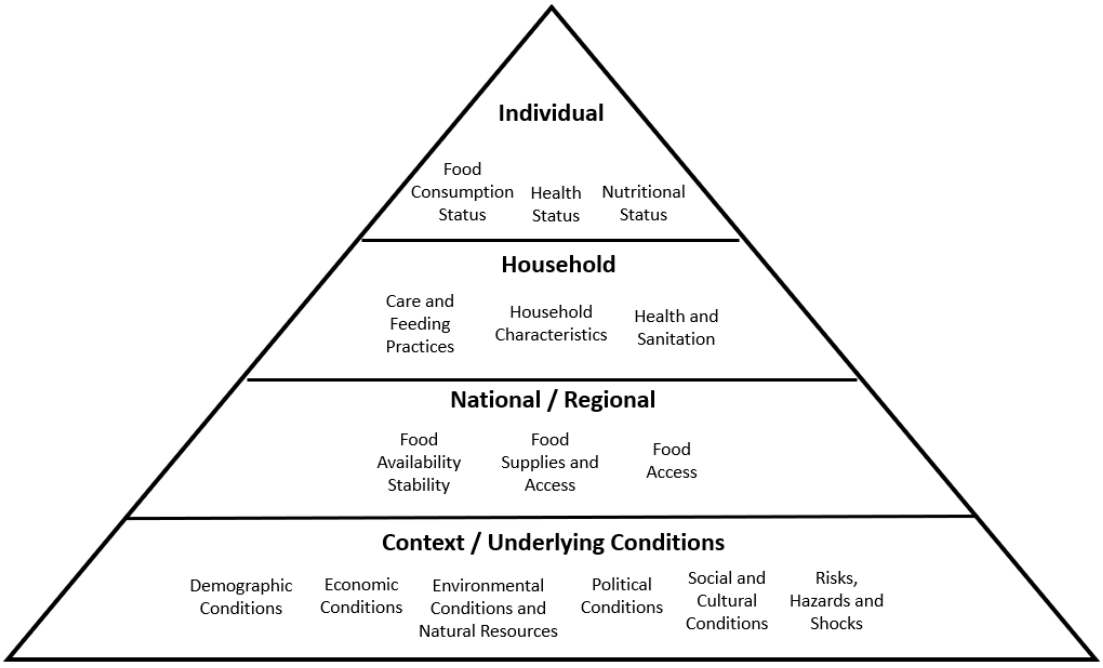

Figure 1: Levels of food security adapted from (19)

1.2 Food insecurity and health

The experience of food insecurity is strongly associated with adverse outcomes on both physical and mental health (21). For example, children living in food-insecure households have about three higher odds of developing iron deficiency anaemia than those living in food-secured households (22). Additionally, having asthma and other chronic diseases is more likely in adolescents who suffered from food insecurity multiple times throughout their life (23). Many studies also show that food insecurity is significantly related to diabetes (24), poor diabetic control (25), poor general health status (26), overweight, and obesity (27). Food insecurity is also associated with learning difficulties and gastrointestinal infections (28).

Food insecurity impacts individuals' health status, particularly in developing and deteriorating chronic diseases, in several ways. For instance, food-insecure households have difficulty accessing healthy dietary options such as whole grains, vegetables and fruits which are essential in preventing and controlling many chronic illnesses like obesity, diabetes, coronary artery disease and congestive heart failure. Additionally, accessibility to food in most food-insecure households is not stable and has changeable patterns over time that might affect the prognosis of certain diseases like diabetes, in which medications times and doses depend mainly on the type and number of meals. Lastly, ensuring food is the most important priority

in food-insecure households, which usually leads to ignoring or procrastinating other basic needs, such as seeking medical care or buying necessary medicines (29).

Regarding mental health, several studies showed that people who suffer from food insecurity have a higher risk of experiencing psychological disorders such as depression, anxiety and stress. In addition, those food-insecure individuals usually are worried about running out of food, not having enough food or missing one or more meals during the day. In addition to this, people living in low and middle-income countries (LMICs) often lack mental health support. However, it should be noted that this link between food insecurity and poor mental health is not only an issue in LMICs, as it has also been described in high-income countries (30-33).

The relationship between health and food insecurity has reflections on health care use. As stated above, food insecurity can impact how healthcare services are being used, such as delaying necessary care. On the opposite side, it might increase use of services. For example, diabetic patients who lack access to food have doubled risk of hypoglycaemia than other diabetics; therefore, their frequency of physician visits per year is much higher. That might put pressure on the health systems and impair their service quality (34).

1.3 Global view of migration

According to the International Organization of Migration (IOM), a migrant is someone who leaves his or her original residence and settles down in another geographic area within or outside the country's borders, and this can happen for several reasons and regardless the willing of a person to do that or not. According to this definition, the term migrant might include international migrants and internal migrants. However, in this scoping review, we focused on international migrants, who cross the international borders of their countries and live in foreign countries (35, 36).

During the last three decades, the number of international migrants has increased by about 128 million migrants. The estimated number of international migrants was about 281 million in 2022, representing 3.6% of the world population. About one-third of international migrants live in Europe, 30.5% live in Asia, and about 21% and 9% live in North America and Africa, respectively (37).

There is a heterogeneity related to causes and drives that lead people to migrate. For example, labour migration is when individuals leave their home countries looking for better job opportunities, and those count for about two-thirds of all international migrants. In addition,

studying and family reunification might be considered as drives of migration. Moreover, refugees and asylum seekers flee their places due to conditions that threaten their safety and/or human rights. There were about 26.4 million refugees in the globe in 2020, and this number has significantly increased in the last two decades. Others could escape their lands due to catastrophic natural events such as earthquakes, floods and climate change. In addition, internally displaced migrants are those moving within their country, usually from rural to urban regions (38-41). Indeed, migrants usually come from multiple different backgrounds and have unequal skills and experiences. These differences determine how they could adapt and interact within their hosting societies and to what extent they could be vulnerable to socioeconomic conditions in the new settings (42).

Although migration has several positive consequences for hosting countries, especially in HICs (43) , the upraising pattern of international migration in the last two decades has also challenged migrants themselves and their host countries. Several countries have responded to the current migration situation by implementing a group of appropriately designed and well-arranged policies. These policies aim to make the migration process safer and easier in order to achieve the tenth SDG, "reduced inequality within and among countries" (44).

1.4 Food security among migrants

The continuing upward trend of migration and the growing number of migrants, regardless of the causes that push them to leave their home countries, has created a significant challenge for host countries and international organizations to secure them nutritionally. Migrants often experience compromised food security in their host countries, even those who resettle in high-income countries (45). In addition to all other socioeconomic factors linked to food insecurity already described, migrants' cultural backgrounds can influence their food choices and preparation and are also associated with their food insecurity. Additionally, other factors such as knowledge about means of transportation, trust in local food items, presence and degree of social connections within the migrant community, and linguistic difficulties can affect migrants' food security (46).

