

COVID-19, Food Security, Food Prices and Urban-rural Interrelationship for Sustainable Food and Nutritional Security: A Study on Dhaka City

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Abstract: Currently the world is facing a phenomenon, a fast-spreading disease named ‘2019 Novel Coronavirus’(COVID-19). It has spread approximately 215 countries around the world and is affecting the health and economic condition widely. To effectively control the situation nationwide lockdown was implemented in Bangladesh following WHO’s instructions. That lead to nationwide panic buying, stockpiling, circulation of misinformation and a sense of food insecurity at local level. Most of the people of Bangladesh depends on agricultural sector and this pandemic created severe crisis for this sector. The magnitude of the crisis fluctuates from place to place in Bangladesh. This study focuses on the specific case of capital city Dhaka which is the most affected area and where the farmer consumer alliance was reportedly disrupted and panic stockpiling was highest. Based on formal interviews with local government officials, the situation of urban-rural food transfer and the consequent government initiatives for maintaining food supply and public health was studied. Then this paper assessed the perceived food security of participants, price at local market level along with online surveys while the city residents were under partial lockdown during pandemic. The study founded that the food insecurity was increased and respondent reported some basic foods prices were higher than usual. Also, the farmer consumer alliance was greatly hampered because of economic shutdown with the restriction of travel which has created an imbalance between demand and supply of food. It also detected that day laborer, marginal and poor people, vulnerable women and children are mostly affected. These findings have policy implication both at farmer and ultimate consumer level addressing the short term and long-term factors, related to food security, price and farmer consumer alliance in Bangladesh.

Keywords: Food System, COVID-19, Food Security, Urban-rural Relationship, Health Security, Agribusiness

1. Introduction

The pandemic named “COVID-19” has become a synonym for the word “Ruin”. Its devastating effect made the whole world stand still and is ruining almost every country’s economy and human lives. The virus was first reported in China in December 2019. It is a fast-spreading respiratory disease which was declared as pandemic on 11 march 2020 by WHO. As per the global tally kept by the Worldometer, until December 30, 2020, the virus has already killed 1.79M people and approximately 82.1M cases have been confirmed [2].

Djalante et al. [5] and Shaw et al. [6] discussed several international response measures, which are implemented to break the chain of rapid virus transmission such as reduction in transportation (through all ground, ocean and air means), tightened border controls, travel bans, lockdowns, advanced surveillance, etc. The term lockdown has become a buzzword during this pandemic. It is a situation that refers to the movement restrictions that is being imposed by the governments on people and goods to prevent the spread of infections.

In addition to the direct health impacts, the pandemic is

having widespread effects on employment, poverty, food security, nutrition, education and health, and the overall functioning of food systems [23, 36, 31, 40]. COVID-19 is destabilizing supply chains at all levels, and creating instability in food supply and food prices [41-46, 53]. The international organization like WHO, the World Bank, the International Monetary Fund (IMF), the Food and Agriculture Organization of the United Nations (FAO) and the World Trade Organization (WTO) have already projected the impact of the virus on global economy and food systems. WHO also predicted that there will be a second wave of the disease and it is already happening.

In Bangladesh, the first case was detected on March 08, 2020. After one week, the government initiated countrywide lockdown intending to mitigate the spread possibilities. Moreover, on the 24th of March 2020, eventually, the government declared holiday along with the shout-down of all educational institutions, business enterprises, factories, shopping malls, and any kind of mass gathering and only necessary goods suppliers shop allowed to open for a stipulated time. Govt. of Bangladesh is claiming that Bangladesh is ready for fighting COVID-19 despite Dhaka centric low number of tests and lack of Personal Protective Equipment (PPE) for the frontline fighters including doctors, nurses, volunteers. As of December 30, 2020, Bangladesh confirmed case 511K people and 7,531 death. She is the top 16th country in the world and second most affected country in South Asia, after India [22]. Bangladesh accounts for 1% of the cases in the world. She is experiencing the geometrical growth in discovering the infected population since its first detection. As Bangladesh's economy was already been experiencing the ruthless and adverse effects in every corner of the economy, COVID-19 has worsened the situation.

Very few empirical studies have emerged thus far so, the expansive implications of COVID-19 on local food systems are still to be understood. The incidents of panic-buying have raised food security related concerns among the city residents. But the government had taken some steps like: Wet markets had relocated to open spaces to ensure physical distancing. That had helped customers feel more reassured of a safer environment. The Trade Corporation of Bangladesh (TCB) is a national Government programme that maintains a stock of certain food items and makes them available at fixed prices that are subsidized. Affordable food items – such as sugar, cooking oil, lentils, chickpeas, dates – are needed, but since prices are mostly fixed, they can be out of reach for the poor. Government has also taken steps to improve the distribution of food assistance. Concerns that food aid distribution has not been effective at reaching the neediest, prompted the Government to allocate food aid proportionately, based on estimates of the number of poor per Ward. Ward-level Councilors are taking steps to prepare lists of the poor for each poor community [20].

