

Worldwide Impact of Covid-19 on Food Security and Farming Sector

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Abstract

Corona virus was first time reported in 2019 in Wuhan city of China. Later it was named Covid-19 and it spread out throughout almost all the regions of the world. It was declared as pandemic by World Health Organization (WHO). Restrictions related to Covid-19 such as lockdown, stay at home etc. affected several businesses including food supply and agriculture sector. There was wastage of raw materials as the processing/packaging industries were closed and the food could not be delivered to markets after proper processing. The labor or the workers couldn't reach the work place due to quarantine and social distancing and hence food security became a challenge for the growing population. This review has compiled information regarding the effects of Covid-19 issues on the food supply, processing, transportation etc. at global level. As the pandemic has threatened nutrition, safety and security of food, various recommendations and strategies have been devised to minimize the effect of the Covid-19 pandemic. This was to ensure the continuous flow of food supply in food and agricultural sector with respect to food supply chain, small farmers, government, business and actions on global trade.

Keywords: Covid-19; Food; Agriculture; Employment; Farmers; Food Supply Chain

Introduction

It's a prolong history of several fatal pandemic diseases that affect mankind globally. Pandemic of Covid-19 is not a surprise disease because several other pandemic diseases such as swine flu, Spanish flu, HIV, Ebola and polio are major realities of existing world. These pandemics not only destroyed economy of world but also cause health issues due to their unprecedented disaster. In the past, spread of disease was limited due to limited source of traveling and urbanization as it happens today [1].

In December 2019, novel corona virus which was later named as Covid-19, initially reported in Wuhan city, China [2]. At first instance Covid-19 was travelled to neighboring areas like Singapore, Japan and Thailand [3]. After six weeks it spreads quickly

to several regions of the world and became a major challenge for Europe and North America and declared as pandemic by WHO and international concern of public health emergency [4]. People were warned through different ways like social media, newspapers, public messages through Television and Radio by WHO but it failed due to lack of proper strategies for its control and it spreads quickly and become a pandemic. In addition, the interconnected living systems and globalization triggers the situation to become worst [5]. According to the report of WHO the second week of September 2020, there were more than 28 million confirmed cases along with more than 900 deaths of which America shared the greatest number, followed by Brazil, India and Russia [6]. As world became a global village, it was now obvious that all the countries will be vulnerable to this pandemic. According to a report by United Nations Sustainable

Development Goals noted that 55 percent of the population in the developing countries did not follow the instructions about the social protection. This situation created the socio-economic pressure and became worse when poor people deprived from proper food and nutrition [7].

Covid-19 restrictions such as lock down, quarantine, social distance etc. had an important impact on closure of several businesses and several industries including food industry as well. On the closure of industries initially workers were at risk of starve but if distributors and processors are infected ultimately all the people are at threat of starving [8]. Food companies faced major challenges such as shortage of income and failure in meeting the demands of retailers. The major issue was to secure the health of employees in food supply chain in time of severe crisis due to pandemic Covid-19 [9]. Food security was the most important factor for sustainable development that is totally dependent on food chain supply and the food chain supply is alternatively dependent on consumers and producers throughout the globe but unfortunately food chain supply was severely disrupted by Covid-19 pandemic [10]. In these conditions, there should be proper distribution of food chain by using supply management strategies to meet the consumer demands [11]. In this time of pandemic and crisis, consumer access to food was more important than food availability because of several imposed restriction [12]. Basically, four major issues were raised in food chain supply and food industry. Firstly, demand of food that contains several immune protecting and bioactive ingredients should be increased as people need to maintain their immune system. Secondly there are concerns for food safety for prevention of coronavirus among retailers and consumers. Thirdly, several concerns rose regarding food security. Fourthly, encounter the problems regarding food stability [14].

In addition, Covid-19 had a great impact on agricultural sector too. As most of agricultural labor are migrant workers that required in several crops harvesting [15]. As a result of lockdown and restrictions in transport system labor shortage occur specifically in those countries that rely on labor for seasonal crops. But due to pandemic conditions, many of native workers either fell ill or took care of their sick family and these issues affected fruit and vegetable production [16,17]. Ultimately, lack of required labor resulted in shortage of food in market and even higher prices of available food which was not affordable for most of the people [18].

Effect of Covid-19 pandemic on food insecurity

Food insecurity is defined as disruption of food eating pattern due to lack of resources and money. According to a survey tracking food security in the nation's capital, 13% of households are food insecure and struggle with hunger, 19% of household's experience food hardship and do not have enough food at least some of the time, and 37% of households with children struggle with food insecurity [19,20]. In 2019 approximately 135 million people faced acute food insecurity. The number of people was the highest in the year 2019 within 4 years' existence of Global Report on Food Crisis [21]. According to UN Food Program, the number of people dealing with food insecurity would nearly double at end of 2020 due to economic impacts of Covid-19 [22]. Unfortunately, pandemic poses threat to Sustainable Development Goals and especially no poverty, zero hunger and food security dependent goals will hit hard during lockdown, particularly in developing countries [23].

