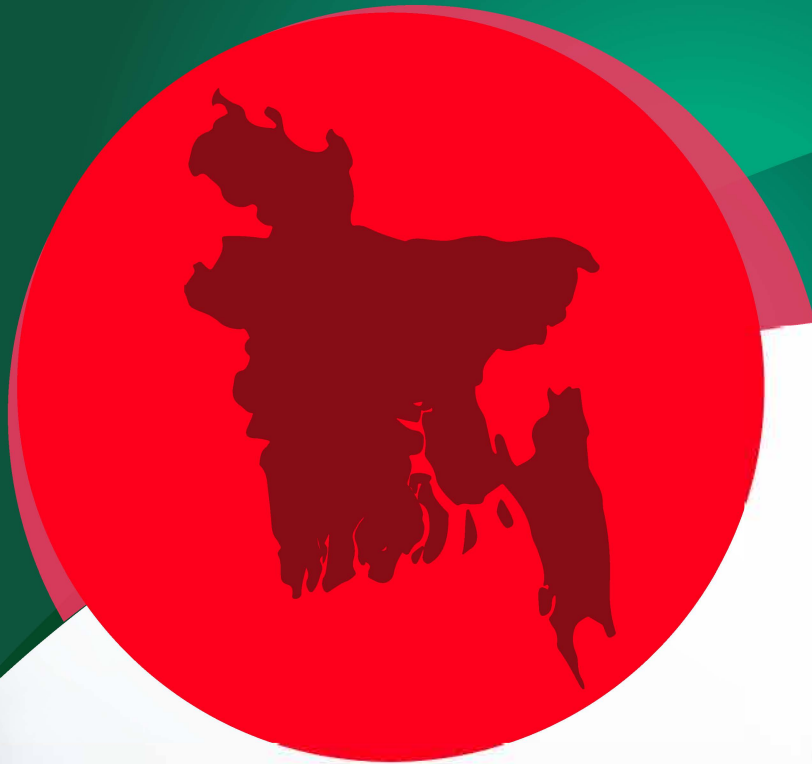


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From the Editor

The Editorial Board and I thank the guest co-editors Dr. Abu Parves Shonchoy and Dr. Kazi Iqbal for taking on the work for this special issue of the *Journal of Bangladesh Studies*. The conception and implementation of this issue coincided with COVID-19, which disrupted the lives of many involved in the production of this issue. Authors and co-editors and their families felt the difficulty of illness and pain of loss associated with the pandemic. There was little space to reflect on the complexity of researching the same phenomenon that one tried to keep at bay, but continuously intruded into every facet of life.

The papers collected in this special issue examine the situation regarding COVID-19 from various perspectives and are a meaningful contribution to the literature on the pandemic and its effects on Bangladesh.

The first article by Israt Jahan, Kazi Iqbal, Atonu Rabbani, and Abu Shonchoy reviews over seventy articles written on COVID-19 in Bangladesh since the advent of the pandemic. From their selection of high-quality publications on this topic, they address most of what has been found and written in the past year, incorporating policy conclusions with respect to averting transmission, ensuring food and income security, providing information on the disease, and minimizing the effect on future generations.

The second article by Hasinur Khan gives an overview of the trajectory of the pandemic in the country, comparing the situation with other places that have had similar paths. This is followed by Mehnaz Hoque, Maliha Tabassum, and Nur E Makbul's analysis of the statements made by the government over the media with an intent to handle the pandemic.

The fourth article looks at how COVID-19 patients fared in their isolation. Rukhsana Fahmi, Naimul Islam, Sardar Munim Ibna Mohsin, and Malabika Sarkar find that the COVID patients employed various creative techniques and found new types of relief to maintain their resilience during this time. The coping techniques of low-income households were examined by Shahidul Islam and Sanaul Mostafa, and they focused more on the sustenance of income and consumption rather than how people coped with the disease.

Gour Goswami and Kazi Labiba involved students in their research project to study how households in Dhaka city had a division in access to vaccines, with well-to-do families having access to vaccines but their (often live-in) help not necessarily having this access, particularly because of a digital divide. Finally, in the last article examining whether the vaccine is cost effective, Israt Sheba and Shafiun Shimul find that the vaccine is "highly cost-effective" when priced at below US \$10.

Farida Chowdhury Khan
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One and a Half Years into the Pandemic in Bangladesh: What Have We Learned So Far?

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Abstract

This survey paper compiles the major works on COVID-19 related issues in Bangladesh and intends to take stock of our knowledge and inform policies for better management of the pandemic. We find i) migration patterns can be utilized for better targeting of vulnerable areas without adequate testing and tracing; ii) contrary to the predicted V-shape economic recovery, a CGE model-based exercise suggests a 3.7 percent decline in output; iii) the initial decline in export is primarily due to demand shocks in the destination countries; iv) micro and small enterprises are the worst impacted sectors which need the most government funding; v) the relief package and enhanced social safety-net support for the vulnerable are largely inadequate, inefficient and fraught with delays; vi) 1.5 years of school closure and resulted learning loss is enormous and most likely irreparable; vii) pandemic induced income shocks have triggered more incidences of child-marriage and possible school dropouts for females; viii) vaccine hesitancy is very low, implying adequate supply can bring about a high vaccination rate; ix) severe impact on mental health has been found, demanding special attention, and x) the widespread provision of the correct information is critical to fighting misinformation and misconception about COVID-19.

Keywords: Bangladesh, COVID-19, Pandemic

Introduction

As of August 16, 2021, the COVID-19 virus had dramatically affected both the economic and social lives of Bangladeshis, with about 1.43 million confirmed cases and more than 24 thousand confirmed deaths. To contain the virus's first wave in early 2020, the government ordered limits on economic activities and travel from late March to May. These measures to restrict the transmission of the virus, combined with pervasive anxieties related to the pandemic, have had a substantial adverse impact on the country, and in particular, on the economy. Later, periodic shutdowns of economic activity, and varying degrees of restraints on the movement of people were imposed.

Bangladesh has also suffered from its interdependence with western countries, which have seen a number of surges in COVID-19 cases and several rounds of lockdowns and other restrictions over the past year and a half.

This paper aims at taking stock of the current evidence on a host of issues having a bearing on the identification of COVID-19 hotspots using migration patterns, impacts on various socio-economic and psychological variables, use of non-pharmaceutical interventions, and vaccines. We have divided these issues into eight broad topics, and these are: i) identification of COVID-19 hotspots using migration data, ii) macroeconomic impacts of COVID-19, iii) impact on employment and enterprises, iv) food security and safety nets, v) awareness building, behavioral change and use of masks, vi) education, child marriage, and women, vii) vaccines and vaccination, and viii) mental health.

A large volume of works on the socio-economic impacts and other relevant aspects of COVID-19 has been conducted in the context of Bangladesh. A search in Google Scholar with three keywords "COVID-19 Bangladesh socio-economic," returns 18 thousand entries. However, we were very selective in choosing the papers considering their relevance and methodological rigor. We have considered both published journal articles and unpublished manuscripts, which are mostly working papers. In the end, we have reviewed 71 manuscripts for this review article.

As the title of the paper suggests, we compiled the major issues and lessons learned from existing studies. The current body of evidence can help us better manage the current pandemic. This evidence can also help if there is an outbreak of the pandemic in the future, which is not very unlikely. If another pandemic occurs in the next decade, for example, what lessons can we draw from this pandemic so that we can manage the future one better? The main messages from this review paper are the following. First, the capacity for testing and tracing the disease for isolating the infected ones is very limited in developing countries. A low-cost method of identifying the hotspots can be implemented for targeted quarantine using migration data, both domestic and international. Districts and sub-districts with a higher number of domestic and international migrants are the potential hotspots of COVID-19, as found during the first wave of the pandemic. The studies find a strong correlation between migrants and their home districts and sub-districts.

Second, the impact of the pandemic on the economy does not stem from the disease itself but from the host of non-pharmaceutical measures taken by the government. Since yearly measured GDP data cannot be available to assess the immediate and short-run impact, some alternative measures such as electricity consumption, mobile financial services, etc., indicate that a dip in the economy occurred during the period of lockdown, after which it rebounded quickly. A CGE type model predicts that a three to four percent contraction of the economy can be attributed to the pandemic. The decline in export is largely due to the drop in demand in the destination countries; the role of supply shocks in the input sourcing countries is very low. Hence the management of the demand shocks should be the priority in boosting exports during the pandemic.

Third, micro and small enterprises bore the greatest brunt of the pandemic. In the early period of the outbreak, it was estimated that about two-thirds of the SMEs had experienced a reduction in revenue during 2020, and this loss continued in subsequent months in 2020-2021. The service sector, which requires person-to-person contacts, was the worst victim of the pandemic. It is also found that female workers lost more jobs than their male counterparts when a beauty parlor and a light engineering enterprise were compared. Workers living the large cities and metropolitan areas are found to be more vulnerable to losing their jobs. Empirical findings on micro and small enterprises and their workers can help policymakers to prioritize the sectors for disbursing the bailout packages. The key message is that the survival of the micro and small enterprises and the revival of the economy critically hinge on the efficiency of the government's incentive packages in reaching those that are most affected.

Fourth, food insecurity is an important issue to address during the pandemic. The extent of food insecurity varies substantially across occupations. Casual workers and day-laborers suffer the most during the pandemic. This impact is found to be more severe in urban areas than rural ones. It is worth noting that, in recent years, non-agricultural income out-shares agricultural income in rural areas of Bangladesh. Though the agricultural sector was more or less unscathed by the pandemic, this does not guarantee that the rural households are food secured. Moreover, those living in rural areas are less aware of available government packages, making them more vulnerable. An important lesson is that food insecurity can be severe in both rural and urban areas, and occupational targeting is required to minimize such shocks.

Moreover, the government-provided relief and extended safety-net package were found to be largely ineffective. Pervasive inefficiency in the support distribution, and unclear targeting mechanism, exacerbated the

sufferings of the vulnerable. Delay in the regular transfers of the safety-net support during the time of pandemic also caused concern. This compromised the food security and general well-being of the benefit recipients. The system of transferring monetary support using the digital financial system, such as mobile banking, showed promise in terms of rapid and timely delivery of the benefits – demonstrating the importance of widespread adoption of such a system for government-to-person (G2P) transfers.

Fifth, information provision is a key tool for combating misinformation, misconception, and malpractice for preventing the spread of disease. People tend to underestimate the large risks associated with disease, and this is more so when it requires pro-social behavior. That is, self-compliance with non-pharmaceutical measures is required not only for the safety of the individuals but for the wider community, and this information has to be communicated properly involving community and religious leaders. The use of local terms avoiding technical jargon is critical in reaching out to people. In essence, gaining the trust of the people and designing a holistic campaign strategy can help align the risk perception of the government and the citizens.

Sixth, like the virus, the impact of the pandemic on education is invisible but deadly; the side effects are expected to be long-lasting, and their extent is still unknown. Learning lost due to the closure of the schools is found to be very high and may not be amendable. This impact is higher for girls as they are more involved in household chores and caregiving. The pandemic has also forced younger girls to drop out of school and get married, making child marriage an important social issue during the pandemic.

Seventh, the low rate of vaccination is primarily a supply-side problem in Bangladesh since vaccine hesitancy is found to be very low. About three-fourths of study participants were found to be willing to get inoculated. Willingness to pay is also not low, as one study found that respondents are willing to pay the equivalent of about seven US dollars for vaccines. As the government of Bangladesh has announced that the vaccines will be available for free, a low hesitancy suggests that the vaccine coverage will be very high once the supply is ensured.

Eighth, the impact of the pandemic on mental health, manifested in an inflated level of stress, anxiety, and depression, has been found to be acute. Comparing with pre-COVID periods, studies have found about two to three times increase in psychiatric disorders during the pandemic. Women are found to be more vulnerable than men. Health care professionals are particularly susceptible to COVID-related fear, restlessness, and depression. Closure of schools has also led to increased depression and anxiety among students who are more worried about delays in their academic lives. Hence, taking care of mental health is as important as physical health during the pandemic, and institutional supports should be in place to serve a wide range of the population.

The rest of the paper is organized as follows. The next section describes the nine issues we refer to above. The final section concludes.

Issues and Lessons Learned

Identification of COVID-19 Hotspots Using Migration Data

There is a tradeoff between quarantining the whole population with high economic costs and testing with targeted quarantine (Barnett-Howell and Mobarak, 2020). Since testing is costly and time-consuming, targeted quarantine can be implemented using the knowledge of potential hotspots based on migrant and traveler data. Two cross-country studies, with a special focus on Bangladesh, use international and domestic migration patterns to predict hotspot regions within, as well as across, countries. Humans carry the disease, and if there is a systematic pattern of human movements from one place to another, we can predict vulnerable places even before the disease is spread. To identify the spatial distribution of the risk from COVID-19, these studies use the information on migration to identify the hotspots. The hypothesis is that the migrants traveling from already exposed countries can carry the disease to their home countries. Moreover, in the case of domestic migration, work related travel from one district to another can also result in the spread of the disease.