The prevalence of food insecurity is, therefore, high among migrants in both their home countries and their destinations. In 2017, 93% of refugees who lived in Norwegian reception centres experienced food insecurity compared to only 3% of the Norwegian population, and this was mainly due to low monthly income (16). One study investigating food security among

Somali women refugees in the United States (US) revealed that 67% were food unsecured. Low monthly income, inability to use the local language, unbalanced diet, and low education levels were strongly associated with food insecurity (27). Another study showed that 73% of migrant Libyan families in Australia had food insecurity, and this was related to large families, difficulties in accessing grocery shops and high food prices (47). In a rural setting in India, migrants usually showed a lack of economic accessibility and worries regarding maintaining sufficient food amounts (48). In addition to the higher risk of food insecurity, migrant populations are more prone to its harmful consequences on their health and well-being compared to non-migrant populations. Disorders like overweight, stunting and vitamin and mineral deficiencies reported among migrants' families have been related to their impaired food security status (49, 50).

1.5 Food security during COVID-19

COVID-19 is an infectious disease caused by the SARS-CoV-2 strain that emerged from Wuhan, China, at the end of 2019 and was declared a pandemic in March 2020. For most persons affected, it causes mild to moderate respiratory symptoms such as fever, shortness of breath and cough, and most people recover without major medical intervention. However, individuals with chronic illnesses and the elderly can show severe disease complications and might need advanced medical care. Transmission occurs mainly through droplets from the sneezing and coughing of an infected person. The virus has infected almost 760 million and killed almost seven million people worldwide at the time of writing this manuscript (51, 52). In addition to its damaging effect on health and the health sector, the COVID-19 pandemic has adversely impacted different aspects of life, particularly the economic and social aspects (53). The COVID-19 pandemic has resulted in an unprecedented economic crisis since the second world war that negatively affected high, middle and low-income countries (54).

The negative effect of COVID-19 on food security could be direct, as the infection deteriorates the population's health and consequently their nutrition status. However, the effect on health can also be indirect through the economic recession that resulted from the COVID-19 pandemic (55). One of these economic repercussions is unemployment which affected many households that reported food insecurity (56). This economic slowdown is basically attributable to the containment measures adopted by many governments around the globe. Those measures such as social distancing, quarantine, complete or partial lockdowns, transport restrictions, and travelling suspension have profoundly impacted food supply chains in different countries (57).

Furthermore, decreased agriculture production, limitations in export/import activities, and panic food purchasing hindered ensuring food security amid the pandemic (58). For example, the harvesting season of fruits and vegetables in several countries was affected by the shortage of migrant labour amid the pandemic. In addition, some migrant workers that were left without jobs stopped sending remittances to their families, which deteriorated the economic situation of the recipients and made them vulnerable to food insecurity (59, 60). On the other hand, some countries excluded agriculture and farm workers from COVID-19 controlling measures to ensure the consistency of food production. This strategy sacrificed migrants' health as they prone to COVID-19 infection in their work environment, which in turn caused reduced agricultural output (61, 62).

In 2020, the first year of the COVID-19 pandemic, global hunger increased by 1.5 percentage points to about 9.9 per cent after five years of stability. In the same way, moderate or severe food insecurity rose abruptly to 30.4 per cent in 2020, after a relatively slight increase from 2014 to 2019 (22.6% to 26.6% respectively). In 2021, the prevalence of moderate or severe food insecurity revealed no big difference from that in 2020. However, there was a significant increase in the prevalence of severe food insecurity during the pandemic, from 9.3% in 2019 to 11.7% in 2021. Moreover, there were nearly 2.3 billion people experiencing moderate or severe food insecurity in 2021 (9). A study in the US mentioned that 94% of the families who experienced food insecurity stated that it started or deteriorated after the commencement of the COVID-19 pandemic (63). Apart from hunger and lack of accessibility, food quality was also affected. According to Headey et al., the quality of food in poor households has been shifted towards cheaper calories instead of a rich nutrient diet such as fruit, vegetables, and dairy products. The reason for this shift was to compensate for the fiscal shortage resulting from either reduced income or unemployment during the pandemic (64). At the same time, a prohibited increase in food prices prevents poor people from having nutritious and balanced meals (55). Furthermore, schools closure contributed to increasing food insecurity as many children, particularly those from families with low socioeconomic status, depended on meals provided by schools' feeding programmes (59).

1.6 Impacts of COVID-19 on migrants and their food security status

Migrants usually have a higher risk of COVID-19 infection due to several factors, including their pre-existing adverse socioeconomic conditions (65). Factors such as inadequate access to health services, poor housing conditions, social discrimination and fear of returning to their

countries make some migrant groups victims of worse consequences like hospital admission and death (66). Moreover, migrants in vulnerable situations also disproportionately suffer financial hardship that prevents them from seeking medical help, which could aggravate the health impact of COVID-19 among them (67). A Norwegian study revealed that the COVID-19 pandemic had affected migrants more than non-migrant populations in terms of having worries about running out of food (68).

As a consequence of the lockdown strategy adopted by several countries, a large number of migrant workers in informal sectors were lifted without jobs and lost their wages abruptly. Eventually, some had to scarify the size and frequency of their meals to cope with their limited resources (69, 70). Furthermore, several poor households in developing countries stopped perceiving remittances they received from migrant family members. This led them to reduce their meal quantities and minimize the variety of food items (71).

In addition, the decline in food aid provided by international organizations threatens the food security of refugees living in camps, making them vulnerable to hunger and several adverse health repercussions (72). Furthermore, undocumented migrants are occasionally exposed to worse forms of food insecurity and health complications than documented migrants, as they are unable to access essential services in their destinations (73).

During the first year of the COVID-19 pandemic, about 3 million people remained outside their home countries due to travel restrictions and borders closure. The majority of them were seasonal migrant workers and international students who suffered from a shortage of food and resources (37).

Furthermore, migrants are prone to many psychological disorders that accompany worries about food access during the pandemic. For example, uncertainty about food during the COVID-19 pandemic precipitated anxiety and depression among migrants (74). In addition, the social isolation broke communication within migrant communities, so migrants lost access to culturally-preferable food available in these communities' gatherings (75).

Based on what was mentioned above, COVID-19 aggravated the global burden of food insecurity. Simultaneously, it widened the pre-existing inequalities within societies and disproportionately affected migrants due to their marginalized conditions (66). However, most of the information regarding food security on migrants during the pandemic relies on the sources of NGOs and international humanitarian organizations, which might be prone to show the need for their own help, and few reports study the associations between food insecurity and

health among migrants during the pandemic. There is therefore a need for more peer-reviewed research in this domain to investigate the nature of association between food insecurity and migration background, particularly in the light of critical situations such as the COVID-19 pandemic. With this study, our purpose was to map this type of literature to know what has been published related to food insecurity as well as to identify gaps in the literature based on the framework mentioned earlier in this introduction to understand the complexity of the associations between food insecurity and migrant background, with a special interest in health associations.

