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## Review Article

### IMPACT OF VIRAL OUTBREAK COVID-19 ON FOOD SECURITY AND RELATED ECONOMIC CONSEQUENCES

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## ABSTRACT

Globally, both in developing and developed countries due to the COVID-19 pandemic, there is a loss of income, many people ran out of livelihood, a change in the food environment occurred, social inequalities formed, country's economy declined, food prices increased, which in return affected the food security and nutrition of the affected countries badly. COVID-19 impacted food security by causing a disturbance in food supply chains, global economic decline, and income losses. It also broadened social inequalities, caused disturbance to social protection programs, transformed the food environs, and increased the localized food expenses. The consequences of COVID-19 on food security include trade restrictions, hunger, unemployment, maternal and child health, and household food insecurity. Thus, to overcome the negative effects on COVID-19 or any other future crisis, every country needs to improve its food system and should achieve sustainable millennium goals.

**Keywords:** COVID-19, Viral infection, food security, economy, food safety.

## 1. INTRODUCTION

Agriculture is a major sector of global economy. Agriculture is very important to food security and sustainable human development (Lopez-Riduara, 2019). Food and agriculture organization has estimated that 60% survival of world population depends on agriculture (Zavatta, 2014). Due to COVID-19 the world trade has been decreased by 13% to 22% (WTO, 2020). Various sectors of agriculture such as crop, livestock and fishery have been affect by pandemic. Coronavirus (COVID-19) is a novel coronavirus SARS-CoV-2. SARS pandemic had occurred in November 2002 and its novel form COVID-19 first case was observed in December 2019 (Wuhan, China). On 11<sup>th</sup> March 2020, it was declared a pandemic by WHO (Jamir). COVID-19 is an infectious disease, transmitting from one person to another and one infected person can infect six other persons on average. It has a lesser mortality rate than SARS but is highly contagious (Seleiman, Selim, Alhammad, Alharbi, & Juliatti, 2020). A person with COVID-19 positive is at higher risk of mortality if he does not get treatment on time (Jamir). The COVID-19 pandemic impacts are not only related to health but has extended to food security by a disturbance in local and national food system and economics (Béné, 2020). Pandemic has imposed major threats to food availability and stability (Laborde,

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Martin, Swinnen, & Vos, 2020). Access to food has been threatened by a rise in food prices comparative to wages (Devereux, Béné, & Hoddinott, 2020). The effects of covid-19 had caused massive destruction to food resources especially the under developed countries have faced many challenges as curtailing food resources have created much malnutrition and poverty among these regions. Moreover, those regions who had limited resources had increased the prices of food products to such a high rate that inflation has caused burden to a huge population in all areas of world (Bene et al. 2021). Food security refers to availability and accessibility of sufficient amounts of nutritious food in consistent manner. As the world economy has been disturbed due to decrease of world trade the food supply chain and production has been affected at large. The most vulnerable ones by this food insecurity raised due to COVID-19 are those facing massive poverty and highly populated areas (FAO, 2020). Currently, 113 million are facing acute severe insecurity and 820 million people are suffering from chronic hunger (FAO, 2019). A recent forecast of the world bank shows that pandemic is expected to thrust 49 million people into extreme poverty in 2020 globally (Amare, Abay, Tiberti, & Chamberlin, 2020). The food supply system is experiencing many difficulties to attain food security. This pandemic has threatened food security globally in the form of lockdowns, rising food inflation, economic decline and food trade restrictions (Erokhin & Gao, 2020). World Bank forecasts that the economy will be reduced by more than 5% globally this year, which lead to a massive contraction in economic activities since World War II (Swinnen & McDermott, 2020).