For better understanding three conceptual frameworks of food security analysis are used like

- FAO's four pillars approach [24].
- Food systems approach by UN Committee on World Food Security [25].
- Sen's entitlement approach [26]. Display quotations of over 40 words, or as needed.

FAO's four pillars approach

Conceptual framework of food security analysis includes four pillars i.e., availability, access, utilization, and stability [24]. At national and global level, food availability has not yet accepted to be an obvious extent. However, there are concerns in some countries regarding the restriction on food export due to pandemic. Food access is however threatened by increase in food prices than income or wages because of sudden raise of prices in early June 2020 globally [27]. Covid-19 affected stability and food access due to restrictions imposed on markets to achieve better social distancing due to which poor consumers didn't have access to supermarkets that leads towards deteriorating health due to the unavailability of food of choice [28].

Food systems approach

A food system includes several elements such as people, input, institutions, infrastructure and activities that involve production, processing and consumption of food, and their output that includes socio-economic and environmental outcomes [29]. In this

case change in one component of food system usually affects others. Production of food decreased due to illness of large number of farmers in pandemic Covid-19. Also, food production needs input in the form of seeds and fertilizers but due to restriction in transport, international shipping and closure of borders, they can't have timely access to the seeds. Mostly the farmers borrow money from financial institutions for the agricultural propagations but under Covid-19 it became difficult due to closure of financial institutions.

Sen's entitlement approach

According to this approach, food security is not only the matter of food supply, it also linked to the availability of sufficient food. There are several schemes of government for formally employed workers that will mitigate the effects during lockdown by doing work from home. But for informal sector there is no pay protection scheme, as a result their income dropped out [28].

Effects of Covid-19 pandemic on food supply chain management

Food supply chain is divided into five stages i.e., agricultural production, postharvest handling, processing, distribution and consumption. Covid-19 affected each of these in one or another way like border restrictions, lock down, lack of labour and transportation hindrance. Regarding quality and safety, two systems are being used in food supply chain. One relies on standards to be checked by state agencies and other on standards defined by markets [30]. Covid-19 didn't spread directly by livestock and agriculture but due to pandemic, certain concerns such as government applied restrictions in agricultural sector too [31]. Seasonal employment is common in developing as well as under developing countries but because of certain restrictions on travelling due to illness in Covid-19 pandemic, local or migrant workers linked with food business are unable to work which ultimately affects the supply chain of food [32]. However, labor shortage because of border controls between different countries causes most disruption in several food and plantation sectors [33]. Consequently, due to the need of appropriate social distance during food production disrupts food delivery and hinders the transport to the markets [34].

There were many reports that due to restrictions farmers were forced to destroy their products. Dairy Farmers in America Co-operative dumped 14 million liters of milk every day due to interrupted supply chain. In England, dairy farmers reported that 5 million

liters of milk was at risk in one week approximately. It was reported that tea plants were being lost because of the logistical challenges in India [35]. Therefore, sustaining logistical proficiency is a crucial factor for the food industry, especially in the global crisis.

Since most of the food production processes depends on a proper schedule and all the stages of food supply chain are connected but if a problem arises in one stage or its delayed then there will be a huge loss of yield [36]. The major issues faced during pandemic are obtaining the raw materials from suppliers and due to border restrictions that cause the disruption in food flow from producers to consumers [37]. As a result, all these problems in the agriculture system affect the food quality, food freshness and reducing affordability of food in supermarkets [36]. Food sector products are divided into staple food such as wheat, rice, maize etc. and high-quality products such as fruits and vegetables. Restrictions within provinces, cities and countries affect the distribution of staple food and huge number of labor is required for high quality food production [32,38].

In addition to producers and consumers, supply chain also affects the food plants. Production process in many food plants is reduced or even temporarily stopped because most of the farmers fell ill with pandemic or some are resistant to come at work due to the fear of disease contact [32]. Covid-19 affected 462 meat packaging, 93 farm and production facilities and 257 food-processing plants in the United States. At least 54,036 workers (39,905 meat packaging workers, 8,343 food-processing workers, and 5,788 farmers) were detected as Covid-19 positive and at least 232 workers (184 meat packaging workers, 34 food-processing workers, and 14 farm workers) died due to Covid-19 [39]. In Brazil, 2,400 meat-plant workers were identified as Covid-19 positive from 24 slaughter houses in 18 metropolises. Several meat factories postponed their processes after 246 positive cases in England. In Gana, 534 staff tested positive for the virus at a fish-processing factory. In Germany, 1553 cases of Covid-19 were found at meat processing plant and 100 cases in France were detected in slaughterhouse [40]. There are many reasons for spread of virus in food processing areas. To keep a particular distance between workers is difficult because in food production section they stand line by line. While the workers talk in loud voice, there might be release of droplets in the air [41]. As most of the workers are poor and didn't have paid sick leave, so they risk their and others lives despite being sick.