Ahsan, Iqbal, Khan, Mobarak, and Shonchoy (2020) construct a risk exposure index of COVID-19 for countries using information on bilateral migration and COVID-19 cases of the countries that the migrants are traveling from. They find that the index can significantly predict the current number of confirmed COVID cases in the host country. The same methodology is used to construct the index at the sub-national level in Bangladesh and finds that

the confirmed cases are higher in those districts with higher international migrants who migrated to worse affected countries. To validate the results, the study uses airport disembarkation card data from CAAB to identify the origin districts of the travelers and link this to the existing COVID-19 cases. Travelers' districts of origin and the extent of spread of COVID-19 have been found to be highly correlated in this study. The result is consistent with other measures of district-level migrants measured from 2016 Household Income and Expenditure Survey (HIES).

Lee, Mahmud, Morduch, Ravindran, and Shonchoy (2021) use the movement of both domestic and international migrants to predict the spread of the disease within a country (Bangladesh, India, and Pakistan). Their estimates show that one standard deviation increase in domestic migration increases the probability of COVID-19 cases by three percent in Bangladesh and 11 percent in India. Interestingly, it decreases the probability in Pakistan.

In a related paper, Shonchoy, Mahzab, and Mahmood (2021) construct a contagion risk index to measure disease spread. Using five sets of indicators - socio-economic, demographic, occupation, migration, and health infrastructure, their constructed index shows a strong and robust correlation (0.61) with sub-national COVID-19 cases across Bangladesh.

It is also worth noting that the COVID-19 symptoms in the host community of Rohingya camps in the Cox's Bazar district are found to be strongly correlated with return migration, mobility of individuals, and food insecurity (Lopez-Pena, Davis, Mobarak, and Raihan, 2020).

Macroeconomic Impacts of COVID-19

The COVID-19 pandemic has been creating an unprecedented global economic crisis. For a developing country like Bangladesh, the effects are expected to be even worse. The disease has impacted the economy in three broad ways. First, the disease itself has high costs related to mortality and morbidity. Second, there is an impact on the economy through various non-pharmaceutical measures such as lockdowns and social distancing. Third, slowing down of the global economy, particularly those in the West, tends to shrink the export volume.

After the first round of lockdown, the Bangladesh Institute of Development Studies (BIDS) prepared a note on the rapid assessment of the impact of COVID-19 and the lockdown on the economy, using high-frequency secondary data such as electricity consumption, remittances, deposits, credit, agent banking and mobile financial services (BIDS, 2021). In the first six months of the pandemic, the adverse impact of COVID-19 was found to be largely restricted to the period of the lockdown; the impact was worst in the first month of the lockdown. The economy seemed to turn around in the second month of the lockdown. A V-shaped recovery appeared very likely in the early period. It was argued that since agriculture was mostly insulated from the lockdown, the livelihoods of about 40 percent of the rural population remained largely unscathed. However, the medium-term impact of the pandemic remained unexplored.

Another systematic analysis of the macroeconomic impact is also short-term in nature. Using a CGE framework, S. H. Rahman, Razzaque, Rahman, and Shadat (2020) argued that the short-term impact is channeled through lower demand and supply in the domestic market and disruptions in international trade and financial flows. To analyze the impact of shocks, the study uses the GTAP model incorporated into a social accounting matrix multiplier model. Four sets of shocks have been analyzed in the model –consumption demand shock, oil price shock, tourism shock, and trade shock. Each of these shocks has been categorized into low, medium, and high shock scenarios, where a higher level of shock means a greater extent of changes. The first approach shows the impact of the shocks on global economies and finds that without any policy intervention and in a low shock scenario, GDP would decline by \$11 billion in 2020, which is 3.7 percent lower than the benchmark level in the absence of COVID-19 pandemic. The impact is larger with medium shock scenarios. The impact on export ranges from about 11 percent to 21 percent lower for Bangladesh, depending on different shock scenarios.

This exercise also includes the impact on household income and poverty. The average household income is expected to be reduced by four to eight percent under different shocks, leading to an increase of the share of the population under the poverty line to 24-28 percent, compared with the pre-COVID-19 rate of 20.5 percent. Hence, the early estimation on the impact of household income and poverty was not high, though the situation worsened over time, as indicated by the results in the food security section below.

COVID-19 pandemic has a devastating impact on international trade and the global value chain, and this impact is expected to be higher for the developing countries, which rely largely on western countries for their exports.

Depressed demand in developed countries has taken a huge toll on merchandise exports from developing countries. Major global suppliers of raw materials and intermediate goods such as China, India, and Brazil are also heavily impacted by the pandemic. Both these demand and supply shocks are likely to reduce the volume of exports of Bangladesh, particularly for the apparel sector.

Ahsan and Iqbal (2021) use firm-level data from Bangladesh to provide the first evidence on the performance of the apparel exporting firms in the early period of the pandemic by separating demand shocks in sourcing countries from supply shocks in input supplying countries. The study documents that during the first half of 2020, Bangladesh's exports declined by 33 percent compared to the previous year. This reduction is hypothesized as the result of two effects. First, the drop in consumer spending on clothing and clothing accessories in destination markets is likely to reduce apparel exports from Bangladesh. Second, the reduction can also be due to the early spread of COVID-19 and other non-pharmaceutical interventions by the government of China. The study finds that the export-demand shock played the dominant role in reducing Bangladesh's apparel exports in the first half of 2020.

Impact on Employment and Enterprises

Murshid, Mahmood, Shashi, and Sarker (2021) document the early impact of COVID-19 on employment using a survey conducted through Facebook. The data represents all socio-economic groups from 64 districts; however, the representation is greater for young and urban workers. People who live in large cities and metropolitan areas are found to be more vulnerable to losing their jobs. However, people with higher levels of education are less likely to be affected by income shocks. Also, the likelihood of reduction of income is higher when the locality experienced more deaths due to COVID-19.

Using surveys on enterprises and workers in the early period of the pandemic in 2020, Iqbal and Pabon (2020) found that 66 percent of enterprises predicted a reduction in revenue due to COVID-19. Larger sectors faced lower losses in revenue. The loss was predicted to be coming from a loss in sales, unsold products in inventory, unpaid receipts, and perishable and non-storable raw materials. Due to disruptions in the supply chain, owners were worried that they would not be able to resume full production even in a month after the shut-down was lifted. Almost 90 percent of owners feared that if the shut-down continued for three months at a stretch, they might have to either wind up their business or survive with huge losses. About 98 percent of the workers were paid in March 2020, either partially or fully. About two-thirds of workers did not think that they would be paid in May 2020. Approximately three-fourths of the SMEs were aware of the incentive package announced by the government. The study noted that the survival of the SME sector critically hinges on how effectively the government's incentive packages reach the most affected SMEs.

Islam and Rahman (2020) conducted two rounds of survey (July 2020 and January 2021) of the light engineering firms and a few service-related enterprises and their workers all over Bangladesh to assess the impacts of COVID-19 on workers. Even though 60 percent of firms were found to be open during the first lockdown (June 2020), almost 97 percent of firms started operating at the beginning of 2021. Although self-reported health guidelines were strictly followed during the first lockdown, the extent of compliance decreased in the following lockdown by 23 percent for mask-wearing and 49 percent for handwashing in the workplace. Sales and use of raw materials have decreased during the first lockdown compared to the pre-COVID time as well, falling further in the second round. In the first round, monthly sales decrease by 56 percent compared to the pre-COVID level, and by 17 percent in the second round. The monthly value of raw materials also fell by 54 and 18 percent, respectively, in rounds one and two. More than 50 percent of the enterprises reported that the price of raw materials might increase due to lockdown.

Interestingly, the recovery of light engineering and service sector firms was found to be the slowest for labor-intensive female sectors, and those with higher health risks. Workers in these sectors are also at high risk. Although the overall unemployment increased by around seven percent between the two surveys, the unemployment rates for females increased to 54 percent in round two compared to 40 percent in round one. Moreover, psychological stress during the pandemic was found to be significantly higher for female workers, particularly those who are unemployed. The results suggest that female workers, particularly those who were in the service sector, were affected more than their male counterparts. Moreover, the percentage decrease in income for female workers was also higher than that of male workers during the first lockdown.

Food Security and Safety Nets

The COVID-19 lockdowns, mobility restrictions, and overall economic downturn have caused significant impacts on vulnerable populations, especially for those who are low-paid, living hand to mouth, residing in the rural areas, and employed in the informal sector casually (Barrett, 2020). These adverse effects include illness (or hospitalization), job or income loss resulting in food insecurity and debt along with concerning effects on mental and psychological well-being. Almost 90 percent of households have faced negative income shocks after the first lockdown was implemented in Bangladesh, with those depending on daily casual labor being affected significantly (WHO, 2020). Ahmed, Islam, Pakrashi, Rahman, and Siddique (2021) conducted a rapid phone survey of 10,000 respondents in Bangladesh to understand the determinants and dynamics of food insecurity and coping strategies adopted by rural households during the pandemic induced lockdown. They found that the main occupation of the household head is a significant determinant of food insecurity. When the household head worked as a casual farmworker or as a day-laborer, the household suffered from food insecurity more intensively than did those headed by farmers or public sector employees. They documented that food insecurity is severe for households that completely lost their income during the pandemic compared to those that lost earnings partially. The coping strategy employed by rural households was concentrated on relying on stored food at home and drawing down on savings. Rural households also used informal borrowing from social networks as a coping mechanism. Shonchoy et al. (2021) documented other coping strategies, such as cutting down spending on food and medication.

Ahmed et al. (2021) conducted a repeat survey on a subset of respondents during the second pandemic wave and found even a more significant impact on food insecurity than the first wave. Among those who were mildly insecure during the first wave, 88 percent reported that they were severely insecure during the second wave. While many studies have found microfinance as a tool to minimize the level of poverty, Ahmed et al. (2021) found that households with microfinance membership are at a higher risk of food insecurity compared to the households who are not members during this pandemic, perhaps due to the regular repayment obligation and losses incurred from enterprise income. T. Rahman, Ahmed, Pakrashi, Siddique, and Islam (2020) confirmed these findings and shed light on future concerns and uncertainty faced by this vulnerable population. They found that rural households who lost their income wholly or partially to be more concerned about their future food security and income. In contrast, income secured households were worried about health and medical treatments.

One widely adopted public policy to tackle food insecurity, poverty, and hunger, especially at times of crisis, is public safety nets. For example, various public food transfer programs have played a vital role for poor and vulnerable households in Bangladesh. The Food Friendly Program (FFP) alone supported 27.5 million people in Bangladesh in the 2019-2020 fiscal year. During the pandemic, the Bangladesh government's assistance includes direct and indirect income support through social safety net interventions and economic support programs aimed at businesses and farmers. In total, the Bangladesh Government allocated Tk 955.74 billion (US\$11.24 billion) to social safety net programs; this amounted to 16.8 percent of the total budget and three percent of gross domestic product (GDP) in FY 2020/2021. This allocation is 17 percent higher than the allocation in FY 2019/2020. However, an increased leakage in FFP programs has been found during the pandemic compared with a normal year (S. Chowdhury, Khaled, Raghunathan, and Rashid, 2020).

One relevant policy question is how effective such programs are during the ongoing COVID-19 pandemic. Ironically the FFP program amount and delivery were severely compromised during this pandemic, worsening the adverse conditions of the poor. S. Chowdhury et al. (2020) reported that the average amount of distributed benefit has been eight percent lower in 2020 compared to 2018. Only 64 percent reported receiving their allotted amount (60 KG) in 2020 (March-April) compared to 86 percent in 2018. The shortfall increased in the latter months of 2020, when they received 12.7 KG on average instead of the entitled 30 KG. Although the price per kilogram is the same in 2018 and 2020, recipients reported paying bribes, and the average amount of bribes was higher during the pandemic. Similar suffering has been documented for other safety-nets. A survey of the beneficiaries of the Old Age Allowance (OAA) and the Widow Allowance (WA) during the first lockdown found that most of the households had zero income during the survey period (Shonchoy et al., 2021). Moreover, 41 percent of the OAA and WA beneficiaries reported not receiving the total benefit amount during the pandemic. Those who could get the benefit transfers digitally were more likely to receive the amount on time and suffered less during the lockdown.

Other support programs were implemented to mitigate the effects of the COVID-19 crisis. These included stimulus package to assist migrant workers, unemployed youth, informal sector workers, and support to farmers and micro, small, and medium-sized enterprises. However, only 60 percent of farmers were aware of the package, and among these only five percent applied for the support, and one percent received the loan (Ahmed, Hossain, Siddique,

and Jobe, 2021). Confusion on what is being provided, who is getting it, when will they receive the relief, and how the government would distribute the relief have created a loss of trust in the government (Ali, Hassan, Hossain, and Haque, 2021). Assistance from NGOs has also not been found to have a significant impact on the well-being of these households during the pandemic.