## **2. COVID-19**

It is estimated that the human population will increase to 10 billion in 2050 and the demand for safe and continuous food will be of great

concern. As the food demand has increased, the emergence of zoonotic disease is also occurring at hastening rate. WHO has estimated that about 75% of new emerging infectious diseases are due to zoonotic infection from animals to humans. Agricultural drivers are at greater risk of zoonotic infection. About 50% of agricultural drivers' infectious diseases are due to zoonotic infection. The risk of zoonotic infections has been increased due to close contact of humans and animals in maintaining the animal livestock production. Infection is transmitted through direct contact with the infected animal during handling or slaughtering or consumption of uncooked meat and animal products and contaminated food and water. The zoonotic disease can be of viral, bacterial, or parasitic nature. In all well-known viral infections, SARS (severe acute respiratory syndrome) coronavirus is the largest viral infection which contributes to a high death rate in both humans and animals. SARS first outbreak had occurred in November 2002 in southern China. After the infectious SARS disease outbreak, it was predicted that in near future such a pandemic will be of global concern (Galanakis, 2020). Coronavirus (COVID-19) caused by novel coronavirus SARS-CoV-2 is an infectious disease that is easily transmitted from person to person and its first case was identified in December 2019 and was declared a pandemic by WHO on 11<sup>th</sup> March 2020(Jamir). The origin of the virus is still a myth to the world and there is no evidence to prove from where it has made a home in the human, but experts believed that such type of new strains of the virus have developed in bats or pangolins (Kashanatti & Sabanna). The first infection was linked (no confirming evidence is present) to the Huanan seafood market (Wuhan, China). Technology has shown that gene sequence up to 96.2% suggested bats as a possible source of SARS-CoV-2 (Galanakis, 2020).

World health organization 2020(WHO) has compared the mortality rate of pandemic virus SARS (9.6%) and the present level of mortality of SARS-CoV-2 is lower (5-7%) than SARS, however, it is a highly contagious and infectious disease transmitted from person to person and one infected person can infect six persons on average. On the 8<sup>th</sup> of May 2020, COVID-19 caused about 9.0M confirmed cases and 276216 deaths globally. It means that death occurrence is about 6-9% of total confirmed cases. Contrary to this, the number of recovered cases on the same date was 1385184 representing about 34.5% of total positive confirmed cases (Seleiman, Selim, Alhammad, Alharbi, & Juliatti, 2020). Coronavirus is transmitted via respiratory droplets of an infected person or by direct contact with virus-contaminated surfaces (Ma et al., 2020). The symptoms of COVID 19 appear differently in every individual but commonly reported are flu like symptoms which appear 5-6 days after exposure to the virus and the symptoms include coughing, sore throat, fever, muscle and body aches, and loss of smell and taste in some cases (Galanakis, 2020). A person who is suffering from COVID-19 is at higher risk of mortality if not treated on time. According to statistical data released by WHO, there are more than 213 countries and territories worldwide being affected by the coronavirus. Vaccine development has been an important task to curtail this pandemic and now as global population is getting vaccinated many parts of world are considered safe to travel and transport upon clearance of vaccination (Jamir, 2020).

### **3. FOOD SECURITY**

In the 1970s, the concept of food security was developed and it is estimated that about 200 definitions and 450 indicators of food security exist. Food has an important role in human basic and vital activities. It is believed by experts that the food issue may surge into an international food crisis during the life of

the modern generation (Mechlem, 2004). As the COVID has impacted livelihoods of people so does their reach to food and nutrition stability. Today we see food and nutrition security is connected to family's financial resources which is an ongoing issue in both developed and underdeveloped countries due to viral pandemic. (Jaime, 2020). The governments of all countries should ensure that each individual of their state is meeting its nutritional needs and able to survive this horrific pandemic (Klimova, 2020).

The State of Food Insecurity 2001 defines food security as:

“A situation that exists when all people at all times have social, economic and physical access to safe, sufficient and nutritious food that meets their food preferences and dietary needs for an active and healthy life” (Chen & Kates, 1994).

Four main measures of food security are discussed here:

#### ***3.1 Availability:***

This puts light on the quality, quantity, and variety of food that is available for the people(Klimova, 2020). The current level of food production, release from food stocks within a country, and uses of food other than human consumption determine the availability of food(Chen & Kates, 1994).

#### ***3.2 Access:***

This is an indicator of physical accessibility and infrastructure and economic affordability. Economic affordability is characterized by a domestic food price index (Klimova, 2020).