Our paper was sent to the International Journal of Environmental Research and Public Health, was accepted on March 13th, 2023 and published on March 27th, 2023. Annex 1 shows the guidelines of the journal.

2. Research question and objectives

2.1 Research question

What kind of peer-reviewed literature is published about food security among international migrants during COVID-19 pandemic?

2.2 Objectives

2.2.1 Main objective: to provide an overview of published research on how the coronavirus pandemic affected food security among migrants, with a special focus on associations between food insecurity and health.

2.2.2 Specific objectives:

1) To map the existing literature to investigate the extent, range and characteristics of the evidence related to migrants' food security amid corona pandemics.

2) To identify any gap in knowledge related to the framework that divides food security into different aspects, especially the health aspect.

3. Methods

3.1 Study design

In order to answer the research question, we conducted a scoping review to describe the published literature about the impact of the COVID-19 pandemic on food security of international migrants. A scoping review is a type of study used to give general description and review for existing literature and identify related articles in a research area of interest (76). Scoping reviews could be conducted for multiple reasons. For instance, it might be adopted as a research method only for exploring the extent of a research area and to know the variety of evidence that is available. Moreover, the scoping review could be used to evaluate the effectiveness of conducting a complete systematic review in certain study areas. In addition, a scoping review might be used to summarize and disseminate findings from evidence as well as identify gaps in the body of knowledge, as we did in this study (77). Although the scoping reviews provide a variety and wide range of studies, they also have some limitations. The heterogeneity of the selected studies, with different methods, designs and tools, makes it difficult to find a common theme or make comparisons. In addition, using a scoping review to map literature does not allow either to evaluate the equality or to determine the risk of research bias of the selected studies. On the other hand, a scoping review could be a good choice when the research area is wide and includes several different types of sources. Moreover, using scoping reviews might be beneficial if the literature has not been explored yet (76).

The methodology proposed by Arksey and O'Malley was used for this study, and according to this approach, several steps should be followed to ensure rigour and transparency of the method. Firstly, the following research question was identified: “What kind of peer-reviewed literature is published about food security among international migrants during COVID-19 pandemic?”. Further steps of this methodology were searching for relevant studies, selecting the studies, charting the data and summarizing the findings (77). We will go through all these steps while describing the process of our scoping review according to the PRISMA-ScR checklist (Annex 2), which helps report a scoping review in a standard way that makes it replicable (78).

3.2 Inclusion and exclusion criteria

The inclusion criteria were:

- Studies should be written in English.
- Studies must include three topics: food security, international migrants, and COVID-19 pandemic.

The exclusion criteria were:

- Studies only focused on internal migrants or minorities and ethnic groups.
- Systematic and scoping reviews.
- Studies discussing the effect of the COVID-19 pandemic on agriculture and food production due to the shortage of migrant farmworkers.

3.3 Search strategy and selection process

The second step in conducting a scoping review is the search of relevant studies. This step aims to thoroughly search existing literature to find articles related to the research question. This could be accomplished by searching in electronic databases, reference lists or manually in main journals (77). We performed our search in four different electronic databases: Embase, Medline, PsychINFO and Web of Science, to have a multidisciplinary approach regarding how COVID-19 impacted the food security of international migrants. Embase focuses on biomedical and pharmaceutical information, Medline includes articles in physical and biological science, biomedicine and humanities, PsychINFO covers psychological, social, behavioural and health literature (79), and Web of Science provides a wide range of topics in different fields such as science, social science, arts and humanities (80).

An expert from the medical library of the University of Bergen helped us planning the search strategy and drafting the search terms. We used the PICO search strategy tool. This is a vital tool in the concept of Evidence-Based Decision-making (EBDM), which helps formulate a well-structured research question in a systematic way that might enhance the efficiency of the search process. The acronym PICO/PECO stands for patients/population, intervention/exposure, control/comparison and outcome (77, 81).

We used the following search terms:

- Medical subject headings (MeSH): emigrants, immigrants, migrants, transient and refugees, food supply, food insecurity, coronavirus infections, Betacoronavirus, Pandemics and COVID-19
- Truncated free text terms: emigra*, immigra*, migrant*, transient*, refugee*, asylum seeker*, ethni*, coronavirus*, pandemic*, corona virus*, virus disease*, virus infection*.
- Other terms: food security, food availability, food accessibility and food utilizationThe third step of the scoping review is the study selection.

The first search was carried out on November 3rd, 2021 and a total of 436 articles were obtained (155 from Embase, 119 from Medline, 142 from Web of Science, and 20 from PsychINFO).

Then, 158 duplicates were removed. After that, 278 papers were screened based on titles and abstracts and we excluded 222 according to the inclusion and exclusion criteria. During this process, any doubts regarding the inclusion of specific papers were discussed with the research team. Then, a total of 56 studies underwent a fully-text reading, and by the end of this stage, 17 studies were finally selected.

Our initial paper was submitted to the International Journal of Environmental Research and Public Health on December 27th, 2022. In January 25th, 2023 the journal reviewers requested us to extend our search period until November 30th, 2022. Therefore, we conducted our second search on January 26th, 2023. We limited this new search from November 1st, 2021 to November 30th, 2022. A total of 473 papers were obtained (168 from Embase, 101 from Medline, 39 from PsycINFO and 165 from Web of Science). Of those, we removed duplicates and ended with 339 articles. These 339 articles were screened based on titles and abstracts; at this point, 302 were excluded since they did not meet the inclusion criteria. In the same way as in our first search, all doubts over eligibility were resolved through discussion within the research team. If the decision of inclusion was not clear based on the title and abstract, the articles were then selected for the next round of review. A total of 37 studies were selected in the first round and were reviewed through full-text reading. Those studies that did not meet the inclusion criteria were eliminated and a total of 29 papers were included in this second search.

The overall result of the two searches was a total of 909 papers (323 from Embase, 220 from Medline, 59 from PsycINFO and 307 from Web of Science). Of those, 292 were duplicates and therefore omitted, 524 were excluded since they did not meet the inclusion criteria, 93 studies were selected in the first round and were reviewed through full-text reading. A final total of 46 (72-75, 82-123) studies were finally included in this scoping review. Annex 3 shows the Prisma flowchart of the overall result of the screening and selection process.