Awareness Building, Behavioral Change, and Use of Masks

People living in rural areas are generally “disconnected” from the digital world of the internet, social media, television, radio, and smartphones (Ahmed and Diesner, 2012), and thereby lacking access to the latest, verified information. As a result, rumors, myths, and misconceptions about the coronavirus are widespread in remote rural areas in developing countries (United Nations, 2020), and can confuse the risks of COVID-19 and worsen the public health crisis (Galvão, 2021). Poor health literacy also aggravates misinformation and makes infection control difficult among the rural poor (Paakkari and Okan, 2020). In addition, people living in remote rural areas, who are predominantly poor, often cannot protect themselves because of their socio-economic conditions (Ravallion, 2020).

Zaman, Rahman, Rabbani, and Matin (2020) reported that socio-economic conditions and cultural diversity play an essential role in perceptions regarding COVID-19 in Bangladesh. Groups such as day laborers do not understand what different public awareness terms (social distancing, lockdown, stay at home, quarantine, etc.) mean. In villages, the term “home,” denotes a few close households residing together; hence “home quarantine” is largely misunderstood. Moreover, people have little information on what to do when they get infected. Respondents in studies mentioned the provision of a customer service number at the Institute of Epidemiology, Disease Control and Research (IEDCR). However, they noted that they would prefer talking to health officials in their localities in person rather than consultation by phone. People also often find the service inaccessible due to the high call volumes to these numbers. Misconceptions about suggested treatments can also cause distrust in health systems. This is severe in urban slums where people think that hospitals do not treat patients, but rather kill them if they do not recover soon (Zaman et al., 2020).

Better information may correct misconceptions and change perceptions about risks of infection and fatality, thus changing people's preventive behavior. Sardar (2020) examines this hypothesis using a randomized experiment on households with international migrants stuck in Bangladesh due to travel restrictions. In this experiment, the treatment group received updated information on the total number of COVID-19 cases in their district, the host country, and the fatality rate in Bangladesh and worldwide. This information intervention has been found to positively impact the perception of local prevalence (infection risk) of COVID-19, and negatively affect perceptions regarding the severity of consequences (fatality risk).

Another issue regarding misinformation is stigmatization, which can have adverse public health implications, as it may lead people to avoid both testing and adopting prevention measures. Moreover, it can have a profound direct impact on the mental health of those who are stigmatized (Bharadwaj, Pai, and Suziedelyte, 2017). A leading cause of stigma is the widespread misinformation and false beliefs about COVID-19 that are fueled by rumors circulating in the news (Bursztyn, Rao, Roth, and Yanagizawa-Drott, 2020) and spread through social media platforms (Pennycook, McPhetres, Zhang, Lu, and Rand, 2020). A. Islam, Pakrashi, Vlassopoulos, and Wang (2021) document that providing valid information on infection transmission and prevention mechanisms, public guidelines to address social stigma, and the geographic distribution of infection rates improves mental health and reduces stress and anxiety substantially. Similarly, Siddique, Rahman, Pakrashi, Islam, and Ahmed (2020) find that disseminating information through text messages and phone calls has been the most effective way to improve public awareness and knowledge on COVID-19 precautions. However, both phone calls and text messages combined with phone calls have a more substantial effect on women than men in Bangladesh. Concern about the health of household members is an essential driver for women to be more compliant than men. These also have a significant impact on the compliance of households with respect to COVID-related hygiene practices, especially for those who do not have access to television or radio, implying they are an important channel to build public health awareness.

The possibility of controlling the disease's spread depends on whether or not people are following preventive measures. Murshid et al. (2021) state that people living in small towns and cities are more likely to follow preventive practices than those living in villages. Knowledge of COVID-19 and income have been found to have a significant impact on protective measures such as mask-wearing and handwashing. Masks were mandated by the government as soon as COVID-19 started to spread in April 2020. About 80 percent of the respondents in their survey reported

wearing masks, but this behavior did not continue in the months that followed. The percentages dropped to 50 percent in May and to 25 percent in June that year.

Abaluck et al. (2021) tested various interventions on 600 villages in Bangladesh to identify the best methods to increase the percentage of people wearing masks. They find that free distribution of masks and role modeling by community leaders do not substantially increase use. However, periodic monitoring of mask use may increase use by 29 percentage points. Monitoring over a longer term (10 weeks) can increase mask usage up to three times than it does in the short term. The intervention that substantially increases the percentage is the combination of four interventions—free distribution of masks, endorsements by community leaders, promotion of mask programs, and monitoring.

Effective responses to COVID-19 depend on how people cooperate with the government in adopting preventive measures (lockdown, social distancing, mask mandates, etc.), testing and healthcare systems. Government policies and communications may have diverse impacts on the acceptance and behavior of communities. Most people, irrespective of gender and occupation, are found to adhere to a lockdown. They are found to be aware of its necessity and how it may restrict the spread of the disease. However, some groups of people are found to be reluctant. These include younger people who believe that God will protect them and those who need to go out to look for work or relief. Although it is difficult to monitor everyone beyond the main roads, patrolling by police and army representatives can significantly result in people staying at home (Ali et al., 2020).

Education, Child Marriage and Women

As the world continues to grapple with the challenges of the COVID-19 pandemic, governments and scholars need to evaluate and improve adopted policies to educate children in these unprecedented times. In parallel, broad outreach is necessary to enhance the uptake of already implemented remedial education programs. Globally, 258 million primary and secondary school-age children were not in school even before the pandemic (Rogers and Sabarwal, 2020). The situation has been exacerbated since the onset of COVID-19, potentially resulting in lower enrollment rates, higher dropout rates, and poorer learning outcomes. In a simulation exercise based on 157 countries, Azevedo, Hasan, Goldemberg, Geven, and Iqbal (2021) found that COVID-19 could reduce the effective years of schooling from 7.9 years to 7 years.

School closures have persisted in Bangladesh since the beginning of the lockdown on March 26, 2020, leading to reduced learning and a high dropout rate. Missing school is also associated with a reduction in the growth of skills among children. Researchers documented a sizable decrease in the average hour of study from 10 to 2 hours a day. School and home study time are found not to be substitutes. Moreover, time usage in non-learning activities (working for the family's economic need; sports, creative activities, and leisure; helping younger siblings in the study, and religious activities) has increased (Beam, Chaparala, Chaterji, and Mukherjee, 2021).

Although children are getting more time with parents, they are spending more time in household activities than homeschooling. For poor households with lower levels of education, it is especially difficult for the parents to homeschool their children. Also, households are more concerned about the health of their children than their ability to continue educational activities. Students who can afford to do so are spending more time with private tutors (Beam et al., 2021).

During the pandemic, the Ministry of Primary and Mass Education and the Ministry of Education in Bangladesh have adopted a multi-modal strategy to deliver educational programs to primary and secondary school students through television, internet, mobile phones, and radio (Sarwar et al., 2020; Biswas, Roy, and Roy, 2020). Academic and co-curricular classes for students and live sessions for parents and teachers have been hosted on TV. However, based on a study by Asadullah (2020), 62 percent of children in rural Bangladesh have access to TVs, and only 25 percent of these students end up following lessons on television. Thus, a sizable fraction of rural children is not taking advantage of televised resources. Beam et al. (2021) mention resource constraints to be a significant barrier to continuing remote education in rural areas. Hassan, Islam, Siddique, and Wang (2020) show a cost-effective way to improve the educational outcomes of resource-constrained children. This paper employs a village-level randomized controlled trial (RCT) design with tele-mentoring intervention. They find the program to improve learning outcomes of treated children by 0.75 standard deviation (SD) points, and to increase homeschooling involvement of treated mothers by 0.64 SD.

The loss in income and school closure during the pandemic forced many children in rural areas to generate income themselves. Makino, Shonchoy, and Wahhaj (2021) analyze the time use of children, plans regarding

children's schooling continuation, and the incidence of child marriages during the school closure. They find that pandemic-induced shocks forced young girls to get married before they reached the minimum legal age of marriage, making them victims of child marriage and school dropout. They also document a sizable, gendered effect on time relocation away from home study. They found a decrease in time allocation for educational activities for girls than boys. On the contrary, the time-use for household activities is higher for girls than for boys during the school closure. This finding was echoed in "UNFPA-UNICEF Global Programme to Accelerate Action to End Child Marriage," a multi-round survey of 960 adolescent girls during the COVID-19 pandemic. In this paper, most of the girls reported spending more time in caregiving and household work. The pandemic's impact also deteriorated girls' psychological health since they have been experiencing stress and isolation (Amin, 2021).

The gendered effect of pandemics also includes higher incidences of domestic violence. Murshid et al. (2021) reported that 6.03 percent of the respondents reported physical and verbal violence, whereas 93.97 percent reported they face more verbal violence in the household. The frequencies of the quarrels in the household are higher for more than 15 percent of the respondents. Furthermore, 19.36 percent of respondents reported being highly insecure/unsafe during the lockdown due to increased crime and social instability.

Vaccines and Vaccination

It is an astonishing feat of modern medicine that within a year since the identification of the SARS-CoV-2 virus in late 2019 (Coronaviridae Study Group of the International, 2020) and the announcement of COVID-19 as a public health emergency of international concern by the WHO in early 2020, a number of effective vaccines against the infection have been developed. Over time, the COVID-19 virus has naturally mutated, and more virulent variants have emerged. However, most of the vaccines have largely proved to be effective against the new strains so far. One should note that vaccines are most effective against the severity of the disease and less so against being infected by COVID-19. Hence, vaccines have lowered hospitalization, the need for oxygen and ventilators, and mortality. The COVID-19 vaccines have been associated with certain risks, most notably, with increased incidence of developing blood clots and heart inflammation. Such "likely association" has led regulatory bodies to include warning labels. However, the adverse outcomes have been extremely rare, and so far, the benefits are believed to outweigh the rare risks of vaccinations.

In this context, the emerging "social science" and "public health" literature on COVID-19 vaccines have largely looked at attitudes towards vaccines, highlighting vaccine hesitancy and willingness to vaccinate along with different socio-economic determinants. We should note Bangladesh is considered one of the least vaccine-hesitant countries in the world (De Figueiredo, Simas, Karafillakis, Paterson, and Larson, 2020). However, the attitudes towards vaccines are typically gauged by childhood immunization, which is high because of the highly successful Expanded Program on Immunization (Adams et al., 2013). Hence, one can potentially hypothesize that overall hesitancy is a minor issue in Bangladesh, and supply-side issues will possibly contribute more towards vaccine uptakes.

The low hesitancy towards COVID-19 vaccines largely holds true in the literature that we have come across. Abedin et al. (2021) find the intention to be vaccinated at 74.5 percent, with a slightly higher rate among men (possibly due to a higher perceived exposure to the infection because of their being more mobile). Higher-income individuals reported a higher level of interest in getting vaccinated. Only 8.5 percent of the respondents state a complete unwillingness to be vaccinated. The low hesitancy is confirmed by other studies. Haque et al. (2021) find 87 percent of the respondents are willing to be vaccinated if the government recommends it. Not only that, 80 percent of the respondents suggested that government should mandate the vaccination; this is quite unique and even at odds with attitudes towards mandatory vaccinations in other countries. Other studies also find high vaccine acceptance rates. Ali and Hossain (2021) report a vaccine hesitancy rate of only 32.5 percent among the study respondents. This study further reports a higher vaccine hesitancy among men (unlike, say, Abedin et al., 2021), aged over 60 years, and those who have the perception that the efficacy of vaccines is low. M. B. Hossain et al. (2021) report a higher hesitancy rate of 41.1 percent among the study participants. One should bear in mind that these studies come from different study populations using different sampling methods and study tools (for example, how vaccine hesitancy is operationalized in each study). Nasir et al. (2021) study health care professionals and finds a high level of knowledge around the efficacy and safety of COVID-19 vaccines, with 29 percent of the respondents reporting hesitancy towards the vaccines because of safety reasons. On the other hand, Alam et al. (2021) report a vaccine acceptance rate that is lower than 50 percent among the health care professionals they study. Overall, a high vaccine acceptance rate emerges from the studies carried out so far, mirroring the prior success in immunization in Bangladesh.

Except for a couple of studies, most studies implicitly assume that the vaccines will be freely distributed and do not explore the role of prices in the willingness to be vaccinated. Kabir et al. (2021) consider the willingness-to-pay (WTP) for COVID-19 vaccines and find that about 68 percent of respondents are willing to pay for an effective vaccine, with an average WTP of about USD \$7. On the other hand, Abedin et al. (2021) find a much lower value; only about 46.5 percent of the respondents are willing to accept the vaccines at a price of USD \$1.2. Vaccine hesitancy and the WTP are also associated with different types of perceptions respondents are privy to. Generally, perceived efficacy and safety are strong determinants of vaccine hesitancy (M. B. Hossain et al., 2021; M. S. Islam et al., 2021). Vaccine hesitancy is much higher among respondents who have a concern regarding whether the vaccines are "halal" or not (Kabir et al., 2021). Religious beliefs and norms, as well as misinformation from different channels of media, are also found to be strongly associated with attitudes and perceptions regarding vaccines, a finding which has strong public policy implications (Arefin, Hossain, and Rahman, 2021).