#### ***3.3 Stability:***

Stability is a temporary measure of food security and is measured by various

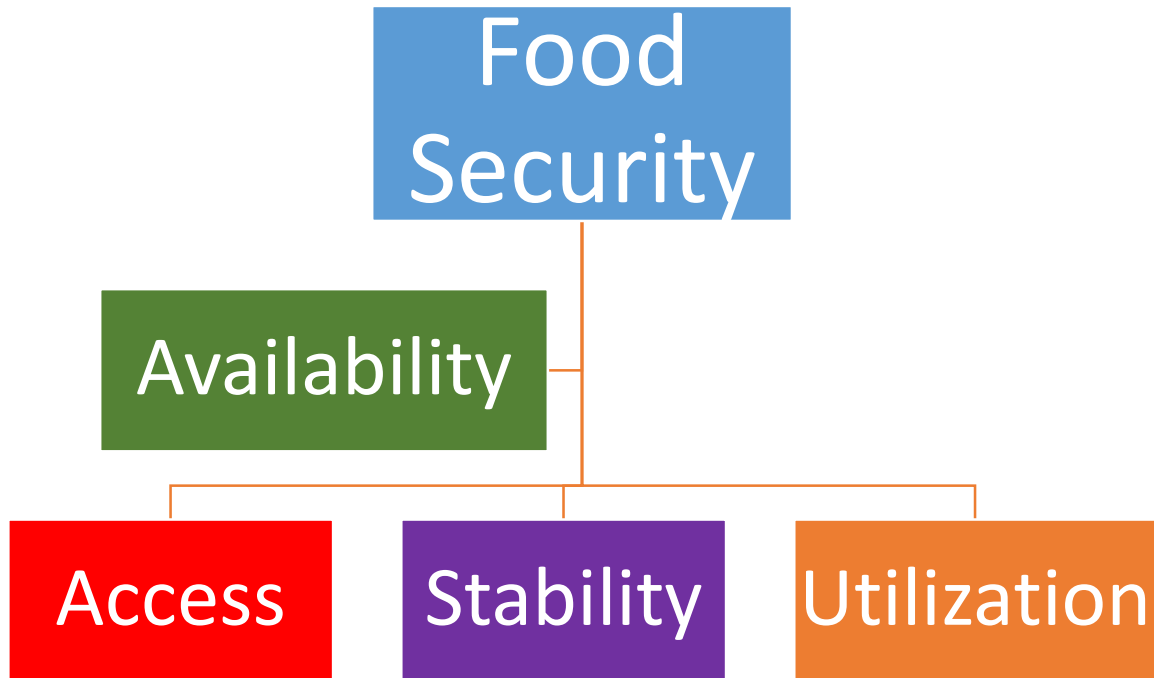


Figure 1. Food Security and related factors to food security.

indicators that define risk factors and periodic upheavals. Periodic upheavals can be political instability, fluctuations in the food supply at the domestic level, etc. (Klimova, 2020).

### 3.4 Utilization:

It is measured by variables that determine food utilization by the human body (Klimova, 2020). This is also a measure of individual food security (Chen & Kates, 1994).

## 4. Impact of COVID-19 on Food Security

The COVID-19 greatly affected the four main pillars of food security; (1) availability, (2) accessibility, (3) stability, and (4) utilization due to quarantine and lockdown imposed by different countries (Mouloudj, Bouarar, & Fechit, 2020).

### 4.1 Effect of COVID-19 on food security and nutrition

A respiratory disease, COVID-19 has no evidence that it is caused by food

transmission (ICMSF, 2020) but, the spread of this viral disease has a great impact on nutrition and food security. The pervasive arrival of COVID-19 is a major factor in the run out of household money and supplies of food. At the universal level, the Committee on World Food Security has made a report that these types of crises are affecting the food scheme no stop by this time and have unknown impacts on food supply and its demand (Himelein, K., & Kastelic, J. G. 2015). A review study was made in 2019 in which it was stated that 50% of infectious diseases are caused by pathogens engulfed along with diet contaminated with sprays and other chemicals applied to crops (Rohr, J. R. et al., 2019). The emerging diseases caused by agriculture are H5N1- Asian Avian Influenza, H5N2, multiple Swine Flu variants (H1N1, H1N2), Ebola, Campylobacter, Nipah virus, Q fever, hepatitis E, Salmonella enteritidis, and foot-and-mouth disease. The Novel Coronavirus is also included in these types of pathogens and is causing havoc.