The urban areas mostly depend on rural areas for meeting their fresh food demand. But this dependency was especially affected due to COVID-19 impact on food supply chain. In that context, the study aimed to highlight the Situation of

urban rural partnership. To understand the situation, answers to the following questions should be found, (1) How the urban-rural partnership been affected due to COVID-19? (2) Is food security being compromised due to the pandemic? (3) What is the impact of COVID-19 on price of essential food items? The study aimed to find the answers and also suggesting policy mix for addressing the short-term and long-term disquiet related to food system in Dhaka.

2. Theoretical Background

2.1. Food Security Challenges

The FAO provides this well-accepted definition of a state of food security: “Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life.” According to Niles et al. the ongoing COVID-19 pandemic affects all the four dimensions of food security, defined by the United Nations which are availability, accessibility, utilization and stability [37, 38].

Bangladesh is a service sector led economy, where 12.6 percent GDP comes from agriculture. A survey by Khaddo Odhikar Bangladesh found that 87 percent of the poor (50 million) people of Bangladesh are already in a serious food crisis due to the coronavirus situation. Therefore, ensuring food security should be a priority for the government and relevant national and multilateral agencies, especially since overall market activity across the country has already been severely affected due to Covid-19 restrictions. The people could also be potentially faced with factory or facility shutdowns, port restrictions and congestion, leading to the spoilage of perishables vegetables and fruits, and increasing food waste due to a lack of refrigerated storage which will increase the food insecurity [52].

Moreover, the direct actions to close food outlets during pandemic are having impact on food access. While food remains generally available, there are certain limitations on where and what can be accessed. Small business owners, who did not have the knowledge or skills to transition to online platforms, had closed, lowering food availability and accessibility for those who normally depend on such outlets [31].

2.2. Essential Food Item Price

Urban poor people are suffering from this pandemic the most. They have lost jobs and savings, and they continue to face desperate conditions as the crisis continues indefinitely. In addition, disruptions to food supply chains from rural areas to the city have resulted in rising prices for the food staples that they depend on – such as rice, lentils, and vegetables. They can't even grow their own food like rural people. With little money or capacity to buy food, many are eating less food of poorer nutritional value [51].

An FAO report confirmed that many shops have closed in Dhaka, especially for fresh vegetables and meat, and food

vendors' businesses is down by as much as 80-90%. It was also reported that, average food prices were 20% above pre-lockdown prices on 19 April. Increases were seen in many key foods (e.g., rice, potato, onion, lentil, banana, and fish) with decreases in egg and chicken meat. There were also large price differences among markets; as consumers were unable/willing to 'shop around', they were obligated to pay the price in the nearest market [32].

Table 1. Average changes in food prices since start of COVID-19.

Country	Avg. Price Variation (%)
Bangladesh	0.95
India	3.82
Indonesia	2.53
Pakistan	2.55
Ethiopia	3.44
Kenya	4.21
Mozambique	10.45
Nigeria	3.10
Rwanda	19.48
Tanzania	12.33

Note: Refers to average change in price across 13 foods, from 14/02 - 7/05/2020; positive values indicate a price increase. Data Source: Numbeo via FAO Big Data Tool.

The prices started to increase during the beginning of the pandemic in Bangladesh. Despite the government's efforts to set the maximum retail price of rice, the prices still remain high. Moreover, Bangladesh has fallen behind in the field of nutrition supply, a person should eat 104 eggs per year. Production of eggs is sufficient to meet the demand, but the

country is lagging behind in the production of milk, fish and meat [25]. Another study on national food security by BRAC revealed that during the 45-day lockdown period between March and May, the country's farmers faced a loss worth 565.36 billion taka (€5.9 billion, \$6.66 billion) [33].

Food prices are important for several reasons. They are an indication for stress within the food system: greater than normal food price volatility often indicates that something is not right in the fundamentals that get food from farms to forks, food prices affect the incomes of farmers and other supply chain actors who make their living from selling food: falling food prices are good for net consumers of food but can cause real economic pain for net producers. Finally food prices play a critical role in determining what foods people can afford to purchase [34].

The FAO Food Price Monitoring and Analysis Tool (FPMA) 12 reports food price increases in several countries in the second half of March, due to COVID-19. A summary of FPMA data (focusing primarily on staple grains) for the six GAIN countries for which data for April 2020 were available (as of 8 May 2020) is shown in the table, revealing that most countries have seen significant increases in staple foods since April 2019 and modest increases since February 2020 (pre-pandemic), though two show price decreases over that period. The differing trends across the different data sources may be due to differences in data quality, markets/areas surveyed, or foods considered (notably, the FPMA data are primarily focused on staples whereas Numbeo largely excludes staples).

Table 2. Average changes in staple food prices since April 2019 and since start of COVID-19, according to FAO FPMA.