We conclude by commenting on actual vaccine uptake and deployment in Bangladesh based on some ongoing work. The intercountry inequality in vaccination rate is a widely discussed topic, and low and low-middle-income countries have lower vaccination rates compared to higher-income counterparts (Ritchie et al., 2021). At the time this article was written, about six million people (3.7 percent of the population) in Bangladesh had received vaccinations, including 4.3 million who received full two doses (2.6 percent of the population). Preliminary findings from a nationally representative phone survey reveal men, members from higher-income households, and higher education are robust predictors of vaccine uptake (JPGSPH, 2021). These preliminary findings suggest socio-economic privilege determined access to vaccines and deliberate policy interventions and community engagements are required to ensure more equitable distribution of COVID-19 vaccines.

Mental Health

Mental health and psychological well-being can be surrogates for subjective "welfare" and have received considerable attention among researchers from different social science disciplines during the COVID-19 pandemic. The cross-sectional nature of the studies also limits ascertaining the causal effect of the pandemic on mental health outcomes [a notable exception is Hamadani et al. (2020), who took advantage of pre-pandemic data on mental health outcomes from an ongoing research project]. Kar et al. (2021) aimed to circumvent this problem by collecting data on suicides reported in newspapers in Bangladesh and India. They find a much higher level of reported suicides during the post-pandemic period compared with pre-pandemic times. Mallik and Radwan (2021) use a recall method within a cross-sectional study to measure the prevalence of predictive psychiatric disorders for a cohort of children and adolescents. They find a two to three times increase in psychiatric disorders during the pandemic compared to the pre-pandemic period. However, such before and after analyses are not common. We restrict ourselves to studies that attempted to link pandemic related fear and perceptions with mental health outcomes.

In terms of mental health outcomes, the reviewed literature has primarily focused on depression, using tools such as a nine-item Patient Health Questionnaire (M. Khan et al., 2021; Sakib et al., 2021), anxiety using a seven-item Generalized Anxiety Disorder tool (M. Khan et al., 2021; Sultana, Khan, Hossain, and Hasan, 2021) along with stress using the Depression Anxiety and Stress Scale 21 (S. R. Chowdhury et al., 2021), and sleep quality with the Pittsburgh Sleep Quality Index (Ahmed et al., 2021; Zubayer et al., 2020). Researchers have also used specialized tools for specific populations, such as the 15-item Geriatric Depression Scale for the elderly (Mistry et al., 2021a).

It is important to recognize the vastness of the literature that has already been developed to understand mental health outcomes and well-being during the COVID-19 pandemic, and what roles the fear of infection has played in worsening the subjective well-being of the studied populations. Health care professionals are particularly vulnerable to COVID-19 infections and Sakib et al. (2021) find that health care professionals dealing with patients with flu-like symptoms suffer from a higher level of COVID-related fear, restlessness, and depression. Not surprisingly, nurses having access to personal protective equipment report lower levels of stress, anxiety, and depression (S. R. Chowdhury et al., 2021).

Al Mamun, Gozal, Hosen, Misti, and Mamun (2021) find a fear of COVID, measured using a scale, and the presence of comorbidity are associated with insomnia and sleeping disorders. Their large sample with over 10,000 respondents allows the geographical mapping of outcomes by different districts in Bangladesh and find district associations with fear and insomnia. Both Al Mamun et al. (2021) and Ara, Rahman, Hossain, and Ahmed (2020) find that women are more likely to report insomnia and sleeping disorders. Women typically report worse mental health outcomes, suggesting a distinct gendered feature of the pandemic, which has both research and policy implications.

Sakib et al. (2021) find depression and fear of COVID are higher among female health care professionals, and M. Rahman, Zubayer, Bhuiyan, Jobe, and Khan (2021) find a higher suicide risk among female respondents. A multi-country review by Marzo et al. (2021), which includes Bangladesh, find higher odds of psychological distress for female respondents.

Several studies have explored COVID-19 symptoms and mental health. Zubayer et al. (2020) show that having COVID-19 related symptoms (with or without actual diagnoses) is associated with a higher level of stress, anxiety, and depression. Sultana et al. (2021) find not only a higher level of anxiety and depression among students with suspected COVID-19 symptoms, but also suicide ideation or "feeling better off dying" among them. The fear of COVID-19 and worsening mental health can further be compounded by having family members and acquaintances with COVID-19 symptoms and diagnoses (A. Khan et al., 2021; Zubayer et al., 2020). A few studies have also explored respondents' perceptions regarding the capacity of the health care sector dealing with COVID-19. Banna et al. (2020) have found the uncertainty regarding the health system's capacity to address COVID-19 infection and care can lead to worse mental health outcomes. Mistry et al. (2021b) have also found a similar association among Rohingya refugees – their psychological well-being worsened when they perceived difficulties in accessing medical care and medicine. Studies such as Abir et al. (2021) and Mistry et al. (2021a) have also shown positive associations between detrimental mental health outcomes and social isolation, quarantine, and loneliness.

Next, we focus on education and economic uncertainty. Bangladesh has maintained one of the strictest closures of education institutes which have postponed in-person classes since the pandemic broke out in March 2020 (ADB, 2021). As such, Mondal, Khan, Ali, Ahamed, and Ahmed (2021) find the majority of the respondents facing severe problems with education-related activities leading to worse quality of life. A. Khan et al. (2021) find increased depression and anxiety among students who are more worried about delays in their academic lives. Hamadani et al. (2020), the only study with real-time before and after within-subject analyses, report a higher level of food insecurity during the pandemic compared to before. Sultana et al. (2020) find a positive association between financial hardship, inadequate food supply, and anxiety and depressive symptoms. Studies have also found higher-income poverty (Hamadani et al., 2020) and lower family income (M. Islam, Islam, Mosaddek, Potenza, and Pardhan, 2021) during the pandemic, leading to worsening mental health outcomes. M. Khan et al. (2021) have documented higher levels of stress and depression associated with being unemployed among young men in Bangladesh.

While the pandemic can worsen mental health through a number of channels (exposure, illness, isolation as well as food insecurity and career and financial uncertainties), some studies have also identified some heterogeneous effects that can guide on how to build psychological resilience during the ongoing pandemic which does not have an immediate end in sight. Ahmed et al. (2021) have grouped study participants according to their adaptiveness based on Big-5 personality traits. The findings show lesser perceived stress among the individuals who are more adaptive compared to lesser or maladaptive individuals. If these traits are malleable and plastic, investing in such adaptive capacities through awareness, education interventions, and counseling can help the vulnerable individuals to better cope with the pandemic and maintain a positive outlook during trying times.

Conclusion

The first COVID-19 case was found on March 8, 2020, in Bangladesh. The pandemic and the lockdowns discussed in this paper affected many aspects of people's lives, and this paper has discussed the evidence on resulting social and economic outcomes. It has compiled the findings of studies from different sources such as research articles, working papers, policy papers, and newspaper articles. Its purpose was to understand the current situation from the evidence, and to provide information that helps manage policy interventions

We find that both international and domestic migration data has been able to predict the risk and spread of the disease effectively. This identification of vulnerable areas may help design efficient contagion policies. The lockdowns and mobility restrictions have affected overall production, trade, and employment. A large share of the manufacturing industry faces a huge loss in their sales, revenue, and exports. Research cited above have shown us it is crucial to concentrate not only on how to increase demand in developed countries but also on managing supply chains.

Studies highlighted that micro and small enterprises experienced a significant reduction in revenue, with a disproportionate number of female workers losing their jobs. Smaller firms in peri-urban areas were more affected.

There is a policy need to prioritize the firms according to their vulnerability and take measures to manage risks and vulnerability of both firms and their employees.

The COVID-19 pandemic also generated food insecurity among people, particularly among day laborers, who are the most susceptible group as they could not go out looking for jobs, nor did these jobs always exist because of nationwide lockdown and reduced economic activity. Targeting vulnerable groups and managing the distribution of government packages would be necessary steps to combat widespread food insecurity.

Providing information is found to be effective in controlling the misconceptions and building trust among the society if it comes from the community and religious leaders. Wearing masks prevent the spread of increases if monitoring or patrolling is involved when someone is found without a mask.

The impact on education is inevitable due to one and half years of school closure. The learning absence for the students is not temporary; rather, it will carry on to a loss in skills for the future workforce. Children, especially the girls, suffered the most and were also sometimes victims of child marriage and school dropout. This warrants a targeted policy for better monitoring and surveillance of incidences of child marriage in rural areas.

The hope for being vaccinated was very low initially because of the low supply and high cost of the vaccines in Bangladesh. Moreover, the willingness to pay for the vaccine is very low as most people do not understand the positive effects on society if they are vaccinated. However, studies suggest that vaccination will not be a problem if the government ensures a sufficient supply of the vaccine and if it continues to be free.

The government of Bangladesh has been taking several measures to combat the pandemic. The policy measures target small and large firms, industries, different occupations, vulnerable groups, and other associated parties. However, due to the sudden outbreak of the disease, the government had to take instant measures to stop spreading the disease. This study compiles the impact of many of the measures taken by the government and helps compare them to assist future policies. It also directs the reader to the issues and concerns that may appear in the future due to the pandemic. Therefore, the study contributes to the literature by examining the current pandemic in a manner that may be helpful to design and manage future pandemics.

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COVID-19 Pandemic Situations and Predictions in Bangladesh

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Abstract

It is evident that the COVID-19 pandemic has affected everyone regardless of race, nationality, and economic status. This paper aims at analyzing the current situation of Bangladesh and predicting infections and deaths for short, moderate, and longer periods of time using Trajectory-Pathway Strategy (ITPS), polynomial regression and Susceptible-Infectious-Removed (SIR) methods and the COVID-19 data extracted from different sources as of April 22, 2021. The case positivity rate increased to 23.6 per cent on April 9 from its lowest 2.3 per cent on February 9, 2021. The tests per head remain low when compared to other south Asian countries. We found that the potential pathway of infections for Bangladesh currently matches the actual infection pathways for Sweden and Pakistan. The ITPS suggests that by May 21, 2021, Bangladesh will cross 916,830 cases and 13,386 deaths, similar to Sweden's pathway, while by May 22, 2021, these figures will be 772,381 and 11,277 respectively if Bangladesh follows Pakistan's pathway. The polynomial regression predicts that by the end of April 2021, total number of infections and deaths will be 851,986 and 11,669, respectively and the required hospital beds and ICU beds will be 20,053 and 4,011, respectively.

Keywords: Bangladesh, COVID-19 Deaths, Infections, Prediction

Introduction

The severe acute respiratory syndrome coronavirus (SARS-CoV-2) is an infectious disease first identified in December 2019 in Wuhan, the capital of China's Hubei province. This disease spread first in Wuhan in December 2019 and then spread globally since February 2020, resulting in the ongoing coronavirus pandemic. For most people, COVID-19 infection will cause mild illness, such as fever, cough, and shortness of breath. However, it can make some people very ill and can be, in its worst scenario case, fatal. Older people and those who have pre-existing medical conditions (such as cardiovascular disease, chronic respiratory disease, or diabetes) are at risk for severe cases of the disease (WHO, 2020). Other common symptoms may include fatigue, muscle pain, diarrhea, sore throat, loss of smell, and abdominal pain.

Bangladesh found its first coronavirus cases on March 8, 2020. The first three coronavirus cases were confirmed by the IEDCR at a press conference (IEDCR, 2021). The cases included two men and one woman, who were aged between 20 and 35. Of these, the two men had recently returned from Italy and the woman was a family member of one of these two men. Approximately 111 tests were conducted on that day in Bangladesh. On March 16, the country detected three more cases of COVID-19, taking the total number of infected individuals to eight. The first death due to coronavirus occurred on March 18, when a 70-year-old man died of the disease. To slow down the spread of the virus, Bangladesh, like many other countries, adopted several measures such as compulsory lockdowns, quarantines at home, social distancing, and bans on domestic and international flights. This was followed by shutting down schools and colleges, and a week later all remaining offices were closed, resulting in a national lockdown (IEDCR, 2021).