#### ***4.2 Dynamics unchecked by the pandemic affecting food security:***

The pandemic outbreaks are affecting the total hidden costs of the modern food system implemented on humans and the environment (Himelein, K., & Kastelic, J. G. 2015). During the outbreak of transmissible diseases like during the lock-down in the time of COVID-19, the food system remained a social determining factor of public health including low-quality foods (Rohr, J. R. et al., 2019; & World Bank Group. 2014). During the pandemic, there were missed meals that affected health-related food insecurity such as fatigue. The other food insecurity is reduced immune system due to missed meals in the pandemic. This reduced immune system increased the risk to attain communicable diseases. The short term food insecurity can also cause long terms of poor health effects such as physical, emotional, and psychological problems. There will be a high risk for the children belonging to the socioeconomically low status who are already poor in health and academics due to poor food during pandemics (World Bank Group. 2014). There is a loss of income, run out of livelihood, flaring of inequality, change in the food environment, and increased food price due to the pandemic (Klassen and Murphy, 2020; Laborde et al., 2020; Clapp and Moseley, 2020).

#### ***4.3 Disturbance of supply chains:***

During lockdown there have been many disturbances in food supply chains which have affected availability, pricing and quality of food (Barrett, 2020). There has been a steep decline in the sale and demand of a foods such as dairy products, potatoes, and fresh fruits which are perishable. Moreover, specialty items such as chocolate and some high-value slices of meat due to the closure of restaurants and other foodservice facilities have also decreased in this situation (Lewis, 2020; Terazono and Munshi, 2020). In May and June, during the lockdown, it was

reported that food is dumped due to the zero demand in markets (Yaffe-Bellany and Corkery, 2020). Labor-rigorous production of food is particularly affected by COVID-19 among food system workers, who facade obstructions in traveling and who often work in overcrowded conditions in farms that have had to close momentarily to enclose outbreaks (Haley et al., 2020).

#### ***4.4 Decline in global economic and income losses:***

Due to COVID-19 daily livelihoods and source of earning on a global gauge created a global economic collapse (World Bank, 2020a). There is a fall in buying power for those people who have lost their jobs and have no income. This is an influence on food security and nutrition. As per the report, the decline in economic rate during the second pandemic is elaborated in the graph chart.

Table.1 Economic decline trend in different countries due to COVID-19.

<b>COUNTRY</b>	<b>Percentage Decline of GDP relative to the same quarter in 2019</b>
UK	-21.7%
France	-19%
Canada	-13.5%
Singapore	-13.2%
Germany	-11.7%
United States	-9.5%
Israel	-7.8%
Indonesia	-5.4%
South Korea	-3%
Taiwan	-0.6%

#### ***4.5 Broadening social inequities:***

The dead slow global economic pandemic has triggered societal discriminations in many countries (Ashford et al., 2020). These discriminations are severely disturbing moralities as well as excess to basic requirements like food, drinking water, health facilities, and contact to jobs, all of these have consequences for food safety and nutrition. Food insecurity is more crucial for those who are suffering from COVID-19 or already are discriminated against in poverty (Klassen and Murphy, 2020). According to the report of WHO, one in three people has a shortage of safe drinking water and simple hand-washing accommodations (WHO, 2020b). There are many workers in systems of food chains who are facing unhealthy work environments. These people are paid very low and have been made worse with COVID-19 (Klassen and Murphy, 2020).

Gender inequities are also aggravated by these crises, such as women have faced extra encumbrances during COVID-19—as forefront health caretakers and food system staffs, no paid care work, public exertion, that has been amplified during lockdowns (McLaren et al., 2020; Power, 2020). The gender element is significant because women, in their care and giving parts for the sickening, children, and the aging, are comparatively at higher threat of introduction to COVID-19 (Moseley, 2020).

#### ***4.6 Disturbances to social safety programs:***

Social protection programs have been disturbed due to the epidemic, which resultantly affected food security and nutrition. For example, during lockdown schools were closed so school meal programs were lost in both types of countries low income or high-income communities. In the report of WFP, it is elaborated that 370 million kids lost their school meals during the pandemic (WFP, 2020a).