3.4 Charting the data and summarizing the findings.

The final steps of a scoping review are to chart the data and summarize the findings. In order to complete this, we used an Excel template to extract data from the selected articles. Based on the objectives and the framework of the study, we selected different variables for this template:

- Characteristics of the paper (including author, journal, publication year, and the country where the research was conducted)
- Research design and method

- Features of the migrant population in the study (country of origin and destination, migrant category in terms of documentation status and/or reasons for migration)
- Objectives, outcomes, and results

Regarding food (in)security, the following variables were also added in the Excel template:

- Tools or ways used to measure/assess food (in)security in the study.
- Level at which food (in)security was discussed (either at individual, household, or national level)
- Health issues related to food (in)security.
- The mechanism by which the spread of COVID-19 and its containment measures impact the food security of international migrants.
- Possible effect of migrants' documentation status on using food aid.

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Scientific paper

Review

Food Insecurity among International Migrants during the COVID-19 Pandemic: A Scoping Review

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Abstract: The SARS-CoV-2 coronavirus and the measures imposed to control it have impacted food security globally, particularly among vulnerable populations. Food insecurity, in turn, has repercussions on health, exacerbating pre-existing inequalities. This scoping review maps the literature describing associations between the COVID-19 pandemic and food insecurity among migrants, with a particular view toward health. A total of 909 papers were extracted through four electronic databases, and 46 studies were included. The migrant populations described originated mainly from Latin America (11/46) and were located in North America (21/46). Most studies included refugees and asylum seekers (20/46). The main challenges described were financial hardship (28/46), the effect of migrants' documentation status on using public food aid (13/46), and the suspension of or reduction in humanitarian assistance due to the economic recession (7/46). The impact of food insecurity on migrants' mental and

physical health was described in 26 of the 46 studies. Authorities in all destination countries should focus their attention and efforts into ensuring nutrition security for migrants in a holistic way, including their economic and legal integration, to be better prepared for health crises in the future.

Keywords: scoping review; COVID-19; food insecurity; food security; health; international migrant

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1. Introduction

The COVID-19 pandemic has negatively impacted different aspects of life. The virus has killed more than six million people around the world (124), and the measures to control the spread of the virus have affected people's mental and physical health globally (125, 126). In addition, COVID-19's containment measures and the resulting global economic recession have had several devastating outcomes (127, 128).

Indeed, the pandemic has disproportionately impacted refugees, asylum seekers, and other migrants who live in vulnerable conditions and have a higher risk of being infected and dying from COVID-19 (66). However, migrants constitute a heterogenic group that has been affected differently, depending on factors such as their country of origin and destination, the reason for migration, and their status of documentation, among others (129, 130). In addition, people in vulnerable situations experienced

more financial hardship and other social consequences during the pandemic, which might be attributed to pre-existing socioeconomic inequalities (131). Poorer socioeconomic conditions can in turn increase vulnerability to infection and disease, creating vicious cycles that are reinforced during a pandemic (132).

Food security is achieved when "all people, at all times have the physical and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life" (133). Global efforts are directed to ensure food security for all people, as this is directly connected to the first and second sustainable developmental goals (SDGs), "no poverty" and "zero hunger," respectively. At the same time, food security affects and is affected by other SDGs such as good health and wellbeing, quality education, and clean water and sanitation (4). Moreover, food security is a crucial element in maintaining good physical (49, 134) and mental health (33, 135).

Food security is a complex and multidimensional concept. To reflect upon this, we used a framework developed by Gibson based on the Committee on Food Security and the Food Insecurity and Vulnerability Information and Mapping Systems initiative (19). This framework divides food security into four different levels (individual, household, national, and underlying conditions). There are several factors related to food security in each (Figure 1), including individual health status (19).

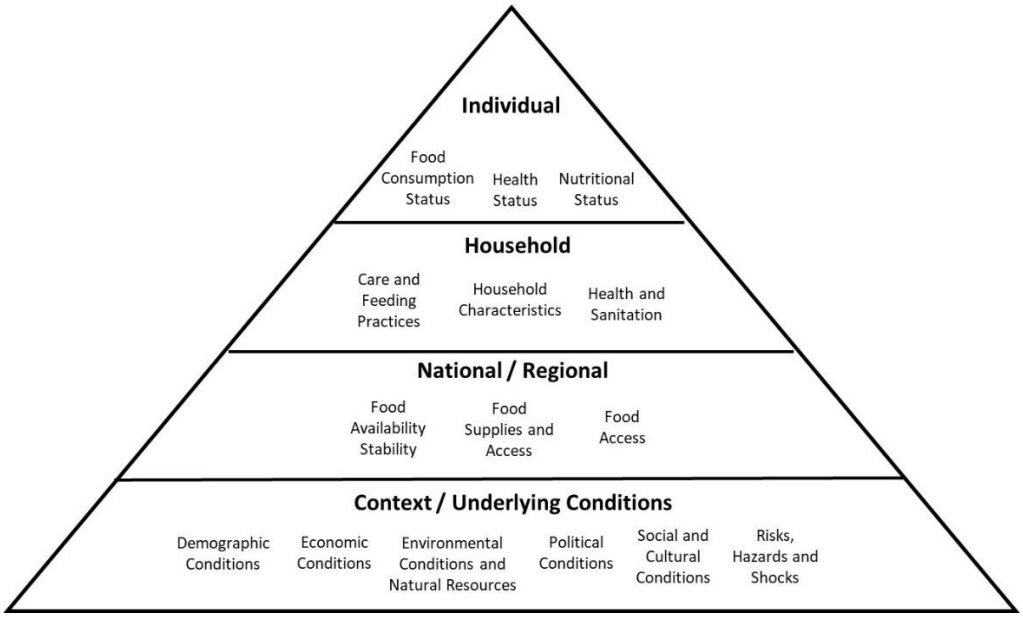

Figure 1. Levels of food security adapted from (19).

Although often used as the mere opposite of food security, food insecurity is defined as "the inability to acquire or consume an adequate diet quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so", which is usually related to economic difficulties and constraints on resources (136). Although food security has mostly been studied in low- and middle-income countries and in studies conducted by non-governmental organisations (NGOs) and international humanitarian organisations, the concern regarding food insecurity is also growing in high-income countries, specifically among the most deprived parts of the population. According to a Norwegian study, 3% of Norwegians have experienced food insecurity, and 93% of refugees were found to be food insecure (16).

Food security has obtained increasing attention during the COVID-19 pandemic, with a growing number of papers describing the situation for the majority population. These studies acknowledge the complexity of the associations between the pandemic and the key role of sociodemographic factors (137, 138). However, they seldom include migration as an additional factor to consider in these associations. So far, most of the information regarding food security/insecurity among migrants during the pandemic comes from NGOs and international humanitarian organisations working in low- and middle-income countries (139). Although this information is extremely valuable, humanitarian organisations often have advocacy as one of their roles and do not have the resources to conduct independent investigations available to the research community.