	April 2019 - April 2020			
	Bangladesh	India	Pakistan	Tanzania
No. commodities	3	7	4	2
No. markets	1	4-8	4-5	1-4
Average price change:	15%	25%	14%	23%
Commodities with price increase:	2	7	4	2
Commodities with price decrease:	1	0	0	0
February - April 2020				
	Bangladesh	India	Pakistan	Tanzania
No. commodities	3	8	4	3
No. markets	1	4-8	4-5	1-4
Average price change:	13%	1%	2%	-9%
Commodities with price increase:	2	5	3	1
Commodities with price decrease:	1	3	1	2

2.3. Urban-Rural Food Transfer in Bangladesh

Usually, consumers do not pay much attention about how the food on their tables is produced. However, this pandemic created concerns about food safety and have drawn attention to the enormous infrastructure of food supply chain [30]. The importance of urban-rural partnerships has also gained high prominence [54] after the global policy agreements, namely Sustainable Development Goals "SDG" [55] and The New Urban Agenda [56].

Rural and urban areas are becoming increasingly interdependent. So, it is important to maintain a close partnership between them for sustainable development. It can

be said that the most important linkage between urban rural is food supply. Urban areas have typically been dependent on surrounding peri-urban and rural areas to meet their fresh food demands. But, this urban-rural food linkages are increasingly pressurized due to the fast-growing urban population, rapid urbanization, industrialization, etc. [17,49]. Lately, the industrial supply chains have started to dominate the food markets by maintaining a steady supply of processed food with higher standards [18].

However, south Asia's food production systems – and particularly those reliant on external inputs and human labor are being disrupted by the COVID-19 crisis through multiple pathways. International and domestic supply chains for

fertilizers, agro-chemicals, machinery, and seeds have been impeded by import and movement restrictions. This study highlights the impact of the pandemic on domestic food supply chains.

Situation during COVID-19

The pandemic affected this farmer consumer partnership. The lockdown state is blocking transport routes and interrupting fresh food supply chains and rising rates of food loss and waste across the country [19]. Economic shutdown with the restriction of travel has created an imbalance between demand and supply of food. One side the farmers don't get the proper price and another side the average income of the major people declined due to the country's lockdown. This virus has rigorously affected the agricultural sector by creating labor shortages which ultimately make farmers unable to harvest in time. And the consequences of this imbalanced agricultural production system are inadequate food supply, increasing hunger, and malnutrition [15]. The prime minister of Bangladesh has asked the people to stay away from rumours which has a detrimental effect in this crisis moment. Hence, the public responses to social media are mixed. Due to insidious rumors concerning the consumption of chicken meat and eggs, people have begun to avoid chicken and egg consumption in the midst of the coronavirus outbreak, which has resulted in a drop in chicken prices of up to 75% with the loss is estimated to reach Tk1200 crore by April [13, 35].

Rural to Urban food transfer

The world's urban population is set to increase to 66% by 2050. The dynamics of urbanization and urban life escalate the pressure on food systems to sustainably provide sufficient amounts of healthy foods. Poverty, malnutrition and hunger persist as urban diets are more likely to be unbalanced [24]. During this pandemic, the transportation disruptions and shortages of workers have caused supply issues for certain food items and have modified the usual foodscape in almost every country. Bangladesh is also facing modification. For example: In Dhaka and Mymensingh, the diversity of fresh produce such as fish, fruits, and vegetables available in the market has decreased significantly, and items appear less fresh and appealing than usual. This reduced variety and diversity may have contributed to falling fruit and vegetable purchases. Dr. Haque noted a sharp decline in overall fruit supply in Mymensingh, most notably for lemons, which are usually in high demand but could not be transported into the city from their point of origin, the South of Bangladesh [29].

Farmers in South Asia and Bangladesh are widely dependent on rural migratory laborers or agricultural machinery owners who offer land preparation, planting, irrigation, harvesting and post-harvesting services to farmers on a fee-for-service basis [28]. Social distancing measures and the shortage of manual labor and machinery services have already been shown to disrupt harvesting [26, 27].

Urban to Rural food transfer

Rural areas are densely populated, with a large share of these areas being peri-urban. The high population density in rural areas in Bangladesh is striking. 80% of rural areas in

Bangladesh were classed as “peri-urban” based on density measures used across countries in a pan-developing region employment study by the International Fund for Agricultural Development in 2019 [47]. Although, not many food items transfer from rural to urban areas, some frozen and processed food items are the things that transported to rural areas from urban areas. Due to this pandemic the transportation system got disrupted and lead to food and nutrition security challenge and labor shortages for rural areas.

3. Methodology

3.1. Study Location

Our study area is Dhaka which is the capital of Bangladesh. it is one of the major cities of South Asia, the largest city in Eastern South Asia and among the Bay of Bengal countries. It is the ninth-largest and the sixth-most densely populated city in the world, with a population of 8.9 million residents within the city limits, and a population of over 21 million residents in the greater Dhaka area. It is the economic, political and cultural center of Bangladesh. Set beside the Buriganga River, its area is 306.4 km². It is the financial and commercial capital of Bangladesh. It accounts up to 35% of Bangladesh's economy. Dhaka serves as the financial hub of the country and also headquarters of major Bangladeshi financial institutions.