#### ***4.7 Alteration in food environments:***

When the COVID-19 pandemic was unfolded, several countries locked down casual food arcades, which were supposed to be spaces of disease transmission by the governments (Battersby, 2020). In developing countries, informal food markets are of great value for food and source of income (Young and Crush, 2019). An interesting view was observed in South Africa where a formal food outlet was kept open, which sell processed and packaged foods while open-air shops were closed which sell more fresh fruits and vegetables. It was due to the reason that open-air outlets were not safe in terms of person to person transmission (Moseley and Battersby, 2020).

#### ***4.8 Increase in localized food price:***

Globally the prices for food and food products fell during the early lockdown, for instance, the prices of dairy products, fruits, vegetables, sugar, and meat were low while cereals remained the same. But when the pandemic and lockdown extended the price of meat increased. It was due to the reason that workers in meat plants experienced a greater health crisis so meat plants were shut down resultantly an increase in its price (Waltenburg et al., 2020; EFFAT, 2020). There has been a continuous rise in prices especially for the countries that import foods (Espitia et al., 2020). Venezuela and Guyana experienced an increase in food cost of approximately 50% as of late July 2020, while in Kenya food price raised only 2.6 percent (FAO, 2020c). Another reason for the rise in food prices is due to the disturbance in food supply chains resulted from the closure of shipping (FAO, 2020c).

### **5. Implications of dimensions of food security**

The above-mentioned dynamics have an impact on food security and nutrition in multifaceted ways. There are some dimensions reported by HLPE Global

Narrative for food security (HLPE, 2020b). These dimensions have been affected by COVID-19.

### **5.1 Availability:**

The stock of grain was high in the early pandemic but shifted over time. The grain supply chain is vulnerable to COVID-19 impacts due to the labor intensiveness.

### **5.2 Access:**

From all of the other dimensions of food safety, food availability has possibly the most affected by the COVID-19 disaster. The pandemic and crisis to livelihood left low or no access to food especially for daily wages people (Gerard et al., 2020). There were no safety nets in underdeveloped or developing countries because they have nothing to spend on safety, besides, to feed their children during COVID-19. This resulted in more deaths, deaths (Moseley and Battersby, 2020).

### **5.3 Utilization:**

The human immune system is triggered by good nutrition and it reduces the risk of infections. However, there was little ability to access food for people in the crisis, they cannot afford a balance diet (FAO et al., 2020). This factor is more contributing to poor countries where a higher proportion (50-80%) of income is spent only on food (FAO, 2011).

### **5.4 Stability:**

The extreme disturbance in food supply chains is affecting the constancy of world-wide food supply and access (Bene, 2020). The limitations in the export and import of staple food such as wheat and rice have led to high rates as compared to non-staple foods (FAO, 2020c). Though several of COVID-19 food shipment limitations were momentary, the hazard leftovers that nations may execute new trade limitations (Espitia et al., 2020).

### **5.5 Agency:**

As food producers and workers were at the front line and they suffered at greater rates of infectious disease and resultantly influenced the supply chain disturbance. The defeat of jobs adversely affected the agencies. Mostly youth and women experienced such conditions which limit their agency (FAO, 2020b).

### **5.6 Sustainability:**

The epidemic is entangled with the sustainability of food supply and security in multifarious means. The development of industrial agriculture is related to a growing frequency of zoonoses—infections that diffuse from animals to humans—of which COVID-19 is a major example (Everard et al., 2020). When the disease started to spread some lockdowns resulted in the wastage of food due to the closure of restaurants and markets (Sharma et al., 2020). There was an upsurge in the usage of plastic food wrapping and carrier bags during pandemics which are not simply reused (Vanapalli et al., 2020).

## **6. Consequences**

Following are the consequences of covid19 on food security. These consequences are interlinked and affect each other.

### **6.1 Trade restrictions:**

Production can move from surplus area to deficit area by trade, which avoids sharp shortage and food insecurity which is related to the only dependence on local production (Glauber, Laborde, Martin, & Vos, 2020). Export restrictions were imposed on staple foods, especially rice and wheat, by many major producing countries, during the food crises in 2008 and 2010, which resulted in high market prices. Even though national interest may be profited by such restrictions in near future, supply to world markets was reduced, setting pressure on world prices.