Reliable peer-reviewed evidence of high quality about food insecurity among migrants is necessary for researchers to understand the intricacies of associations between health and migration background and for policymakers to make adequate decisions, specifically during health crises such as the pandemic, when health, economy, and health services are compromised. This study aims to provide an overview of published research on how the coronavirus pandemic has affected food security among migrants. Furthermore, we want to map the existing literature to investigate the extent, range, and characteristics of the evidence

related to migrants' food security amid the COVID-19 pandemic. In light of this information, we try to identify any gaps in knowledge related to the levels and factors of the food insecurity framework, with a special emphasis on health, as well as to different risk factors related to migration background. Even though food insecurity is of utter importance for internally displaced people, too, given that the pandemic posed strict constraints on movements across national borders, for this paper, we study migrants that have moved to a new country.

2. Materials and Methods

2.1. Study Design

We conducted a scoping review following the methodology proposed by Arksey and O'Malley (77). According to this approach, the following steps were followed to ensure the rigour and transparency of the method. First, the following research question was identified: What kind of peer-reviewed literature has been published about food security among international migrants during the COVID-19 pandemic? We then searched for relevant studies and carried out a selection process to choose only those papers that met the inclusion criteria. Thereafter, data obtained from the selected studies were charted. Finally, the results were summarised and reported.

To be included in this review, studies had to be written in English, and they had to include three topics: food security/food insecurity, international migrants, and COVID-19. We excluded studies on internal migrants or minorities and ethnic groups, systematic and scoping reviews, and articles that discussed the effect of COVID-19 on agriculture and food production due to the shortage of migrant farmworkers.

2.2. Search Strategy

In order to identify articles relevant to this scoping review's focus and acquire a multidisciplinary approach with regard to how COVID-19 could influence the food security of migrants, our search used four electronic databases: Embase, Medline, Web of Science, and PsychINFO. The search strategy was conducted with the help of a librarian expert from the University of Bergen, particularly to draft search terms. The PICO search strategy tool was used to determine our search terms (Table 1). Medical subject headings (MeSH) (emigrants, immigrants, migrants, transients and refugees, food supply, food insecurity, food security, coronavirus infections, Betacoronavirus, pandemics, and COVID-19), truncated free-text terms (emigra*, immigra*, migrant*, transient*, refugee*, asylum seeker*, ethni*) (coronavirus*, pandemic*, corona virus*, virus disease*, virus infection*), and also food security, food availability, food accessibility, and food

utilisation were used in this study. We limited the search until November 2022. The final search was carried out on 26 January 2023, exported to EndNote bibliographic manager, and the duplicates removed.

Table 1. PICO/PECO strategy.

PICO/PECO strategy		**Search terms**
P	Participants	International migrants
I or E	Intervention/exposure	COVID-19
C	Control	Not applied for this study
O	Outcome	Food (in)security

2.3. Data Extraction

In the first search, a total of 909 papers were obtained (323 from Embase, 220 from Medline, 59 from PsycINFO, and 307 from Web of Science). Of those, 292 were duplicates and therefore omitted. Initially, articles were screened based on titles and abstracts; at this point, 524 were excluded, since they did not meet the inclusion criteria. Any doubts over eligibility were resolved through discussion within the research team. If the decision of inclusion was not clear based on the title and abstract, the articles were then selected for the next round of review. A total of 93 studies were selected in the first round and were reviewed through full-text reading. Those studies that did not meet the inclusion criteria were eliminated, and all doubts during this process were

discussed within the team. Data were extracted from the selected articles using an Excel template. The variables used in this template were: characteristics of the paper (author, journal, publication year, and the country in which the research was conducted), research design and method, features of the migrant population in the study (country of origin and destination, migrant category in terms of documentation status and/or reasons for migration), objectives, outcomes, and results. Regarding food (in)security, the following variables were also added in the Excel template: tools or methods used to measure/assess food (in)security in the study, level at which food (in)security was discussed (i.e., at the individual, household, or national level), health issues related to food (in)security, and the mechanism by which the spread of COVID-19 and its containment measures impacted the food security of international migrants. These variables were selected based on the objectives and the framework of the study. During the full-text review stage, a new variable regarding the possible effect of migrants' documentation status on using food aid was added to the template. It was observed that many studies focused on the impact on the agriculture and food production sectors caused by the shortage of migrant farmworkers due to the pandemic. Those studies did not discuss the direct effect of COVID-19 on the food security of the migrants themselves, so

they were excluded based on a discussion within the research team, and the exclusion criteria were adjusted.

A total of 46 studies that met the inclusion criteria were included in this scoping review. Figure 2 shows the screening and selection process followed (140).

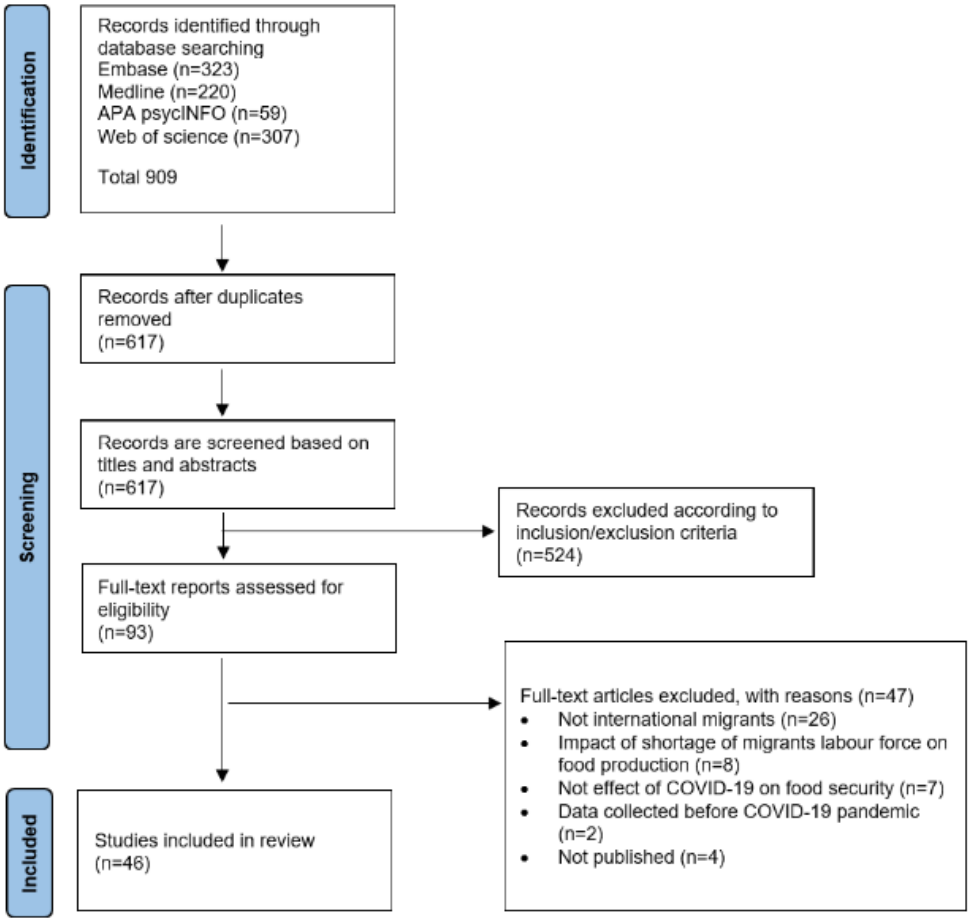

Figure 2. PRISMA flowchart.