Figure 1. Map of Dhaka city.

In last 6 months 1684 confirmed cases were found in

Dhaka city [21]. As it is densely populated city, the virus has spread more rapidly. Due to partial lockdown and limited transportation service, the price of the essential food items was on the rise.

3.2. Research Method

3.2.1. Formal Interview with Government Officials

The primary data were collected through formal interviews with the government officials from Dhaka North and South City Corporations who are in charge of keeping COVID-19 under check in Dhaka. The mentioned questions were asked to gather secondary information. (1) what are the significant measures taken by government to control the market situation? (2) In past few months, has there been any fluctuation of price of essential food items? (3) Has there been any change in demand for essential food items? (4) How this pandemic has affected the Urban rural food chain? (5) which group of people were mostly affected? A clear-cut understanding of the COVID-19 situation of Dhaka city was demonstrated based on their responses. The author also collected information from various data regarding COVID from the city corporation offices and media reports.

3.2.2. Questionnaire

The response of different country differs due to social structure, economic capacity and resources [12, 14]. The COVID-19 pandemic has heavily impacted household and individual level earnings in Bangladesh with around 13 percent of people becoming unemployed; lower and middle-income classes have been experiencing a significant drop in income for the last few months [3].

In addition to that, lack of proper information regarding the spread of infections or unavailability of products in market has created a concern for food security and food price. To understand the conception of insecurities of Dhaka city resident during COVID-19 four major aspects should be discussed.

(1) Information sources; (2) Health situation; (3) Food security; (4) Job security

Question for Source of Information assessment:

(1) Do you have access to updated information of COVID-19/available information of COVID-19? (2) What are your major information sources for COVID-19 situation in Dhaka city? (3) In what source do you rely most?

Question for health sector situation assessment:

(1) What is your major concern related to health during pandemic? (2) Are you satisfied with the COVID-19 test facility in Dhaka? (3) Has there been any change in price of pharmaceuticals/ health care products in Dhaka? (4) Do you think enough initiative was taken by the government to control and treat COVID-19?

Questions for Food security assessment

To assess the food security level of Dhaka, the 4 dimensions of food security should be covered. (1) food availability (both in-house and market availability); (2) food accessibility (3) food consumption and (4) food stability. Although government has taken different measures to ensure

continued food supply, it's effectiveness will be assessed through the mentioned questions.

Food availability: (1) Do you own any farmland outside of Dhaka city or rooftop gardening in Dhaka? (2) Do you consume any food products from your own farm/garden? (3) In last few months, was there any change in availability of essential food products (cereals, spices, poultry, vegetables) in market?

Food accessibility: (4) How has the price of necessary food products (cereals, spices, poultry, vegetables) been affected in last few months? (5) Do you have availability of online grocery service? (6) Is the delivery service satisfactory/reliable?

Food consumption: (7) Has there been any shortage of your favored food items? (8) Which food products were short? (9) Has there been any change in quality of food? (10) If yes Q9, Which food products quality has changed? (11) Do you have adequate access to nutritious foods?

Food Stability: (12) Do you think supply of food products is stable in Dhaka? (13) Is there any possibility that the supply of food products will be stable in Dhaka? (14) Do you think there will be available information on market situation of Dhaka? (15) Do you think the demand of essential food products will be the same in Dhaka?

Question for Job security:

(1) Did COVID-19 situation affect you/ your family member's job? (2) How was it affected? (3) Are you facing any financial difficulty in this COVID-19 situation? (4) Do you think job situation will be stable?

4. Results and Discussion

4.1. COVID-19 Pandemic Unfolding in Dhaka City, Situation of Vulnerable Group and Government Response

Based on the formal interviews with local government officials of Dhaka North and South City Corporation, the initial rise in the number of COVID-19 confirmed cases was observed as geometrical spikes. According to the data collected from IEDCR, there were 39 confirmed COVID-19 cases in Bangladesh on march 24, including four deaths. Case Fatality Rate (CFR) was 10.3%. on March 31 the confirmed case was 51 including 5 deaths which was incredibly fast spreading. The Case Fatality Rate was 9.8%. In only 6 days, the confirmed cases were 123 including 12 deaths and CFR was 9.76%. Dhaka was the center of attention confirming 54 cases in Dhaka district and 52 in Dhaka city. The recovery rate was not so fast compared to infection rate. As of April 6, 33 patients were recovered [10, 11].

The situation became fiercer within just four months in Dhaka. in 11 June the total cases of active COVID-19 were 5935 for Dhaka North and 6531 for Dhaka South area according to data collected from govt. officials. Among the area in DNCC, most affected area was Mirpur (968), followed by Uttara (587) and Mohammadpur (496) [9].

Vulnerable group like marginal people, old people are

facing most problem due to this pandemic in Bangladesh. More than 10 million marginal people (rikshaw puller, day laborer, factory workers, maid etc.) had to return to their home due to lockdown and restriction of public movement. Older people are also at an increased risk of adverse mental, emotional, and physical consequences because of COVID-19 [8].