March 2020, this issue reemerged and export limitations were imposed by 21 countries by July 6th, which comprises the caloric value of worldwide traded food by almost 4% (Laborde, Martin, Swinnen, & Vos, 2020). For example, until April 15, exports of various cereal products, oilseeds, and vegetables were banned by Kazakhstan. By the end of March, rice export certificates were not permitted by Viet Nam while the country examines local inventories (Glauber et al., 2020). Accessibility of food stocks may be interrupted to a definite degree as restrictions begin, hampering export and import. Countries should make sure that they have sustainable food stocks to fulfill market demands. The limited number of workers leads to delayed harvesting and thus late planting of crops for uninterrupted supply. Accessibility to food chains is further influenced by these that could affect dietary recommendations and nutrition (Ma et al., 2020).

### **6.2 Hunger:**

According to estimates of the UN World Food Program, the number of people experiencing hunger may be doubled to nearly a quarter of a billion due to the disturbances caused by COVID-19 ("Food in a time of COVID-19," 2020). The Global Nutrition Report states that 1 in 9 people are hungry. In 2018, 149 million children were stunted and 7.3% were wasted of almost a quarter of the world's children younger than 5 years. Food insecurity was caused by armed conflict which disturbs trade and agriculture, hinders supply chains, and induces mass population migration, by the global report on food crises. Transportation of products and livestock to markets are disrupted regularly by lockdown limitations and that rice importation is also hindered which was for covering the shortage, leading to high prices for staple foods. Lastly, the purchasing power of numerous families who were on edge of

poverty is further limited by wage losses which occur due to government imposed shelter-in-place orders. According to the Global Report on food crises, in 2019, 135 million people were food insecure, but WFP estimates show that number could double in 2020 to 265 million due to economic effects and supply chain disturbances linked with COVID-19 (The Lancet Global, 2020). Reports from South Africa and other lower-income countries indicate that people are more scared of dying of hunger than pandemic which is explicable as millions of families are forced into utmost poverty, restricting their buying capacity for chief foods and food systems in these countries are incapacitated and not stable, so more liable to be affected by COVID-19 (Pérez-Escamilla, Cunningham, & Moran, 2020).

### **6.3 Unemployment:**

Besides health, COVID-19 has been linked with many worldwide serious issues, among which unemployment is one of them. Lockdown and transport restrictions are the reasons for unemployment and food insecurity. Mainly farmers, poor families, and lower-income countries are affected by it. Disturbances in major food systems were caused by extreme poverty, trade limitations, and labor migration and unemployment. For instance, in the United States, thousands of families suffered food insecurity due to wage loss and severe unemployment and were on the waiting list at emergency food distribution centers. Without having access to any social protection to aid them during the crises, many of them lost their financial sources due to COVID-19-linked limitations (Pérez-Escamilla et al., 2020).

### **6.4 Maternal and Child Health:**

Vulnerable groups: young children, pregnant and lactating women are estimated to be severely affected by the pandemic, among which the significant decline in food security



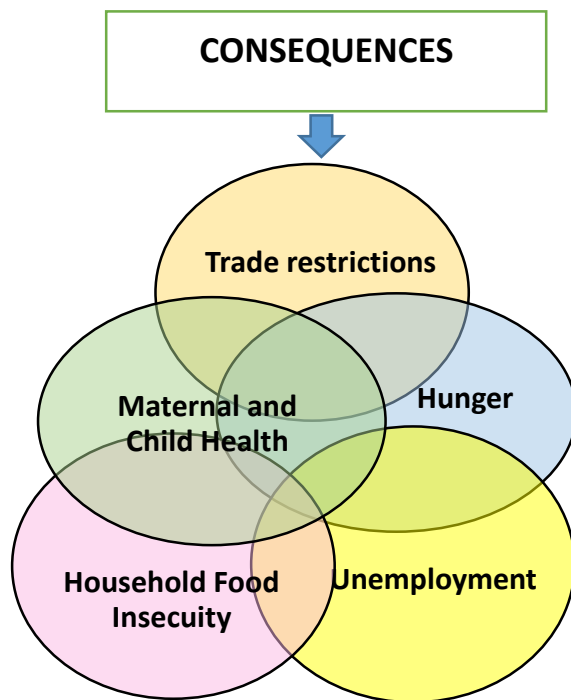


Figure 1.2 Consequences of food insecurity on global scale.