The first peak in infections took place on July 2, 2020, when 4,019 cases were identified while the second wave began in March 2021. As of April 22, 2021, the number of COVID-19 infections and deaths were 736,025, and 10,780 respectively. The government announced a strict lockdown on April 14 and extended that to two weeks. For people in one of the most densely populated countries, it is a difficult task to maintain social distance, despite the closing of educational institutes, offices, and markets. These closures may contribute considerably to reducing the spread of the pandemic, but people are still at risk when traveling in crowded public transport and living cheek by jowl in urban slums. Additionally, the public healthcare system in Bangladesh is inadequate and overburdened. According to the World Bank (2020), in 2015 Bangladesh had 0.8 hospital beds for every 1000 people.¹

A considerable amount of research on COVID-19 using Bangladesh data has already been published (Khan and Hossain, 2020b; Ali et al., 2020; Khan and Howlader, 2020a; Khan et al., 2020; Khan and Howlader, 2020b). Recently, Islam et al. (2020) proposed a model to measure the risk of infectious disease and predict the risk of COVID-19 transmission using data from Bangladesh and four other countries - the United States, Australia, Canada, and China. Paul et al. (2020) proposed a Susceptible-Exposed-Infectious-Removed (SEIR) epidemic model that accommodates the effects of lockdown and individual based precautionary measures and used it to estimate model parameters from the epidemic data for three South Asian countries - Bangladesh, India, and Pakistan. However, their prediction model for Bangladesh may not give reasonable results because of the small sample used. Mamuna and Griffiths (2020) discussed possible suicide prevention strategies when the first COVID-19 suicide case in Bangladesh took place. None of these studies analyzed the current situation with regard to the coronavirus in Bangladesh, nor made direct predictions for incidence, deaths, hospital ICU beds, number of severe patients, etc. This paper fills that gap.

There are a number of models for infectious diseases available in literature and have been used primarily for countries where the number of cases is very high.² Particularly, a number of studies (Kucharski et al., 2020; Chinazzi et al., 2020; Roosa et al., 2020; Grasselli et al., 2020; Boldog et al., 2020; Hui et al., 2020; Xie et al., 2020; Lourenco et al., 2020; IHME, 2020; Phua et al., 2020; Barra-Sandoval et al., 2021; Guo and He, 2021; and Roberto et al., 2021) have used different mathematical models to determine the spread of the disease and predict the number of incidence and health care facilities in tackling COVID-19 spread. In this study, we will use a polynomial regression model, the Infection Trajectory-Pathway Strategy method and a Susceptible-Infectious-Removed (SIR) model to predict the total number of infected people, deaths, and the number of hospital and ICU beds. It should be noted that, given the weak existing healthcare infrastructure and the spread of the virus, the government may find it difficult to manage the spread in light of the predicted statistics.

Data Source

The data used for the current study has been from the Esri Living Atla (Dong and Gardner, 2020). This is a data repository maintained by the Johns Hopkins University (Johns Hopkins University, 2021a, 2021b) until April 22, 2021. For prediction purposes, we used data from April 1 to 15. Several other secondary data sources have been used such as the IEDCR (IEDCR, 2021), Our World in Data (Max Roser and Ortiz-Ospina, 2021), and Worldometers (Worldometers.info, 2021).

Methodology

Basic statistical analysis, trend line charts, correlation, and *t*-tests have been used in this study. For a prediction of COVID-19 infections and deaths for a short and moderate period of time, a higher order polynomial regression model and the Infection Trajectory-Pathway Strategy (ITPS) methods, respectively, have been used. For a prediction of COVID-19 infections and deaths for a longer period of time, the SIR model has been used. We implemented these three prediction techniques to forecast mainly the cumulative number of COVID-19 infections and deaths in Bangladesh. We believe that knowing predicted figures during different time intervals can help the authorities to take the appropriate and necessary actions that will reduce the spread of the disease for these three time periods that are considered.

Most models infer trends regarding an epidemic in a given location by looking at the current status of the disease, and then applying a mathematical approximation of its likely future path. This is drawn from experiences in

other locations and/or assumptions about the population, transmission, and public health policies in place. Here, the second order polynomial regression model has been used with confirmed orthogonality to help arrive at uncorrelated regression coefficients. Polynomial regressions, along with fitting trends, have been used in forecasting diseases by many researchers (Pandey et al., 2020; Johannes, 2008; Howard, 1943). A second order polynomial regression model has been proven to be an extremely effective and useful tool to provide predictions for a short period of time, e.g., 15-30 days. It can be used for predicting COVID-19 infections, deaths, hospital beds and ICU beds. The two-degree polynomial regression model is given by:

$$\widehat{f}(x) = \widehat{\beta}_0 + \widehat{\beta}_1 x + \widehat{\beta}_2 x^2$$

where x is a variable that represents the number of days, β_0 , β_1 , and β_2 represent the estimated regression coefficients, and $\widehat{f}(x)$ is the predicted total number of infections or deaths. We have also obtained 95% confidence interval estimates for the total number of infections or deaths. This method is used to fit the trend of infections and deaths for Bangladesh COVID-19 data. Then, based on many studies including Phua et al. (2020), we estimated the hospital and ICU patients as 20% and 4% of active COVID-19 infections, respectively.

The SIR model is a common epidemiological modeling technique that divides an estimated population into different groups or compartments at time t . These include “susceptible” [S(t)], “infected” [I(t)], and “removed/recovered” [R(t)]. Then the technique applies a set of mathematical rules about how people move from one compartment to another, using assumptions about the disease process, social mixing, public health policies, and other factors. The above models have taken center stage in many key policy discussions surrounding COVID-19, largely due to the unprecedented nature of the situation. Countries use models to shape their health system responses as the virus spreads in their communities.

More specifically, the dynamic model is expected to consider the existing growth rate (e.g., exponential in recent months for Bangladesh) and several covariates such as the planned number of tests, measures taken for social distancing, healthcare facilities, etc. would be used. Such a model family comprises many models such as SIR, SIER, or Susceptible-Infectious-Removed-Deceased (SIRD) which have been used recently in many studies (Loureno et al., 2020; IHME, 2020). The dynamics of COVID-19 seem to be much faster than the dynamics of birth and death. Therefore, births and deaths are omitted and an SIR system without these vital dynamics (birth and death) is used in this context of the pandemic. The simple SIR model can be discussed briefly below. It is assumed that the total population $N(t) = S(t) + I(t) + R(t)$ is fixed, such that the differential equation becomes

$$0 = \frac{dN}{dt} = \frac{dS}{dt} + \frac{dI}{dt} + \frac{dR}{dt}, \quad \forall t \geq 0, \text{ where}$$

$$\frac{dS}{dt} = -\beta S(t)I(t)$$

$$\frac{dI}{dt} = \beta S(t)I(t) - k I(t)$$

$$\frac{dR}{dt} = k I(t)$$

where β is the average number of contacts per person per time and k is the transition rate that is assumed to be proportional to the number of infectious individuals. These two rates change as time changes. Under this method, the only way that a person can leave the susceptible group is to become infected, and the infected group will either recover or die. Those who have recovered from the disease are included in the immune category. The model begins with initial values of $S(t=0)$, $I(t=0)$, and $R(t=0)$. These are the number of people in the susceptible, infected, and removed categories at time period zero. If the SIR model is assumed to hold at all times, these initial conditions are not independent. As a result, the flow model updates the three variables for every point in time with set values for β and k .

In addition, a new Infection Trajectory-Pathway Strategy (ITPS) method, as proposed in Khan and Hossain (2020a), has been implemented to predict total COVID-19 infections, deaths, and other statistics in Bangladesh for a moderate period of time. These methods have been implemented under the assumptions that no major interventions, such as strict lockdowns, or rapid decrease or increase in tests, are imposed over the predicted period. We have also used this method to fit the trend of infections and deaths for Bangladesh COVID-19 data by observing the trajectory of infections and deaths.

Analysis

In Bangladesh, the first COVID-19 case was detected on March 8, 2020, and the government announced a national unofficial lockdown 17 days later. To curb the spread of the infection, this lockdown was called well in advance, compared to many other countries, including India and Pakistan. Even before the lockdown, a majority of schools, colleges, markets, cinema halls, etc. were already shut down in Dhaka and other parts of the country. Nonetheless, Bangladesh had its first peak of COVID-19 cases in the month of July. The highest death toll was 64 and took place on June 30, 2020, while the highest number of cases, 4,019, took place on July 2 of that year. The effect of the first peak went on until October or November, while another peak was about to start in November or December but did not become significant. However, three months later a clear second wave began in March 2021.

In order to decrease infections, the government announced a strict lockdown on April 14 for one week, and then extended this to April 28. The government banned all movement and urged people to stay at home. Citizens were allowed to step out only in emergency situations. All these steps were taken in the hope of flattening the curve of infected cases and to limit the exponential growth of the patients in Bangladesh. The month-wise rate of infected cases, deaths, recoveries, and tests are reported in Figure 1.

The highest number of cases per hour (>189) took place in April 2021, while the second highest number of cases per hour (about 137) took place in June last year. So far, the highest number of deaths per 10 hours (>26) took place in April 2021, while the second highest number of deaths per 10 hours (17) took place in July 2020. So far, the highest number of recoveries per hour (about 152) was reported in April 2021, while the second highest number of recoveries per hour (>103) occurred in December 2020.

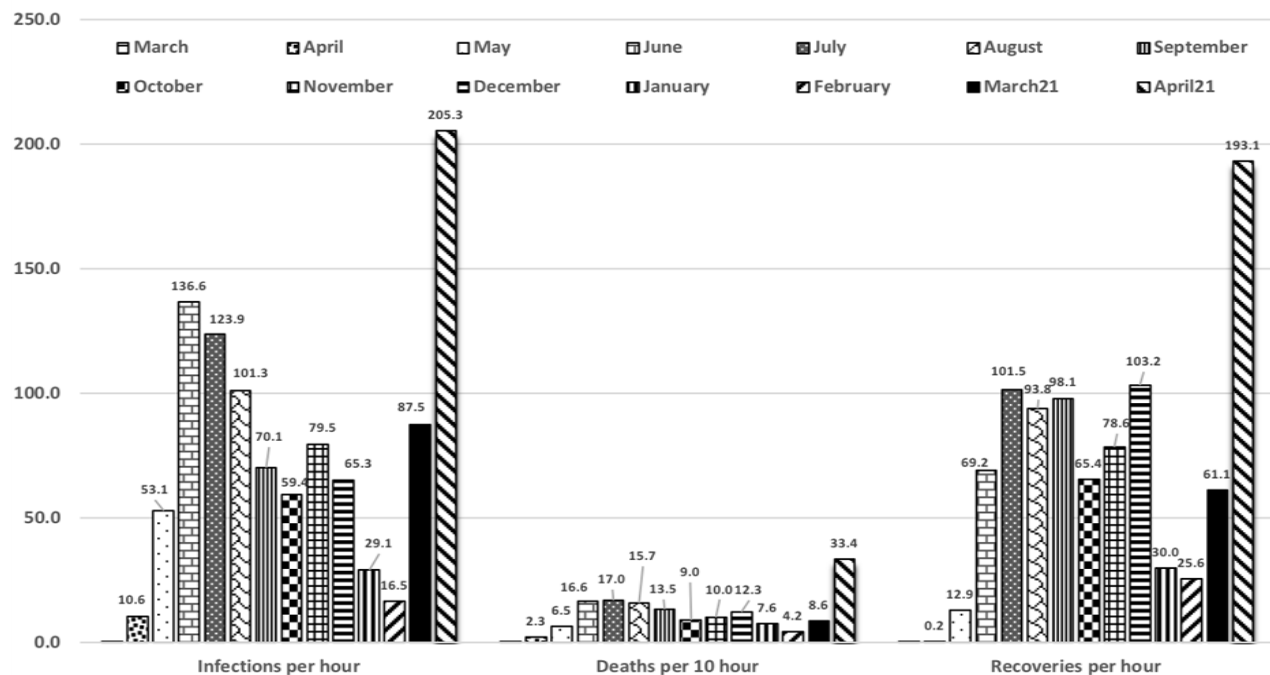


Figure 1: Month-wise rates of infections, deaths, recoveries, and tests of COVID-19 in Bangladesh (as of April 22, 2021)

There were 727,731 infected cases and 10,587 deaths reported in Bangladesh as of April 20, 2021, with 12.2% of the cases being active. This is similar to the global percentage of active cases at 12.8% (Dong and Gardner, 2020). On that date, the recovery rate was 86.3%, the test positivity rate was 13.9%, and the infection fatality rate was 1.45. Globally, Bangladesh currently stands in 33rd position in terms of infection cases, 38th position in terms of deaths, and 50th position in terms of tests. More than 50% cases are from Dhaka division (IEDCR, 2021). The sex ratio (males to females) among the infected population is found to be 71. Since March 2021, the number of infections and deaths have increased significantly with much higher rates compared to 2020 (see Figure 1). The R_e is called the basic reproduction rate or the expected number of secondary cases produced by a single infectious individual during the infectious period within a completely susceptible population. If R_e is greater than 1, then epidemic increases exponentially, but if R_e is less than 1, then the disease is predicted to die out. We found the highest R_e value of 8.95 taking place on March 17, 2020, and the lowest R_e value 0.12 on March 29, 2020 (see Figure 2). The R_e is found to be 0.86 on April 22, 2021, with the median value of R_e at 1.03. All R_e 's are estimated based on the Cori model.