Government response is a crucial phase for pandemic. To decrease economic fall of any country government should take proper measures. The government of Bangladesh had taken Country Preparedness and Response Plan to control the pandemic situation initially. There are six pillars CPRP for Bangladesh: surveillance and laboratory support; contact tracing and Point of Entry (POE); case management and Infection Prevention Control (IPC); risk communication/awareness and community engagement; logistics and procurement; and preserving stability and addressing social tensions [8].

On 16 March, the Government closed all educational institutes (schools, colleges and Universities) to contain the COVID-19 outbreak. Government also ordered public hospitals to set up separate isolation wards as a preparedness measure for treatment of suspected COVID-19 patients. Limited 2/3 circulation of public transports, limited banking services was permitted; Bangladesh Armed Forces joined to support district administration dealing with the COVID-19 situation. It was late start of lockdown however [8]. Government allowed returnees from abroad and they were not even cautious of the virus. Due to late start of lockdown, people of Dhaka saw incredible fast spreading of the virus. This lockdown situation interrupted the transportation facility which led to food supply chain disruption and urban rural food transfer hampered. Supply of fresh food products decreased and that led to high demand and high price of food products. Supplies of masks, hand sanitizers and hand rub also disappeared from shop shelves in a matter of hours after the first coronavirus case was reported on March 8. People started panic buying pharmaceuticals products, food products including soaps and hygiene products. Mostly affluent people stockpiled food products.

Government closed down the wholesale market and wet market and set up fixed points from where products can be bought. Directorate of National Consumer Rights Protection (DNCRP) is finding wholesalers who increased their price during pandemic and are fining them. A website to inform people about corona situation is also established named "Corona-info". It is updated daily and publish authentic news. The Prime Minister announced BDT 2,500 cash incentive to 5 million marginal families which will be paid out using Mobile Financial Service services directly to the families.

4.2. Assessment of Sources of Information, Health Sector Situation, Food Security and Job Security

The sample does not represent the demographic characteristics of the overall city population, as it was conducted online due to limited movement facility.

4.2.1. Major Information Sources Related to COVID-19 Pandemic

Figure 2 shows the major information sources from where survey respondent got information. People got updated information from social media the most (60.6%). Next source is newspaper (30.3%). Although govt. has created a website to keep updated information on corona situation, only 1.5% respondent got information from the site.

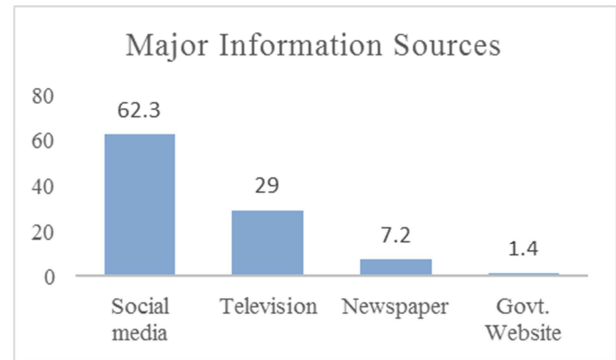


Figure 2. Major sources of information.

Among the different information sources, Figure 3 highlights the most reliable source of information identified by the survey respondents. The "Television" followed by "Social media" were identified as the most reliable sources for COVID-19 related information according to them. Although not many respondents attained information from govt. website, it was identified as reliable by 17.4% people which was identical to newspaper.

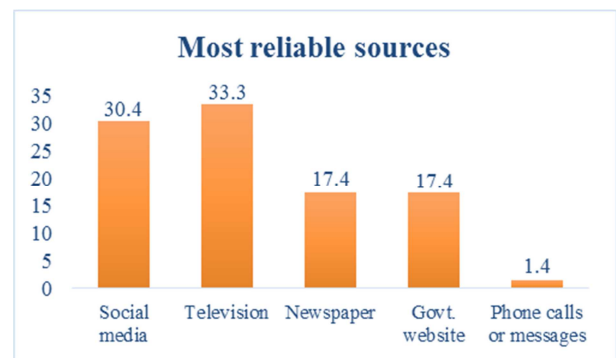


Figure 3. Most reliable source.

From the survey an interesting piece of information is obtained. Although the major information source was the social media, respondents relied on information attained from television most. The surveys information was collected through online mode due to the movement restrictions, so there is a possibility of these results to be more relevant for those who use online sources.

4.2.2. Health Insecurity Due to Pandemic

Enough initiative was not taken by the government to fight COVID-19 according to the survey result. Mandatory temperature check was halted due to broken thermal scanners, which government bought in few numbers in the

first place. Figure 4 revealed that, people of Dhaka were more concern about safety than any other health security. It is understandable, because the country's population is about 170 million. But, for this huge population, the entire public health system has only 1160 ICU beds including private healthcare sector and 110 of which are outside Dhaka. This is undoubtedly a matter of concern as government cannot assure the safety of people. Another reason behind that is, not maintaining the lockdown properly. Although government restricted mass gathering and unnecessary movement, it was not implemented properly. That led to safety concern. Proper treatment was not assured by the government and it also became a concern as hospital facility of Dhaka was not enough to fight COVID-19 according to people.