Centralize manufacturing of food creates another problem in food supply chain. It allows processor to increase production and causes reduction in cost. But to meet demands, unavailability of large facilities for production creates problems as the whole facility can be closed in case of outbreak [42]. The crises due to pandemic resulted in several disruptions in supply and demand balance thereby affecting supply chain and the poor producers and operators are facing tough situation [43].

In general, modern food supply chains have focused on reduction of food loss, but the unpredicted rise in food demand as a result of Covid-19 restrictions has led to empty shelves. This immense shock to a well-organized food supply chain highlighted the need for increased consumer education. Many modern techniques helped to monitor food consumption and production that can be used to ensure an uninterrupted and reliable food supply in such challenging time period [23].

Effect of Covid-19 pandemic on Food demand

Covid-19 had devastating effects on food demand by threatening the purchasing power and loss of employment for workers in the food sector; however, developing countries are more vulnerable to it as they didn't have enough savings and they mostly rely on imports. In many developing countries, Covid-19 had created a major food crisis for people who are unable to afford food, ultimately it affected their health that lead to increase in the risk of infection [44]. Only in Pakistan, 64 percent of sample respondents observed a fall in income that result in poor health conditions of the population [45]. During Covid-19 pandemic, according to the WHO's orders "stay at home" had made a huge gap between demand and supply of food due to the panic buying of people all over the world leads to temporary food shortage in grocery supplies followed by changes in consumer behaviour [46].

Effects of Covid-19 pandemic on global food trade

The susceptibility of the food systems associated with disease and climate has been experienced in the past during different pandemics around the world like in 1970's oil crisis, 2006-08 food crisis and SARs and Ebola outbreaks have already unbalanced food supply. According to report of International Panel of Experts on Sustainable Food Systems (IPES), by end of 2019, China, world's biggest exporter and swine producer had lost 37% of its pigs to

African Swine Fever Disease [47]. Government of some countries has changed their food trade policies by facilitating imports and restricting exports during the pandemic. Main reason for restricting export is to maintain the amount of the products in domestic markets which eventually led to decrease in domestic prices followed by financial instability due to decline in crops' production and decrease in industrial incentives. Furthermore, the country has not only lost its rank in international market but also its trust in international trade which ultimately destroyed the business opportunities for exporters in future [48]. When the exports restrictions on some countries were evaluated, it was found that Azerbaijan, Afghanistan, Uzbekistan and Tajikistan were affected negatively by 54%, 61%, 70% and 79% respectively [49]. In Pakistan, a report showed that there was loss of \$3.5 billion in exports of apparels and textile which is considered to be one of the Pakistan's top exports and about 40% of its total output was exported to the world. There was a decline of \$1.6 billion in exports of light manufacturing and \$0.97 billion in processed food. However, there was positive impact on services and heavy manufacturing that were increase by \$1.3 billion and \$205 million respectively [50].

According to a report by FAO, it was reported that in 2019 grain production estimates about 2.721 billion tons of production among which coarse grains were of 1.44 billion tons and wheat was of 763 million tons. In 2020, the production of wheat and coarse grains were estimated to be same as in 2019. Thus due to this, global grain production should adopt a stabilized situation as Covid-19 pandemic had triggered a domino effect [51].

Effect of Covid-19 pandemic on agriculture

World has suffered from different previous pandemics like HIV/AIDS, SARS, Ebola virus, swine flu, Spanish flu etc. and it not only affected the economy and human activities but also agriculture on large scale [52]. The pandemics are always accompanied by an increase in malnutrition and intense hunger [53]. According to FAO, there are basically 2 major aspects that are affected by Covid-19 and that are food supply and food demand. Since food security is directly related to these 2 factors, so, effect on these factors also puts the food security at risk [54].

A study was conducted in Zimbabwe to determine the effect of Covid-19 -pandemic on the agriculture because agriculture sector is considered to be the primary pillar of Zimbabwe's economy as it

fulfils 70% of the livelihood of the population of Zimbabwe that result in shortage of food supply in urban areas that lead to increase in poverty [55,56]. The global agriculture market was also affected due to the Covid-19 pandemic. There was a sharp decrease in the economic growth followed by 7-18% decline in the international meat prices in 2020 and 4-7% decline in dairy products. This slowing down of economy resulted in sharp decline in prices of biofuels, feed stocks, oil seeds and maize in 2020 that result in loss of profit of main suppliers [57].