3. Results

Thirty-seven papers contained original research, four papers were commentaries (72, 90, 91, 93), one was a viewpoint (82), one was an opinion piece (94), two were literature searches (115, 122),

and one was a letter to the editor (119). (Table 2). Thirty-five studies mainly or totally used the term "food insecurity" (73, 74, 82, 84-93, 95-99, 101, 103, 104, 106-113, 115, 116, 118-120, 123), six used "food security" (72, 94, 102, 105, 117, 122), and five used both (75, 83, 100, 114, 121).

Table 2. Description of the 46 studies included.

Variable	Total- N
Total- N	46
Country in which study was conducted	
America	23
USA	19
Canada	2
Trinidad and Tobago	1
Peru	1
Asia	11
Bangladesh	4
China	1
Gulf Cooperation Council countries	1
Israel	2
Singapore	1
Malaysia	1
Iraq, Lebanon, Turkey, Jordan, and Syria	1
Africa	6
Rwanda	1

South Africa	2
Uganda	2
Ethiopia	1
Europe	4
Switzerland	1
United Kingdom	2
Netherlands	1
Oceania	2
Australia	2
Year published	
2020	9
2021	14
2022	23
Publication type	
Original research	37
Qualitative design	9
Quantitative design	16
Mixed design	12
Commentary	4
Viewpoint	1
Opinion piece	1
Literature search	2
Letter to the editor	1

Among the 46 studies included in this scoping review (72-75, 82-123), half of them were conducted in America (75, 82, 83, 88, 92,

93, 95, 98-104, 109, 110, 112, 114-116, 119-121), 11 studies were conducted in Asia (74, 84, 86, 87, 89, 94, 96, 97, 105, 107, 123), and 6 studies were conducted in Africa (72, 90, 91, 108, 117, 122). Only four of the studies were conducted in Europe, and two in Oceania (106, 111).

Eight studies (83, 84, 86, 87, 89, 96, 105, 123) were focused exclusively on migrants from Asia (China, Bangladesh, India, Myanmar, Pakistan, and Syria). Eight papers included exclusively African migrants (from Ghana, Zambia, Congo, Burundi, South Sudan, Somalia, Eritrea, Sudan, and other African countries that were not specified) (72, 75, 88, 90, 91, 97, 117, 122). Eleven studies focused exclusively on Latin American migrants (from El Salvador, Mexico, Guatemala, Venezuela, Cuba, Honduras, Puerto Rico, and other countries in Central and South America) (92, 93, 99, 101, 102, 109, 114, 115, 119-121), and two studies included migrants from Oceania (Republic of the Marshall Islands) (95, 103). Ten studies did not specify the region of origin of the migrant population (85, 94, 98, 104, 106-108, 111, 113, 116). Seven studies presented a combination of migrants from different regions (including non-EU European countries) (73, 74, 82, 100, 110, 112, 118) (Figure 3).

With regard to the categories of the migrant population, refugees and asylum seekers were studied in 20 papers (72, 85, 86, 88-90, 97, 99, 102, 105, 107, 108, 110, 112, 113, 117, 119, 122, 123).

Migrant workers were presented in five papers (74, 84, 94, 112, 118), and three papers studied international students (75, 87, 111). The sample in seven studies included migrant families (83, 92, 98, 100, 112, 120, 121), and five also included undocumented migrants (73, 90, 107, 116, 118).

Food (in)security was included in all papers, as it was a condition for inclusion. However, among the thirty-seven papers containing original research, food (in)security was the main focus in ten studies (75, 87, 92, 100, 104, 106, 111, 113, 114, 123), another ten studies focused on migrants' health and wellbeing (73, 74, 89, 108, 109, 111, 112, 116, 117, 120), and the impact of COVID-19 on living conditions was the focus in eleven studies (83-86, 98, 101-103, 105, 110, 118). Two studies focused on education during the pandemic (95, 107), and in one study, the primary outcome was the knowledge and information gathered about COVID-19 (88).

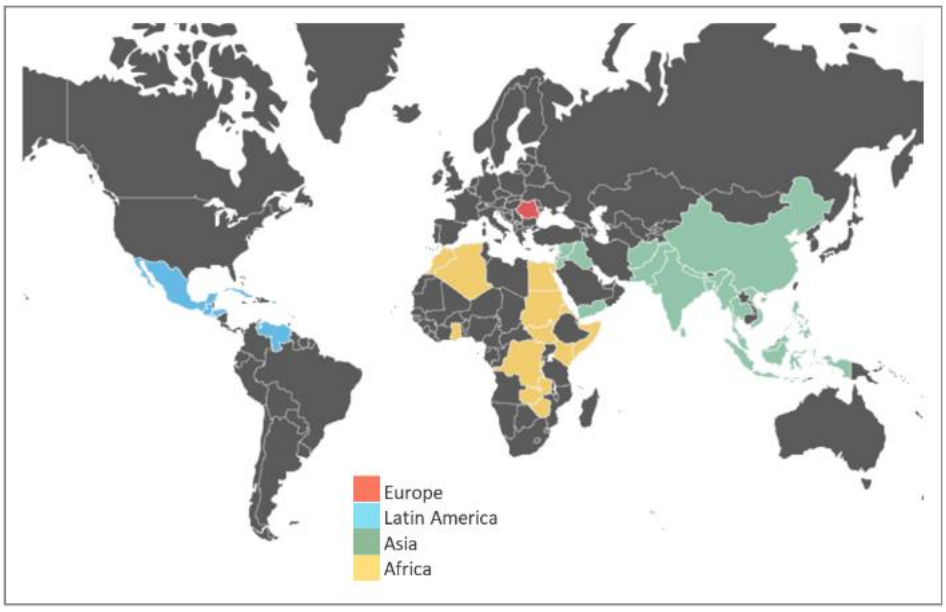

Figure 3. Country of origin of the migrant samples of the studies selected (Marshall Islands in Oceania not visible on the map).

In more than half of the studies selected (28 out of 46), food insecurity among migrants was explained by the financial hardship resulting from the COVID-19 pandemic (loss of jobs, decreased working hours, and low incomes that prevented migrants from purchasing nutritious food or forced them to adapt their diet either by skipping meals, consuming cheap, poor-quality food, and/or prioritising children's food) (73, 83-86, 88, 91, 93, 94, 96, 98, 101-104, 107, 109-111, 113-115, 117-120, 122, 123). In addition, thirteen of the studies showed that the documentation status of migrants impacted the utilisation of national food assistance (73, 82, 90-94, 111, 114-116, 118, 123), and seven studies discussed how the economic recession caused by the pandemic led to minimising the food rations served to refugees and asylum seekers in refugee camps (72, 86, 102, 105, 113, 117, 123).