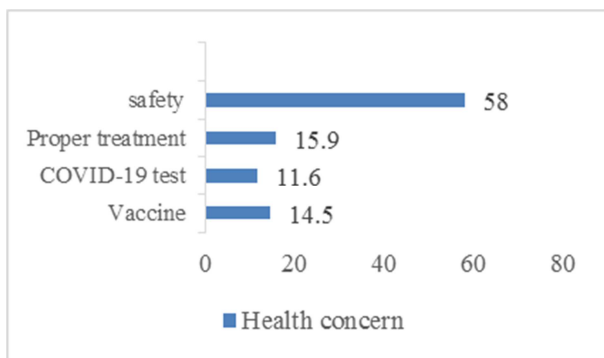


Figure 4. Major health concern.

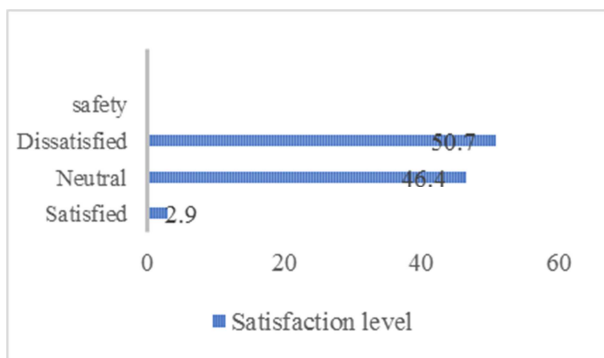


Figure 5. Test facility satisfaction level.

Figure 5 showed Majority of them were not satisfied with the test facility. Not enough test centers were established. Dedicated hospitals, testing kits, labs, training for the front-line fighters, PPEs etc were insufficient in Bangladesh. Moreover, Inaccurate test report and insufficient test kit was the reason they were dissatisfied with the test facility. The prices of pharmaceuticals products were also increased during pandemic. People were panic due to this incident.

4.2.3. Food Security at Household Level

These results highlight the dependence of Dhaka city residents on food purchased from the formal and informal markets.

Food availability: The study found that, about 36.2% respondent own a farmland outside of Dhaka city and 37.7% respondent consume food products from their garden.

Although a good number of people consume their own garden food, Majority portion (63.8%) still depend on food market. It is a relief that majority of respondents did not notice any change in availability of essential food products in market (44.9%). But, around 30.4% of the survey respondents have witnessed a decrease in market availability of food products (mainly cereals, spices, meat and poultry). So, food availability in both market and household level is secured till now.

Food accessibility: The frequent disruption in food supply chain increased the price of the essential food products. About 87% respondents witnessed the increase of price of essential food items (cereals, spices, poultry, vegetables). For safety reason, people avoided going to market as much as possible. It was possible because 55.1% respondent had the accessibility to online grocery service. But 26.1% respondent were still required to visit market as they did not have the accessibility. Notably, 18.8% of respondents were not sure if they even have any access to home delivery services for food. The delivery service was reliable enough according to the respondents. They were satisfied with the service.

Food consumption: Overall, there was not any shortage of majority of respondents (62.3%) favored food products in the market. However, 37.7% of the respondents experienced shortage of their favorable food items, mainly vegetables (33.3) followed by dairy, grains and spices. About 29.6% of the respondents experienced shortage of food products like fruits, poultry, packaged foods and imported food items. The shortage possibly be created due to panic buying incident.

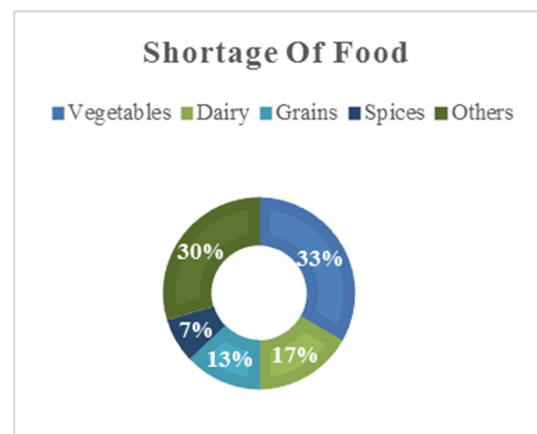


Figure 6. Shortage of favored food products.

The survey also found that, 62.3% of the respondents experienced dropping of the quality of food products. Especially, vegetables (36.9%) and grains (17%). It is to note that, Vegetables are perishable food commodities, which need adequate storage and processing. Due to transportation facility disruption, the food quality has decreased. In general, 47.8% of respondents were found to have adequate access to nutritious foods.