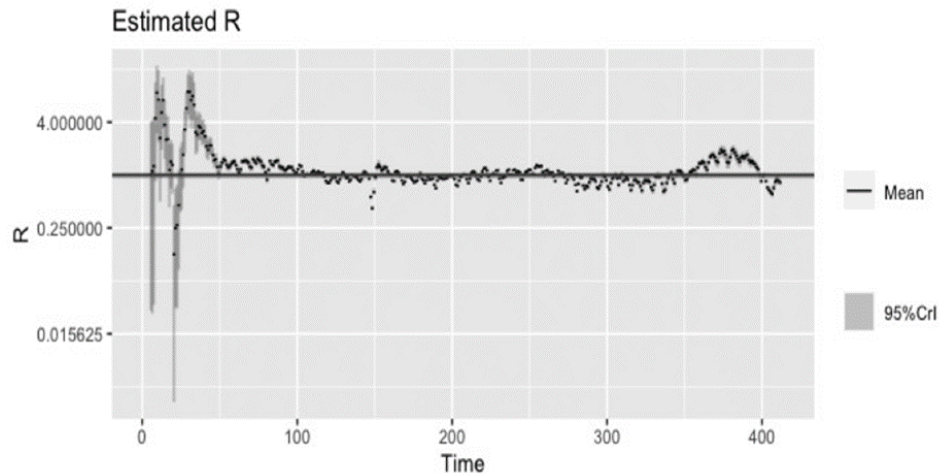


Figure 2: Daily instantaneous effective reproduction numbers (R_e) of COVID-19 in Bangladesh (as of April 22, 2021)

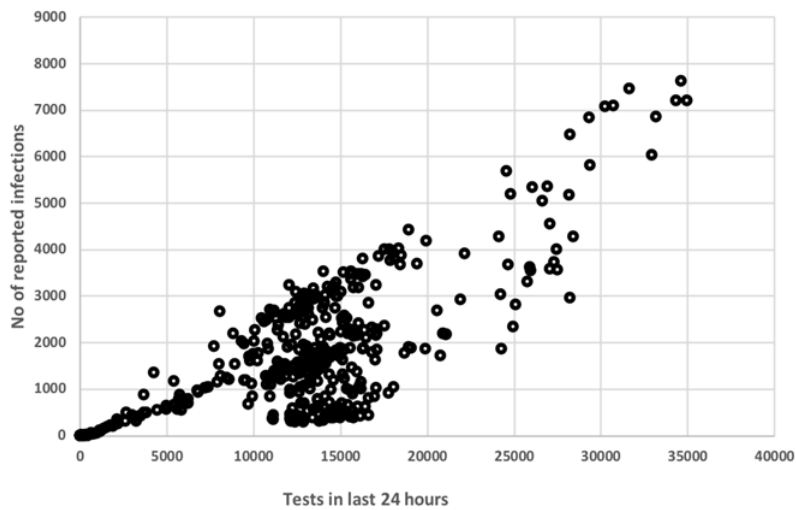


Figure 3: Scatter plot between number of tests and reported infections of COVID-19 in Bangladesh (as of April 20, 2021)

Testing is the only effective window into the COVID-19 pandemic and how it is spreading. When a disease becomes a pandemic, early testing can lead to a swift identification of cases, quick treatment for those infected, and immediate isolation to prevent spreading and to trace their contacts. Early testing also helps to identify anyone who has come into contact with infected people so that they, too, can be quickly treated. China, South Korea, and Taiwan have followed this procedure and used it as one of the most important tools in the fight to slow and reduce the spread and impact of the virus. As expected, Figure 3 shows that a very strong and positive correlation is found between the number of tests conducted daily and the reported infections in Bangladesh. The correlation coefficient is 0.76, based on the data reported as of April 20, 2021. As of April 20, Bangladesh has tested only 5,221,275 case samples, which is at a rate of 31,454 per million, and much lower than many countries including India and Pakistan (Max Roser and Ortiz-Ospina, 2021). The number of COVID-19 tests has also been increased considerably in the months of March and April 2021.

Prediction with Infection Trajectory-Pathway Strategy

Bangladesh is one of the 33 countries that have passed the threshold of 700,000 confirmed cases, with many more countries on the cusp (Max Roser and Ortiz-Ospina, 2021). Figure 4 displays the infection trajectory since the 100-case mark for Bangladesh, along Pakistan and Sweden, based on data reported on April 20, 2021.

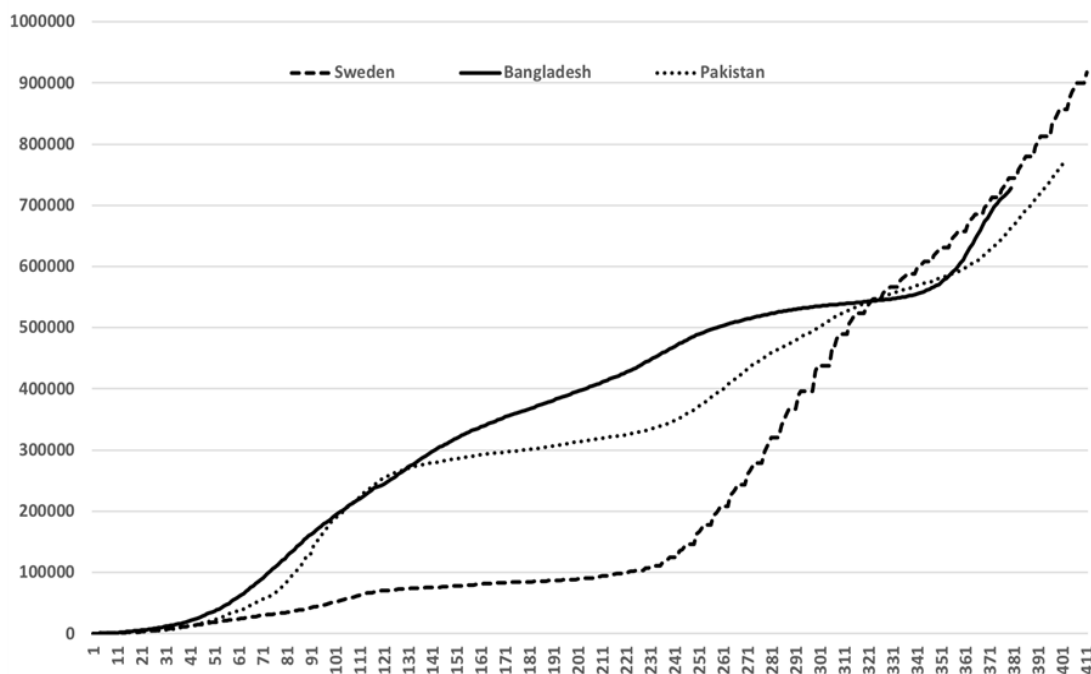


Figure 4: Infection trajectory (number of days versus cumulative infections) in Bangladesh, Pakistan, and Sweden since 100 confirmed cases

Pakistan and Sweden have trajectory pathways or experiences that are similar to Bangladesh, and this is evident from the 325 days of data after the 100-case mark was crossed in each country. In terms of infections, both countries are well ahead of Bangladesh, and Bangladesh is likely to experience their pathways in future. By comparing such trajectories, we would be able to see a clearer picture of how quickly the infections may increase in the future.

While Bangladesh is on the same trajectory, but well behind the other two, it is possible to gauge how quickly the virus cases may increase based on this trajectory. This procedure is known as the ITPS (Infection Trajectory-Pathway Strategy) and discussed in Khan and Hossain (2020a).

Bangladesh crossed the 100-case mark on April 7, 2020, exactly one month after the first case that was identified. However, Figure 4 shows that Bangladesh could follow the same pathway of infection trajectory that was experienced by the two countries – Sweden which is 31 days ahead and currently has 916,830 COVID-19 infections, and Pakistan which is 32 days ahead and on April 22, Pakistan has 772,381 COVID-19 infections. Hence after 31 and 32 days the predicted infections for Bangladesh can easily be estimated and these are reported in Table 1. Bangladesh's pathway appears to be closer to Sweden's than to that of Pakistan. This table also gives the predicted deaths estimated based on the current case fatality rate of 1.46% in Bangladesh, as reported on April 20, 2021 (Johns Hopkins University, 2021b). If all the assumptions regarding COVID-19 infection growth are kept similar to Sweden and Pakistan for Bangladesh, then the ITPS prediction method suggests that Bangladesh may exceed 916,830 cases and 13,386 deaths, in its worst-case scenario, by May 21, 2021, while infection and death toll may cross 772,381 and 11,277 respectively in its best-case scenario, by May 22 of that year.

Table 1: Predicted total infections and deaths based on ITPS method

| Date | Predicted total Infections | Predicted total deaths |
|--------------|----------------------------|------------------------|
| May 21, 2021 | 916,830 | 13,386 |
| May 22, 2021 | 772,381 | 11,277 |

Prediction with Polynomial Regression Model

Short-term predictions for infected people, hospital beds, ICU beds, and deaths have been made using a second-degree polynomial regression. Table 2 shows the predicted numbers at 95% confidence intervals. According to Phua et al. (2020), 12% of all reported cases need ICU admissions while 13.4% of all patients are treated as severe. However, at present, many studies have found that 20% of all infected may need hospital beds while only 4% of all patients need ICU service. All patients who have a severe case of the disease need hospital admissions, in addition to some other symptomatic patients demonstrating sufficient symptoms.

In this paper, we have predicted the cumulative infections for a 15-day time interval - April 16 to 30, 2021. This prediction was based on the April 1-15, 2021, dataset since the model is reasonably good for capturing and predicting short-term trends. In particular, Khan (2020a) had used this model to publish a daily report on the COVID-19 situation in Bangladesh, with predictions for infections conducted on June 6, 2020. The predicted figures had matched well with observed figures on June 15, 2020 (Khan, 2020b).

Our predictions for hospital and ICU beds have been carried out based on the predicted number of patients. We assume that each patient may occupy a single bed. For this study we estimated the total hospital and ICU patients as 20% and 4% of the active number of infections. The rate of active infection in Bangladesh was 14.1% on April 15, 2021. We used this rate as the fixed rate for the prediction period. Prediction of total deaths has also been carried out in the same way using a second-degree polynomial regression.

This prediction method tells that the total number infected people and deaths in Bangladesh by April 30, 2021, may cross 851,986 (95% CI: 839,137-864,835) and almost 11,669 (95% CI: 11,642-11,695) respectively, while the number of hospital and ICU beds may cross 20,053 (95% CI: 19,751-20,355) and 4,011 (95% CI: 3,950-4,071) respectively. These figures are estimated to be 798,395 (95% CI: 788,777-808,014), 18,792 (95% CI: 18,565-19,018), 3,758 (95% CI: 3,713-3,804), and 11,071 (95% CI: 11,051-11,091) respectively by April 25, 2021. Although the relationship between deaths and country's intensive care bed capacity is very important in calculating the predicted deaths, it is likely that the actual deaths could be higher than the predicted numbers since Bangladesh does not have enough hospital and ICU beds to meet the required demand (The Daily Dhaka Tribune, March 21, 2020; Nafseen, 2018).