The spread of the COVID-19 pandemic has negatively impacted the food security of international migrants through other paths. Five studies mentioned the unavailability of certain food items either due to a disturbed supply chain or panic buying as a consequence of the pandemic (75, 82, 85, 93, 114). Moreover, six studies described the role of food safety, which relates to the hygiene and settings in which food is prepared and served, and

health consciousness regarding the consumption of unfamiliar or low-quality food (84, 87, 91, 93, 113, 114). In addition, the closure of schools, one of the containment measures applied by many governments around the globe, was related to food insecurity in migrant households in six of the studies (88, 91, 107, 114, 115, 117). Language was also considered a barrier that may have affected the use of government assistance programmes in two of the articles selected (88, 93). Finally, 3 of the 46 studies did not describe exactly the mechanism through which the COVID-19 pandemic affected the food security of international migrants (74, 89, 95, 98, 100, 105, 106, 108, 112, 121) (Table 3).

Table 3. Link between the COVID-19 pandemic and food insecurity among international migrants.

Link between COVID-19 Pandemic and Migrants' Food (in)Security	Number of Studies
Increased financial hardship (job loss, decreased working hours, decreased income, and elevated food prices)	28
Migrants avoided utilising humanitarian food assistance due to legal residency policies and/or fear of deportation	13
Suspended/reduced humanitarian assistance	7
Lack of safe, high-quality, and/or culturally appropriate food during the pandemic affected migrants' food consumption	6
Closure of schools that offered meals for children	6
Unavailability of certain food items either due to disturbed supply chain or panic buying	5
Lack of physical access due to lockdown measures	3

Language as a barrier to access governmental programmes and food aid	2
Workers staying at home not able to access food at workplace	1
Worries of gaining weight during home quarantine (reducing physical activity) that led to skipping meals	1

Food insecurity was related to health in 26 of the 46 studies. As Table 4 shows, eighteen of the selected studies described the negative effect of food insecurity on the mental health of international migrants (72, 74, 75, 84, 87-90, 93, 102, 108, 109, 111, 112, 116-118, 120). In particular, food insecurity could be related to anxiety and depression. Eight studies showed a negative impact of food insecurity on physical health (72, 84, 85, 91, 99, 100, 122, 123). Two studies showed the negative impact of food insecurity on both mental and physical health (72, 84). At the same time, eleven studies described the effect that COVID-19's containment measures and their socioeconomic impact on the mental wellbeing of migrants rather than or in addition to studying the direct effect of food insecurity on health (73, 83, 85, 86, 90, 93, 95, 96, 101, 103, 121).

Table 4. Classification of articles by the impact of food insecurity on migrants' health during the COVID-19 pandemic.

Physical Health (8 of 46 Studies)	Mental Health (18 of 46 Studies)
• Digestive problems • Reduced immunity • Undernourishment • Vitamin deficiencies • Worsened COVID-19 infection • Long-term consequences: impairment of children's development, increased susceptibility to and morbidity of diseases • Increased children's BMI	• ***Anxiety*** due to food insecurity • ***Depression*** due to food insecurity • ***Stress*** due to lack of access to culturally preferable food • ***Sadness*** for staying hungry due to skipping poor-quality meals • ***Low self-esteem*** resulting from utilising food assistance services • ***Fear*** due to difficulty in obtaining food • ***Worries*** regarding safety of food during the pandemic • ***Somatisation*** due to anxiety for food insecurity

4. Discussion

This scoping review gives an overview of the published peer-reviewed literature on the effect of COVID-19 on food insecurity among international migrants. It covers the pandemic period up to November 2022, by which time most countries had implemented and thereafter ended the toughest containment measures.

Migrants' food insecurity was significantly exacerbated during the COVID-19 pandemic (141, 142). According to our findings, one of the major causes of this was the financial hardship

that resulted from the containment measures put in place to hinder the spread of COVID-19 and the way in which these measures precipitated an economic recession (143). Migrant populations have experienced higher job losses and decreased incomes than the majority populations in the wake of the pandemic, which eventually disrupted their access to adequate nutritious food (131, 144, 145). This finding builds upon the existing evidence that shows that migrants experienced food insecurity before the pandemic to a higher degree than non-migrants as a consequence of several socioeconomic inequalities (49). However, the studies in this scoping review show that worsening food insecurity among migrants since the start of the pandemic could not be explained by pre-COVID-19 risk factors of food insecurity or COVID-19-related income loss alone (92).

In addition to economic factors, migrants' documentation status was associated with food insecurity during the COVID-19 pandemic. Indeed, several studies in this scoping review showed that undocumented migrants had impaired access to health services as well as to government food assistance. For this group, avoiding public help was also associated with the fear of being legally exposed and then deported to their home countries. Furthermore, migrants with legal residency sometimes preferred not to use food aid because of the regulations in some host countries that prevent migrants from having legal permanent

residence if they benefit from certain national assistance. This made migrants avoid other relief programmes that help mitigate the impact of the pandemic even if they were eligible for them (146, 147). Thus, the legal determinants of health seem to also apply to further endangering the food security of those migrants who are most vulnerable (148).

As shown in some studies, the closure of schools during the pandemic worsened the situation of food insecurity among migrant households. Before the pandemic, migrant children used to have cooked meals in their schools, which helped them to maintain their minimum nutritional requirements. However, during the COVID-19 pandemic, children stayed at home and lost out on school meals, increasing the food insecurity burden for migrant schoolchildren and their families (149). These results are consistent with a study in the United States that reports that more than 1.15 billion school meals were missed between March and May 2020 alone (150). In addition, a considerable number of studies have discussed the effect of other containment measures, such as closed borders and travel bans, in producing a scarcity of migrant workers on farms and in food production and the ways in which this precipitated global food insecurity (59, 61). However, such studies have been excluded from this scoping review, as they did not describe the direct effect of food insecurity on migrants themselves.

Food insecurity and mental health problems can reinforce each other (32, 151). Almost a third of the studies in this scoping review focused on migrants' psychological disorders that emerged as a consequence of experiencing food insecurity during the pandemic. These studies revealed a range of symptoms, from sadness and psychological distress to depression and anxiety. This is in line with Nagata et al., who illustrated how food insecurity during the COVID-19 pandemic is associated with poor mental health (152). At the same time, evidence showed mental health deterioration during the COVID-19 lockdown because of social distancing, reduced social support, financial insecurity, and worries related to health and COVID-19 infection (142, 153, 154).