Effect of Covid-19 pandemic on farmers

Rapid increase in Covid-19 cases has become serious problem for not only general public but also for farmers. It's not only creating chaos in the stock market but also causing a significant recession in the economy. The Covid-19 mainly effects in following situations in farming system like; Farm and market prices, Shortages and downturns in food supply chain, Health of farmers, Workforce of farm, Personal protective equipment and safety of workers (<https://www.agriculture.com/news/business/six-possible-impacts-of-covid-19-on-farming>).

A cross-sectional survey conducted to determine the impact of Covid-19 on farm households in Pakistan showed that 27% farmers faced problems in farm inputs, 45% didn't face any problems and 28% were unsure. The farmers said that they faced problems in following of the farm inputs like seed purchase and delivery (81.2%), diesel fuels (17.1%), pesticides (19.7%) and fertilizers (23.9%). Generally, 55.2% farmers reported increase in farm input costs, 15.4% were not sure and 29.4% farmers said there was no increase. 31.2% farmers claimed increase in cost of fertilizers, 35.9% for pesticides and 90.7% for seeds [58].

Effect of Covid-19 pandemic on income generation

Economies of under-developed, developing and emerging markets regardless of their income level were greatly affected by economic and social impacts of Covid-19. Majority have faced a decline in GDP, malnutrition, poverty and food insecurity due to losses in income and employment. Covid-19 pandemic has affected the policies that were made by government for poverty reduction in Pakistan. A report showed that from 2001-2015, 23 million people were saved from poverty as its percentage decreased from 64.3%-24.3%. However, since 2015, the pace of poverty reduction is expected to be halted due to the macroeconomic crisis and related

slowdown in growth. The outbreak of the recent Covid-19 pandemic and the control measures adopted by the government, are expected to increase poverty in the country [59].

However, Covid-19 has posed following challenges in poverty reduction in Pakistan like, Global regression in oil prices and economic activities affecting remittance and down turning domestic consumption, Bad influence on informal sectors involved in livelihoods for poor and for populations that are at a risk of becoming poor; Impact on both formal and informal sectors due to complete lockdown and limited access of poor households with respect to protecting themselves from pandemic [60].

Strategies and recommendations to control Covid-19 pandemic's impact

Covid-19 pandemic has threatened nutrition, security and safety of food. Economic access and physical availability of food is threatened by economic chaos created by Covid-19. Problems related to malnutrition and hunger may appear due to rising disruptions in logistics, trade systems and marketing that limit the access to food at certain time in some places [61]. According to a report of World Food Program, in 2020 the number of people suffering from hunger will increase to 265 million due to pandemic [62]. Similarly, another study showed that in children of age less than 5 years, there is 14.3% increase in prevalence of wasting because of disruption in social protection and malnutrition in under-developed countries [63].

Various recommendations and strategies have been devised to minimize the effect of the Covid-19 pandemic with respect to food supply chain, small farmers, government, business and actions on global trade. For food supply chain, it was found that food consumption is not the source for transmission of virus. So in order to prevent virus transmission, one must wash their hands frequently. Masks and gloves should be worn by the workers during food preparation and should be changed frequently during cutting, slicing or food packaging in order to prevent transmission of Covid-19 virus [64]. Similarly, in many food factories, robot systems are used to facilitate food safety. Moreover, unsafe or low quality products can be monitored by using CPS (cyber physical systems) [65]. To avoid drawbacks associated with centralization paradigm, decentralization of food manufacture should be used as it proves to be flexible in food supply and helps the consumers to get natural and fresh products [32].

Conclusion

During the Covid-19 pandemic, several restrictions are imposed including lockdown as well as border restrictions due to which there is a huge loss in food and agriculture sector including disruption of supply chain, affecting the purchasing power of people and availability of labor because of illness or restrictions on travelling that leads to poverty and huge losses to economy of different countries. So, there should be continuous flow of supply not only in the health but also the food and agriculture sector, which is of equal importance to health sector. It is considered to be very important in decreasing the negative impact on the global economy and to solve the food crisis. Though various problems are associated with the food supply chain so different strategies to overcome those problems should be devised. Each country has to understand the gravity of the situation and should take measures in order to stop the spread of Covid-19. There should be flexible food supply chain so that it can respond to the world's food requirement.

Competing Interests

Authors declare that they do not have competing interests.

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Ethical Approval

None of the animal or human sample study is involved in this therefore ethical approval is not applicable.

Consent to Participate

Not applicable.

Consent to Publish

All the authors have read and consent the publication of this manuscript.

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