Table 2: Prediction for COVID-19 infections, hospital beds, ICU beds, and deaths for April 16-30, 2021, in Bangladesh using a polynomial regression method

| Date | Projected Infections | | | Projected Hospital Beds | | | Projected ICU Beds | | | Projected Deaths | | |
|--------|----------------------|-----------------|-----------------|-------------------------|-----------------|-----------------|--------------------|-----------------|-----------------|------------------|-----------------|-----------------|
| | Total | Lower of 95% CI | Upper of 95% CI | Total | Lower of 95% CI | Upper of 95% CI | Total | Lower of 95% CI | Upper of 95% CI | Total | Lower of 95% CI | Upper of 95% CI |
| 16-Apr | 715010 | 708591 | 721430 | 19819 | 19641 | 19997 | 3964 | 3928 | 3999 | 10158 | 10145 | 10170 |
| 17-Apr | 723445 | 716835 | 730054 | 19443 | 19265 | 19620 | 3889 | 3853 | 3924 | 10249 | 10236 | 10262 |
| 18-Apr | 732087 | 725249 | 738925 | 19059 | 18881 | 19238 | 3812 | 3776 | 3848 | 10343 | 10329 | 10357 |
| 19-Apr | 740937 | 733830 | 748043 | 17439 | 17272 | 17607 | 3488 | 3454 | 3521 | 10439 | 10425 | 10454 |
| 20-Apr | 749994 | 742576 | 757412 | 17652 | 17478 | 17827 | 3530 | 3496 | 3565 | 10538 | 10523 | 10553 |
| 21-Apr | 759259 | 751487 | 767031 | 17871 | 17688 | 18053 | 3574 | 3538 | 3611 | 10640 | 10624 | 10655 |
| 22-Apr | 768732 | 760563 | 776901 | 18093 | 17901 | 18286 | 3619 | 3580 | 3657 | 10744 | 10727 | 10760 |
| 23-Apr | 778412 | 769802 | 787022 | 18321 | 18119 | 18524 | 3664 | 3624 | 3705 | 10850 | 10833 | 10868 |
| 24-Apr | 788300 | 779207 | 797393 | 18554 | 18340 | 18768 | 3711 | 3668 | 3754 | 10959 | 10941 | 10978 |
| 25-Apr | 798395 | 788777 | 808014 | 18792 | 18565 | 19018 | 3758 | 3713 | 3804 | 11071 | 11051 | 11091 |
| 26-Apr | 808698 | 798513 | 818883 | 19034 | 18794 | 19274 | 3807 | 3759 | 3855 | 11186 | 11165 | 11207 |
| 27-Apr | 819209 | 808416 | 830001 | 19282 | 19028 | 19536 | 3856 | 3806 | 3907 | 11302 | 11280 | 11325 |
| 28-Apr | 829927 | 818487 | 841367 | 19534 | 19265 | 19803 | 3907 | 3853 | 3961 | 11422 | 11398 | 11446 |
| 29-Apr | 840853 | 828727 | 852978 | 19791 | 19506 | 20076 | 3958 | 3901 | 4015 | 11544 | 11519 | 11569 |
| 30-Apr | 851986 | 839137 | 864835 | 20053 | 19751 | 20355 | 4011 | 3950 | 4071 | 11669 | 11642 | 11695 |

Prediction with SIR Model

Suitable and dynamic models are generally used for precision in prediction. Figure 5 shows that the SIR model was implemented on the observed data collected on April 22, 2021, under the similar assumptions Bangladesh is expected to reach 68,000 daily infection cases by May 31; 23,000 by June 30, and 3,400 by the end of July 31, 2021, which translates to a corresponding number of deaths following the contemporary case fatality rate which was 1.46% on April 22 of that year.

Discussions and Conclusions

This paper presented basic analysis and results of the current COVID-19 situation in Bangladesh during the second wave of the virus that started in March 2021. The paper proposed an ad-hoc prediction strategy known as Infection Trajectory-Pathway Strategy (ITPS) for predicting total infections and deaths suitable for a moderate period of time (one month or 45 days). The ITPS is a new method in predicting infections under the assumptions that the predicted country will follow the infection trajectory line (or, indirectly, the exact infection growth rates) of countries that have already experienced the same infection trajectory.

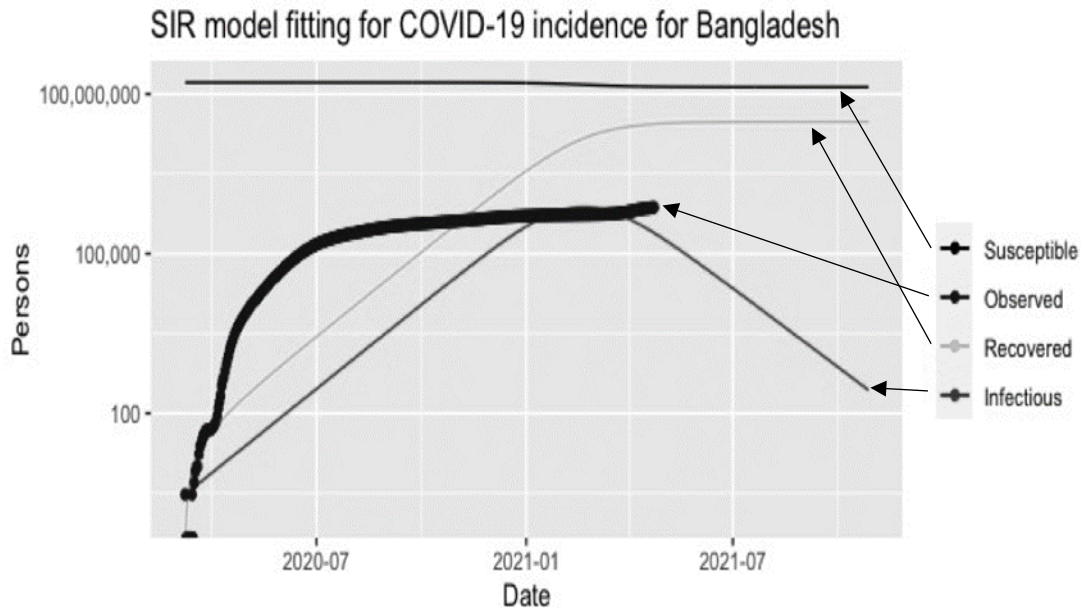


Figure 5: Prediction for COVID-19 infections by SIR model

While the world grapples with the containment of the COVID-19 outbreak, Bangladesh may not be doing well in this regard as the number of tests done as of April 20, 2021, is over just 5,231,000 which is a low number compared to the neighboring countries, such as India or Pakistan. Despite having a very strong positive correlation (0.76) between the daily tests and number of infected people, the growth rate of tests in Bangladesh is considerably low. Although the capacity of tests has increased to double from March to April 2021, this needs further rapid increase for a quick detection of cases. This will help to restrict the spread by isolating those infected and quarantining those who are susceptible. Unfortunately, little contact tracing, isolation and quarantine have been done during this ongoing second wave of COVID-19.

A prediction on the number of severe and ICU patients could help the government of Bangladesh to prepare an adequate number of hospital beds, including ICU beds, and health staff to tackle the potential demand of COVID-19 patients. The findings in this study provide an indication of the challenges that the Bangladesh healthcare system will face if the COVID-19 epidemic progresses unabated. To treat critical patients, fully functional ICU beds are crucial. These ICU beds are not useful in the absence of an adequate number of trained critical healthcare workers, medical supplies, and personal protective equipment (PPE) that are needed for crisis management. Therefore, the government, hospital administrators, and policy makers must work with ICU doctors and nurses to prepare for a substantial increase in critical care bed capacity. The government must use unprecedented methods to protect healthcare workers from nosocomial transmission and physical exhaustion, including potential mental health issues.

Endnotes

¹ By way of comparison, India has 0.7 (2011), Pakistan has 0.6 (2012), Sri Lanka has 3.6 (2012), the US has 2.9 (2012), and China has 4.2 (2012) beds per 1,000 people.

² These include China, Italy, Spain, the UK, Germany, and the US.

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COVID-19 and Political Leadership: Understanding the Corona-time Metaphors of Bangladesh's Political Leaders

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Abstract

Newspapers in Bangladesh published news and statements from the country's political leaders indicating the government's response, strategy, and initiatives related to the Covid-19 pandemic. The authors analyzed speeches from March to December 2020 to understand how texts act as manifestations of political agendas and reflect underlying ideologies through the usage of metaphors. This study employs a critical discourse framework that reveals four major metaphors – “war” to identify the virus as the enemy to the leadership; “fearless leadership” to represent the government's efficiency in combatting the pandemic; “harmless virus” to deceive citizens, and finally “new nationalist” attitudes to put one's country first. Together, these metaphors deliberately diverted public attention away from the grave reality of the pandemic. Findings from this study suggest that the leaders' response to the catastrophe generated a misleading notion about the pandemic and reflected Bangladesh's patron-client political culture. This study has implications in understanding political leadership in the Global South during a pandemic situation and/or catastrophe.

Keywords: Covid-19, Political Leadership, Metaphor, Critical Discourse Analysis

Introduction

The world is going through a challenging time due to the corona pandemic. Governments and political leaders of almost every country are facing the challenge of securing the lives of their citizens. At the initial stages of the pandemic, the situation was quite different. Many political leaders were not worried at all and had little idea about the widespread effect of the novel coronavirus. Perhaps for that reason, the initial responses of the world leaders during the early days of coronavirus have noticeable similarities. For example, during the very first outbreak of coronavirus across the United States, President Trump repeatedly emphasized that there is nothing to worry about. Trump continued to repeat that everything is under his full control and the coronavirus will vanish in upcoming warm months. On January 22, 2020, in a CNBC interview, Donald Trump urged that, “We have it totally under control. It's one person coming in from China, and we have it under control. It's going to be just fine” (Washington Post, 2020). In

February, he again declared in a news conference that, “it’s going to disappear, one day. Like a miracle.” Indeed, the coronavirus crisis has exposed the narcissistic mentality of the president and that he had no knowledge whatsoever regarding the deadly coronavirus (Taylor, 2020). Following the same path, British Prime Minister Boris Johnson responded to the virus in a similar vein.

In Bangladesh, the situation was somewhat similar. On May 14, 2020, Health Minister Zahid Malik, while attending an orientation workshop of 2,000 doctors and 6,000 nurses said, “You know that there are many deadly diseases. But I think this (COVID-19) is not a terrible disease. Coronavirus is not causing that many deaths in Bangladesh.” (Bdnews24.com, 2020). The Daily Star published a photo story titled “Coronavirus: what ministers, leaders said” covering the response of political leaders in the very eve of the outbreak of the pandemic (Daily Star, 2020, March 21a).

This study analyzes the responses of Bangladeshi leaders about the deadly coronavirus, adopting conceptual metaphor theory as part of critical discourse analysis (CDA). Discourse analysis refers to the analysis of used language (Brown and Yule, 1983) and is based on how texts can be a way of expressing and imposing particular ways of thinking about the world (Widdowson, 2007). Using CDA, this article analyzes how leaders use figurative language and contribute to the meaning making process of metaphors. The findings restate ideological characteristics that are present in the political culture of Bangladesh, as discourse refers to language in context, and context covers people’s background, knowledge, beliefs, intentions, and expectations (Ulum, 2016). That leaders can affect people’s beliefs and behaviors through different channels is well understood (Acemoglu and Jackson, 2015; Dewan and Myatt, 2008; Hermalin, 2017). In Brazil, after the president publicly and emphatically dismissed the risks associated with the COVID-19 pandemic and advised against isolation, the social distancing measures taken by citizens in pro-government localities weakened (Ajzenman, Cavalcanti, and Mata, 2020). Similarly, we discuss here that Bangladeshi leaders were also able to use their rhetoric to distort people’s impression of the crisis.

Background: Covid-19 Affects the World and Bangladesh

The initial days of the corona outbreak is worth mentioning. Chinese authorities paid less attention to the threat of a massive outbreak in the month of December 2019. They downplayed the threat and allowed people to travel around the world. The same thing applied to tourists, as well. Moreover, on the last day of that year, the Chinese government tried to assure the World Health Organization by releasing a statement that said that the disease is “preventable and controllable” (Colarossi, 2020). Martin Luther King Jr. once said: “The ultimate measure of a man is not where he stands in moments of convenience and comfort, but where he stands at times of challenge and controversy.” It is easy to do the right thing and say the right words when times are good; it is a lot harder when we are navigating an unprecedented crisis such as the coronavirus pandemic (UN Global Compact, 2020).

Starting in January 2020, Trump consistently refused to give importance to the possible outbreak for three months, making statements such as, “We have it totally under control,” “It will disappear,” and “America will again and soon be open for business.” In late February, he tagged outbreak stories as a “new hoax” spread by the Democratic Party, and in March, he claimed that the cases were nothing but a seasonal flu (Colarossi, 2020). It is believed that this caused the US to become the global epicenter of the outbreak.

The same phenomenon happened in the UK. In the month of February, the Boris Johnson government considered coronavirus to be “moderately risky virus” and were very late in imposing a lockdown. Public health officials and epidemiologists said that the UK’s strategies to fight the virus were unplanned from the very first, delaying the purchase of necessary equipment. They failed to convey messages that would build an awareness to maintain social distancing and other public health restrictions needed to prevent the spread of COVID-19. This resulted in a faster transmission of the virus, high infection rates, and death tolls.

The situation was not the same everywhere. Organized, prudent, and empathetic responses were witnessed in Finland, New Zealand, and South Korea. Political leaders in these countries enabled greater compliance by people with regard to health instructions and hence the countries were successful in controlling the massive spread of the virus from the early days of this outbreak. Transparency, cautiousness, timing, empathy, and mental strength were found to produce excellent results in these three countries (Hamilton, 2020). On the other hand, in many countries, we may note the denial of some political leaders regarding the threats from COVID-19, neglect of scientific advice, and prioritization of economic and political gains before lives.