Food Stability: Dhaka city residents typically depend on the food came from rural areas. COVID-19 lockdown has created a sense of uncertainty about the stability of food in market. 40.6% of the respondent think that there is no

stability of the supply of food products in Dhaka while 30.4% of the respondents are not sure about the situation, which is alarming. It was found that 37.7% of the respondent think that in future the supply of food will be stable in Dhaka and 53.6% respondents were not sure. Moreover, 50.7% of the respondents think that demand of the essential food products will not be the same in Dhaka city. 34.8% of the respondents believe that there will not be available information on market situation like food availability, price etc. Even more concerning thing that, 36.2% of the respondents were not sure if there will be available information on market situation.

4.2.4. Job Insecurity Increase (Vulnerable Group er Under e Pore)

The survey showed that, COVID-19 affected 66.7% respondent or respondent's family member's job. About 14.8% people lost their job. Salary decrease was the most common occurrence, 46.3% respondent were affected. Sudden termination rate was high (25.5) which is alarming. People cannot cope up with sudden termination. Also, temporary termination rate was 7.4%. Another problem that jobs holders face was "No salary". Many companies did not give salary to their employee due to financial difficulty.

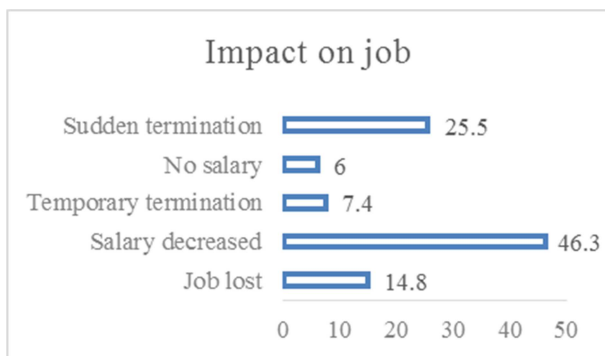


Figure 7. Effect of COVID-19 on job.

65.2% respondent were facing financial difficulty during pandemic. Majority of the respondent (about 49.3%) think that job sector will not be stable in future. Hence job insecurity has increased. COVID situation affected job sector most. Especially for the country like Bangladesh where getting a job is hard enough.

5. Policy Recommendations

5.1. Short-Term

5.1.1. Effective Sharing of Information Related to COVID-19 Among City Residents

To effectively manage the ongoing COVID-19 health emergency, reliable access to accurate information is a must. However, through the online surveys, it is seen that people get their information from social media which is not authentic most of the time. Government has created a website. Although government website is the most authentic information source, many people do not even know that it

exists. So, it is not effective enough. Government should make some promotional activities regarding this matter and raise awareness among citizen so that they can be cautious of any kind of misleading information. They should prevent any rumor that can create chaos among the people.

5.1.2. Ensuring Systematic Food Supply Chain

Many global research agencies including the UN, FAO, WHO, etc. have put forward specific guidelines to manage the wide-ranging implications of COVID-19 along with those on food systems [57]. It has been recognized that the steadiness of food supply chains is the core need to avoid any potential food shortages or price hikes [48]. Based on the primary surveys, the author found that, there has been some problem regarding food supply chain. Freshness and quality of food products was compromised during pandemic despite opening an emergency transportation system for agriculture. Ensuring available supply of food is a must as most people depend on food market to fulfill their demands. According to survey result, availability of food products is secured till now but people are not sure if that would be stable in future. So, government should focus on ensuring strategic food supply chain.

5.1.3. Intensify Market Monitoring to Check the Price Increase of Food Products

The most common incident people faced during pandemic was price hike. The main reason behind the price rise was frequent disruption in food supply chain. Directorate of National Consumer Rights Protection (DNCRP) has taken actions against the unfair price rise, even so the price hike could not be averted. Hence, enhancing the market monitoring system is essential. Government should emphasize on checking price of essential products and control the price hike.

5.1.4. Keep Track of Health Sector

Health sector needs monitoring as it is a crucial sector for this pandemic. Based on survey, people experienced increase of price in this sector also. Many pharmaceuticals and safety products (including sanitizer, medicine, mask etc.) price was high and people panicked due to the sudden jump of these products. So, effective monitoring is necessary to control the price hike of health sector products and to ensure equal health facility for all. Proper treatment was not assured by the government to fight COVID-19 according to people. Enough test centers, dedicated hospitals, testing kits, labs, training for the front-line fighters, PPEs etc. should be ensured by the government to put people at ease. Accuracy of the test reports should also be assured.

5.2. Long-Term

Despite COVID-19 pandemic growing rapidly, the government of Bangladesh are now easing the lockdown restrictions to lessen the economic impacts. They have certainly taken some steps to manage the local food systems during the lockdown situation but there is also a need for adopting certain long-term actions to minimize the impact of

pandemic. The author recommends some policy based on the research findings.