is one of the reasons. During COVID-19, in low and middle-income countries, increasing data of great risk for disturbances in “maternal, newborn and child health services (MNCH)” is worrisome. The reason may be concerns associated with pursuing health care, but can also be because of transportation restrictions. Also, the limited provision of health services as pandemic got attention (Pérez-Escamilla et al., 2020). The effects of food insecurity and COVID-19 related health system interruptions may be endured by women and notably children. Timothy Robertson, in an article in “The Lancet Global Health”, in 118 low and middle-income countries, states the impacts of these disturbances on maternal and below-5 child mortality. They evaluate that 42,240 additional child mortality and 2030 additional maternal mortality per month could be the result of a minor decline in coverage and use of health services (The Lancet Global, 2020). Poor performance, emotional and nutritional outcomes are the essential consequences of short-term food insecurity on children’s health. Obesity is also related to food insecurity among children, as long-term outcomes for chronic

disease morbidity (Kinsey, Kinsey, & Rundle, 2020).

### **6.5 Household Food Insecurity:**

Worldwide data reveals that the rise in food insecurity would be a significant public health issue as caregiver psychology is drastically affected by household food insecurity and in turn, as young children can't get the nurturing care they need, harms of early child development result. Child internalization and externalization problems, behavioral problems, poor academic performance, and cognitive problems are the outcomes of HFI in early life, once the child becomes school age. Family chaos and partner violence are linked with HFI and substandard infant feeding practices may be related to HFI. Chance of infectious diseases and chronic undernutrition in children, maternal anemia, obesity, and development of NCDs (as type II diabetes) are raised by HFI, which are risk factors for reduced prognosis in COVID-19 patients (Pérez-Escamilla et al., 2020).

The worldwide impact of COVID-19 on food security led to several consequences. First import and export restriction that affects the

consumption of quality food. Second, hunger, in 2020 due to economic effects and food supply chain disturbance, the number of food-insecure people will be doubled. Third, unemployment, due to quarantine, lockdown, transport limitation, social distancing, and reducing large gatherings, lead to poverty and hunger in low-income countries (Blustein et al., 2020). Fourth, household food insecurity largely affects the house food environment and child feeding practices (Laborde, Martin, Swinnen, & Vos, 2020). Fifth and last, child and maternal health are compromised due to transport restrictions and the poor situation of health care sectors (Gildner & Thayer, 2020).

### **7. Conclusion and recommendations:**

This study concluded that the COVID-19 pandemic affected 213 developed and developing countries and their food systems due to lockdown. The pandemic has secured several negative effects, which include tourism, agriculture, trade, and economic sectors that directly and indirectly endangered food security.

There are various dynamics unchecked by the COVID-19 pandemic, which affected nutrition and food security badly. These include: (1) the disturbance of the supply chain, which affected pricing, availability, and quality of food; (2) global economic decline and income losses, which resulted in a loss of jobs, livelihood, loss of purchasing power, and source of global earning; (3) broadening social inequities, which led to discrimination and deprivation of basic needs especially to those who are already facing poverty; (4) alteration in food environments resulted in the opening of a formal and informal food market; (5) increase in localized food price, during the early lockdown, the prices were low and gradually increased in some countries.

Every affected country needs to take immediate measures for the betterment of the food system and supply chains worldwide and at the domestic level. To reduce the

negative impact of the COVID-19 pandemic, every vulnerable, developing, and the poor country needs to strengthen the global and local food system and progress towards achieving the Sustainable Development Goals (Mardones et al., 2020). To target future shocks just like COVID-19 one should adopt risk-based approaches to improve food security and food supply chains. Moreover, this pandemic is a wake-up call for all the countries to restructure, review, and rethink the food systems, which are feasible, secure, healthy, and beneficial to all populations.

### **8. Author contribution:**

Sharjeel Khawar gathered the data and compiled the first draft.

Dr. Raheel Suleman has made outline of this article and helped in scientifically writing this article with Sharjeel. Prof. Saeed Akhtar has supervised the study by improving the draft with scientific editing. Dr. Muhammad Riaz and Dr. Tariq Ismail have critically revised the entire article. Dr. Amir Ismail and Dr. Aneela Hameed have helped in table and figure formation with suggestions and modification in design of figures and tables.

### **9. Conflict of Interest:**

Authors declare no conflict of interest.

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