Some of the papers in this scoping review reported on the impact the pandemic has had on the physical health of migrants because of the lack of a balanced and nutritious diet. The literature shows that food-insecure people have a higher risk of infections due to low immunity (155). In addition, Gowda et al. found that over time, food insecurity was associated with two forms of malnutrition: obesity and undernutrition (156). Moreover, other studies have shown that children living in food-insecure households have about three times higher odds of developing iron deficiency anaemia than those residing in food-secure households and are frequently prone to infections that hinder their normal growth and development (22, 157). Although we have not found

literature on food insecurity and health specific to migrants before the COVID-19 pandemic, we can infer that if food insecurity among migrants increases, their health problems will also increase.

It is noteworthy that of the several hundred thousand peer-reviewed papers related to COVID-19 published during the pandemic, only a few articles discussed how COVID-19 impacted the food security of international migrants. Furthermore, only four of the studies in this scoping review were carried out in European countries, revealing a lack of research awareness on this subject and a disregard of the fact that food insecurity among migrants is also increasing in high-income countries such as Norway (158). Based on the food security framework used in this study, we have found several gaps in the research and in knowledge. First, only two studies focused on national/regional levels and on contextual/underlying conditions. Second, few studies connected food security and the health status of migrants. Last, food security was not always the primary outcome or explanatory factor and was measured with different instruments, often non-comparable and poorly described. Addressing these gaps would help to identify factors at all levels and to understand their connections. This is crucial in order to make comparisons and implement policies and interventions.

With regard to the recommendations in the field of research on migration and health (159), although definitions and

classifications of migrant groups were incomplete or omitted in some of the studies selected, most of the migrants presented in the studies included in this scoping review belong to groups in very vulnerable situations: refugees and asylum seekers, undocumented migrants, and precarious migrant workers. Based on the existing evidence, different migrant workers, not only those in precarious situations, have experienced the loss of jobs and/or decreasing wages affecting their health and living conditions (126, 160). More focus is needed on the impact that COVID-19 has had on the health and food security status of different types of international migrant workers in different countries.

This scoping review has some limitations. First, because it includes only studies written in English, it is possible that many relevant national and international studies in other languages have been missed. Further, papers that do not describe the direct association between the pandemic and food insecurity with regard to migrants themselves were excluded, which led us to ignore valuable information on how COVID-19 disturbed general food supply chains and the food production process, which exacerbated food insecurity in general. The papers obtained in our search were heterogeneous in terms of definitions (often using food security and insecurity interchangeably) and design and method, which made creating comparisons and finding common topics challenging. However, four different databases were used for the

search, making our scoping review comprehensive and multidisciplinary. Lastly, by setting our results in light of a food security framework and the recommendations for research in the research field of migrant health, we have suggested some gaps in the literature in terms of the volume of literature, migrant-related factors that are covered, and the description and instrumentalisation of food insecurity as the main outcome or explaining factor. However, a scoping review gives some indications of the research published but does not cover all literature. Nevertheless, we acknowledge our scoping review's limitations in detecting all literature and appreciate that other ways of looking for gaps might be more relevant.

5. Conclusions

Migrants have been overrepresented in COVID-19 statistics, and the spread of the pandemic has also vastly increased food insecurity among international migrants through financial, legal, and other pathways. Food insecurity has probably further worsened migrants' physical and mental health, exacerbating pre-existing inequities in health. However, very few scientific papers describe this situation, and most studies have been conducted on only two continents and included migrants from few countries of origin. Therefore, authorities in all destination countries should put more attention and effort into ensuring nutrition security for

different types of migrants in a holistic way, including their economic and legal integration, to be better prepared to contain health crises and epidemics in the future.

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Annexes

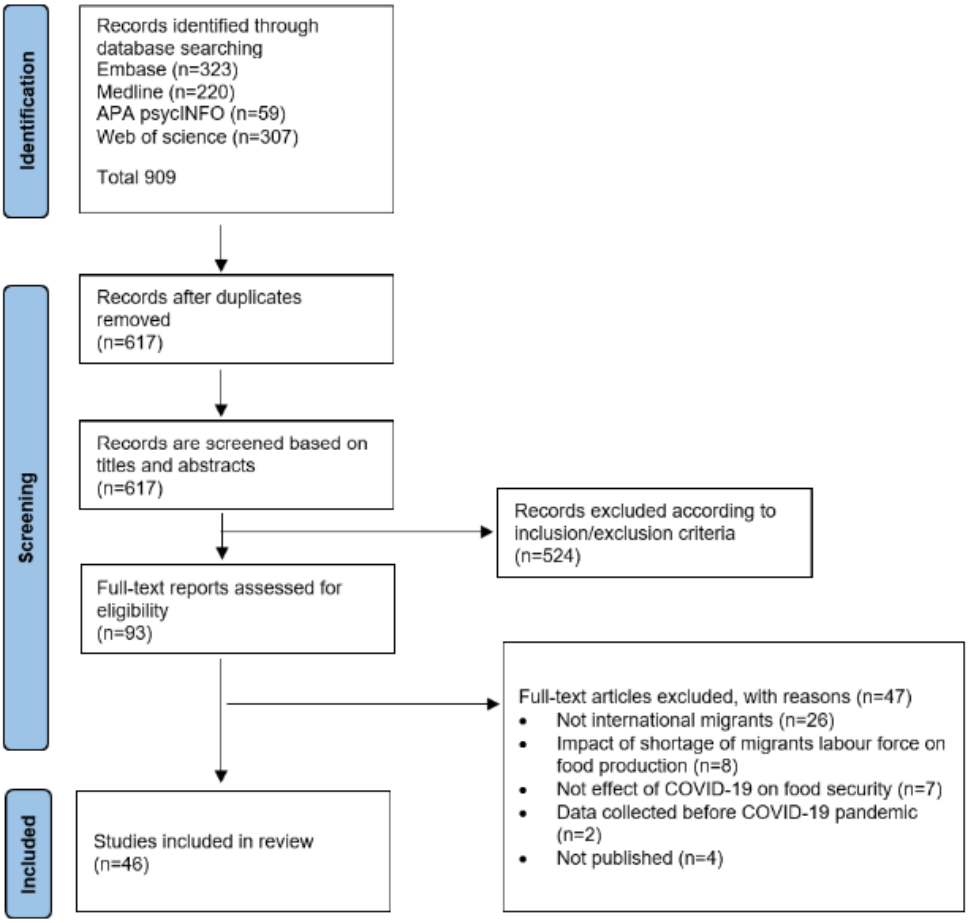
Annex 1: IJERPH guidelines

IJERPH _ Instructions for Authors.pdf

Annex 2: PRISMA-ScR checklist

PRISMA-ScR-Fillable-Checklist PDF.pdf

Annex 3: PRISMA flowchart



Annex 4: the scientific paper

the scientific paper PDF.pdf