5.2.1. Securing Stable Food Supply

Undeniably, a good deal of Dhaka city residents has their own source of food but the portion is not majority. So, government should encourage city residents to practice agriculture more so that supply of food remains stable during any unfortunate events. Several forms and practices of urban agriculture such as rooftop gardening, vertical farming, homestead gardening etc. Rooftop gardening has become popular recently as people realized that it can provide solution to increased food demand and also can promote a sustainable and livable city. Local fresh and safe food can be ensured through roof gardens in Dhaka city. Homestead gardening has also been playing an important role in production of horticultural crops of Bangladesh. Homestead vegetable, fruits, spices cultivation are especially important in overcoming not only seasonal unavailability of foods but also promotes household self-sufficiency [50]. Recently another practice is gaining attention named "Community Supported Agriculture".

Community Supported Agriculture system: It is still a new concept for Bangladesh but the term is common in United States and Canada. Community-supported agriculture (CSA model) is a system that connects the producer and consumers within the food system more closely by allowing the consumer to subscribe to the harvest of a certain farm or group of farms. For the small farmer, it is advantageous as they can sell food even during the off-seasons. They also get an assurance of timely payment without the hassle of worrying over sales. These farming communities allow the farmers to connect deeply with everyone involved and community farming shareholders get the freshest, most local food possible.

5.2.2. Decentralized Food System

A decentralized food system is a food system that minimizes middlemen, reduce the price of produce and market grows more responsive to customer experience and demand, boosting profit margins. Minimizing the gap between consumers and producers is a critical step towards an environmentally and economically sustainable food system [3]. Also, it is important to understand the food system properly. Dubbeling et al. [16] highlighted the importance of city-region perspective for building more resilient, fair, and sustainable food systems. Dhaka city provides the biggest market for food supply, yet the bulk of it is produced in rural areas. So, the supply chain gets interrupted as soon as transportation facility hampers. And exactly this has happened in this COVID-19 situation. Region wise food producing system and decentralizing food system can be a key to a sustainable food supply chain. Decentralized food system would democratize the food industry by dispersing small food hubs across the globe, bringing food production to local communities [3].

5.2.3. Elevate the Urban Rural Interrelationship

Donfeli [7] showed that, both rural and urban settlements

interact with one another in many ways. The rural areas grow food which they supply to urban areas, while the latter act as collecting and marketing centers or agricultural produce from the surrounding villages. Again, Sukhwani et al. [17] explained how improved producer-consumer relationships can serve for narrowing the food supply demand gaps between urban and rural areas at regional level. A good urban rural interrelationship of a country means smoother supply chain. But, whilst there is considerable literature on both rural and urban development issues, there is much less concerning the interrelationship between them [4]. Boosting the urban-rural relationship is a much-needed step. Its necessity became clearer during this pandemic.

5.2.4. Guarantee COVID-19 Vaccine for All

The vaccine of COVID-19 has not reached Bangladesh, yet people are concerned about it. Because, the amount of vaccine coming to Bangladesh is not sufficient. Moreover, experts say challenges are there, as it requires complex logistics. They think a high-profile committee should be formed and a well-designed plan and policy need to be put in place immediately to have the necessary work done before procuring the vaccine. Experts suggested to the government to improve the capacity of the existing cold chain and ensure other required logistic support so that the vaccine can be delivered to the upazila level for fair distribution [1]. The government has prioritized affected, old people and people with health complicity to give the vaccine firstly as suggested by the experts. People will understand the priority list as the situation is dire now. But in the long run it will be difficult to prevent people from panicking if the government cannot guarantee the vaccine for all. So, government should plan a strategy so that COVID-19 vaccine can be secured for all people.

5.2.5. Ensuring Fair Price of Products in the Market

The after effect of this pandemic will lasts for a long time. Price instability is one of the effects. The high price of many essential medicines and food products is a major barrier to the goal of health coverage and primary health care. The poor bear a disproportionate portion of this burden and it is common in middle-income countries like Bangladesh. The medicines are the highest out-of-pocket expense after food [39]. Hence, government of Bangladesh should take proper steps to ensure fair price of products. Otherwise, the economy will be unstable and people will suffer in the long run.

6. Conclusions

This paper presents an assessment of COVID-19 impact on local food systems, health sector with reference to the specific case of Dhaka in Bangladesh. The key purpose of the study was to understand the COVID-19 situation and the market situation of essential food items, health sector situation along with the chronological measures taken by the Govt. of Bangladesh to tackle the situation. The study considered the important issues of food security at the household level, health security and job security as the city

residents stay confined to their homes.

Through a descriptive analysis of respondents "Information Sources" a considerable variation of sources of information was observed. People preferred "Television" as the most authentic information source. Regarding health sector, people were more concern about safety than proper treatment. Prices of many pharmaceutical products were on the rise. The assessment of food security has brought forward some problem's citizens are facing during COVID-19 and a positive side that there are still available foods in both market and household level. The study also found out through assessment that high insecurities is prevailing in job sector.

However, these results suggest that the city corporation and government should pay particular attention to policy formation for improving the households' food security of vulnerable and marginal peoples. Therefore, key issues for policy development regarding this subject matter are how to ensure food security, create effective information sources, create short time and long-time employment opportunities, promote the awareness building programs regarding the social distancing and health rule to ensure healthy life.

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