In India, during the elections in West Bengal, Assam, Kerala, and Tamil Nadu, as well as the election in Bihar in 2020, Narendra Modi and other Bharatiya Janata Party (BJP) leaders addressed several rallies without paying attention to COVID restrictions. Modi himself addressed more than 20 rallies attended by thousands of unmasked people (The conversation, 2021). And in early March, India's Health Minister Harsh Vardhan declared that the country was "in the endgame" of the COVID-19 pandemic. Mr. Vardhan also lauded Prime Minister Narendra Modi's leadership as an "example to the world in international cooperation" (BBC News, 2021). But from mid-April 2021, India was in the grips of a devastating second wave of the pandemic, and cities there were facing fresh lockdowns. During this crisis, Assam's Health Minister Himanta Biswa Sarma had decided in early April, when the upward curve in COVID-19 cases was clearly visible, that "there is no Covid in Assam... there is no need to wear a face mask now in Assam... If there is a need I will inform the people" (The Wire, 2021). Leaders' actions and speeches are important tools for shaping people's beliefs and affecting their behavior during a pandemic (Ajzenman, Cavalcanti, and Mata, 2020). The government warned Indian officials in early March of a new and more contagious variant of the coronavirus taking hold in the country. Despite the warning, the federal government did not seek to impose major restrictions to stop the spread of the virus and millions of largely unmasked people attended religious festivals and political rallies (Reuters, 2021).

This is evident in Bangladesh as well. Since the start of the COVID-19 pandemic in December 2019, Bangladesh had a long lead time to be prepared to address the situation, as the first confirmed case was found in early March. But from that very early period, government ministers downplayed the seriousness of the issue. This includes the health minister. He initially said, the government "is well prepared to prevent the highly contagious strain" (Dhaka Tribune, 2020, January 29). On March 11, 2020, Education Minister Dr. Dipu Moni said, "The whole world is in an unstable situation because of the coronavirus outbreak. Under the circumstances, Bangladesh is in a more stable state compared to other countries" (Dhaka Tribune, 2020, March 11). Although the situation was visibly worsening day by day, on March 21, 2020, General Secretary of the Awami League, Obaidul Quader urged everyone not to believe in false rumors and said, "We are stronger than corona" (Somoynews, 2020).

The first cases were confirmed in the country on March 8, and the infections remained low during March. The lockdown began in Bangladesh on March 26, three days after the UK. It was extended several times after that. Nonetheless, on April 11, 2020, new infection cases in Bangladesh grew by 1,155 percent, the highest in Asia, ahead of Indonesia (TBSnews.net, 2020, March 8). It took too long for the general public to comprehend the deadly spreading capacity of COVID virus. Dr. Romen Raihan, a public health expert in Bangladesh, said, "I think we missed an opportunity; the so-called lockdown didn't work properly" (Vaidyanathan, 2020).

On June 14, 2020, the State Minister of Religious Affairs of Bangladesh died of coronavirus (Daily Star, 2020, June 14). But the perception of Bangladeshi leaders did not seem to change much. On June 20, Obaidul Quader blamed the Directorate General of Health Services (DGHS) for weakening the spirit of Bangladeshi people because she had said that the coronavirus may sustain for two more years. According to him, she was absolutely "careless" about the effect of her words on the general public. He stated that such information can cause severe anxiety and undermine all the effort the government is putting in to make people mentally strong (DW, 2020). He also said that "the government spokespersons and media almost stopped talking about the virus. It looks like the fear has gone" (Deutsche Welle, 2020).

As "a text does not consist of sentences; it is realized by, or encoded in, sentences" (Halliday and Hassan, 1976), so too the text of the political discourse of the coronavirus is not only strings of sentences put together, but rather "a text" with "texture, and this is what distinguishes it from something that is not a text. It derives this texture from the fact that it functions as a unity with respect to its environment" (Halliday and Hassan, 1976). In light of the above definition, it can be argued that the traces of the use of political jargon, features of spoken discourse, different stylistic techniques, and a plethora of language features can be found in different political leaders' responses regarding the pandemic.

The responses from political leaders show that Bangladesh missed an opportunity to prevent a crisis with regard to this pandemic on the very eve of this outbreak. Therefore, the main focus of this research is to analyze the speeches of the leaders and what they wanted to establish through their speech about this pandemic in the early stage.

Theoretical Framework

Critical Discourse Analysis (CDA) is a branch for Discourse Analysis commonly used for analyzing political spoken and written texts (Jalali and Sadeghi, 2014). Conceptual metaphor theory as a part of CDA has been considered as the foundation for the text analysis in this research. In CDA, discourse structures are viewed as formulated representation of linguistics to achieve some particular strategies (Hart, 2008). According to Lakoff and Johnson (1980), the Conceptual Metaphor Theory has provided the lens through which otherwise naturalized or opaque ideological patterns could be detected in language and thought. Musolff (2012) describes metaphor as a way of building concepts and arguments, thus constructing meaning in a social context.

This research adapts Susan Sontag's work on cancer and tuberculosis (1978) and AIDS (1989), where the use of metaphors is taken into consideration during a time of pandemic. Here, the metaphor is a tool for meaning making and essential for the development of language, cognition, culture, and ideologies (Sontag, 1989). Adapting this analytical framework, this research analyzes the speeches of prominent Bangladeshi leaders and finds the meaning-making processes in the metaphors used during the time of coronavirus to understand how crises are interpreted, constructed, and governed by political elites. We consider their roles in the construction of actions and identities.

Fairclough (1992), a pioneer in this field, defines CDA as the kind of discourse analysis which aims to systematically explore often opaque relationships of causality and determination between discursive practices, events, and texts, and wider social and cultural structures, relations, and processes. Its purpose is to investigate how such practices, events, and texts arise out of and are ideologically shaped by relations of power and struggles over power; and, to explore how the opacity of relationships between discourse and society is itself a factor in securing power and hegemony. The textual analysis for meaning-creation of the speeches was carried out based on an analytic theoretical framework of the Fairclough Critical Discourse Analysis model.

Methodology and Sampling

Government spokesperson such as the Health Minister Zahid Malik, Road, Transport, and Bridge minister Obaidul Quader, Finance Minister AHM Mostafa Kamal, Foreign Minister Abdul Momen, Information Minister Hasan Mahmud, and various other ministers including the Prime Minister talked in the media about coronavirus, and government plans to combat the pandemic during the first outbreak in 2020. This article analyzes speeches of these political leaders published in Bangladeshi newspapers from March 8, 2020, to December 27, 2020. The photo story "Coronavirus: what ministers, leaders said" published on March 21, 2020, in Daily Star has also been analyzed, as it covers early responses of top political leaders of Bangladesh. The prime methodology of this research is textual analysis.

This article's central research question is the discursive use and effect of political leaders' speech on the coronavirus epidemic in Bangladesh. For this purpose, Fairclough's (1992) CDA model has been adapted. The model consists of three dimensions: text, discursive practice (production, distribution, and consumption of texts), and social perspective. The article discusses the dimensions of the text of the speeches given by the political leaders about COVID-19 crisis.

Text

Textual analysis shows that leaders in Bangladesh are using different types of metaphors in their speech to disseminate meaning about coronavirus to the public. These include war, neo-nationalism, the innocuous virus, and fearless leadership. These metaphors do not merely describe the existing reality, they create it. The findings of the analysis are as follows.

War Metaphor

During the outbreak of coronavirus in the USA, Trump tagged himself as a “war-time president” who is fighting relentlessly against this deadly invisible virus (Reuters, 2020). The UN Secretary General Antonio Gutiérrez adopted a similar “fighting” approach at the G-20 summit on the COVID-19 pandemic and said that this situation is nothing but a wartime situation. He said that we (humans) are losing it (the war) and need a strategic war-time plan to defeat the coronavirus (United Nations, 2020). In India, Modi also described this situation of pandemic and lockdown as nothing but a challenge during wartime in almost every speech he made.

Political leaders and policy makers are not alone in using war metaphors to depict a challenging situation. In oncology, the fighting spirit of cancer patients is strengthened using military metaphors such as a “War on Cancer” (Penson et al., 2004). The irony is that in most cases, and for most forms of cancer, this war has not been won (Hanahan, 2014). Nevertheless, this metaphor is widely used to maintain the mental strength of patients throughout treatment.

So, a war metaphor can be highly effective as a rhetorical tool, but it also hides important points that, especially in this pandemic situation, can be dangerous. This is true in the case of the US. While there was a war declared against coronavirus in March, we ironically find that the number of deaths spiked in March and April in the USA (Fox, 2020). Similar war metaphors were used by political leaders in Bangladesh during the early stages of COVID-19. War metaphors identify the coronavirus as the enemy, saving the economy as the strategy, and health professionals as the front-line warriors, thus sidelining the duty of the authorities. On March 21, 2020, the Road, Transport, and Bridge Minister, who is also the spokesperson of Awami League (AL), urged, “coronavirus is not such an enemy or force that can’t be defeated. We’re stronger than coronavirus,” the war metaphor came out with the word “enemy”, “force”, and “defeat”. Here the virus is the “enemy” but the strategies that leaders take up will result in Bangladesh winning.

War metaphors can also be found in the speech of AL Presidium Member Mohammed Nasim on March 17, 2020 - “Awami League along with the people will tackle any crisis, including coronavirus under the competent leadership of Prime Minister Sheikh Hasina”. Here the words “tackle” and “competent leadership” are reinforcing the idea of war against a virus. These types of metaphors are especially useful during a crisis because they can divert the focus of citizens in insidious ways. Citizens are made to believe that they are no longer only citizens; now they are “soldiers” in a battlefield. So, in this wartime situation, everyone needs to fight. Under this pretext of war across the world, a shift has taken place towards dangerous authoritarianism.

War analogies can also trigger authoritarian tendencies in governments elected in a democratic manner. The crisis situation gives power to the authorities to punish people who are said to spread “false information” about the pandemic, a lawful right that could easily be abused to silence opposing political ideologies. For example, on May 6, 2020, eleven people in Bangladesh (including a writer, a cartoonist, and two journalists) were charged under the DSA (Digital Security Act) for “spreading rumors and carrying out anti-government activities”. The government alleged that they had posted about, “the coronavirus pandemic to negatively affect the nation’s image and to create confusion among the public through the social media and cause the law and order situation to deteriorate” (Article 19, 2020). On March 25, the government issued a circular to monitor television channels and social media for “rumors” and “propaganda” regarding Covid-19 (Human Rights Watch, 2020). All these impose an unspoken message that people should be quiet and not complain much, as there is an ongoing war.

In addition, the specter of war creates a supportive environment and empathy for the government, allowing them to have many opportunities to cover up their administrative weakness. Consider this case from Bangladesh. The first COVID-19 case in Bangladesh was found on March 8. By this time, India and many countries had already locked down, and the world was staring at a pandemic. No one questioned the Bangladesh government as to why they were late in imposing a lockdown and why they had failed to control the number of affected people.

Neo-Nationalism

Along with the use of war metaphors against viruses, this study identifies that leaders also adopt a “my-country-first attitude”, which we can call a neo-nationalist metaphor. When the Information Minister in his speech on March 21, 2020, said, “Bangladesh has taken various steps and the coronavirus situation in our country is still better than many countries in the globe” (Daily Star, 2020, March 21a), he used a nationalist metaphor to make Bangladesh seem better

than many developed countries. This type of nationalism was also found in the US when Trump administration attempted to prevent 3M, one of the largest medical gear manufacturers of the world, from sending medical equipment to Canada (National Post, 2020). As a lockdown was the only way to save any country from the outbreak of COVID-19, every country tried to secure their own areas without regard to others. That is why some essential supplies have been prevented, many countries have blocked shipments of items such as masks, sanitizers, and other life-saving equipment. In these circumstances, the US, with the motto “make America great again”, did not want to share their best masks with any other country and behaved as though they were in a wartime situation. Similarly, the political elites tried to portray Bangladesh as a self-sufficient country that could provide treatment for COVID-19 patients. The Finance Minister urged, “Hospitals similar to China are to be built to combat coronavirus” (Daily Bangladesh, 2020). This approach is illustrated in Canadian artist Michael Slotwinski’s posters in preventing the spread of COVID-19, “we are doing our part, are you doing yours?” (Making Science Public, 2020)

Harmless Virus

As Bangladesh went through a risky stage of community transmission of the virus, fear and oversensitivity increased with time. To counter this, the political elites of Bangladesh produced a metaphorical representation of the harmless nature of this virus to absolve the state from being able to contain the outbreak. This metaphorical representation was found in Foreign Minister Abdul Momen’s speech, “coronavirus is not a deadly disease, it is like the flu and fever” (Daily Star, 2020, March 15). The Health Minister’s speech on March 14 is also mentionable here, “You know that there are many deadly diseases. But I think this (COVID-19) is not a terrible disease. Coronavirus is not causing many deaths in Bangladesh” (Daily Star, 2020, August 15b).

Through this benign representation of the coronavirus, the general mass was expected to be allayed about this global pandemic. On March 18, 2020, almost one thousand people gathered in Raipur in Lakshmipur district to recite “healing verses” from the holy Quran. This was led and organized by an influential religious leader who urged people to join this holy event, promising that it will make people “free from the coronavirus” (Atlantic Council, 2020). Also, during Eid, thousands of people continued to defy the restrictions of social distancing and travelled back to their home districts, despite the suspension of all types of public transport by the government (Dhaka Tribune, 2020, May 19).

Fearless Leadership

State Minister of Shipping Khalid Mahmud Chowdhury said, “Coronavirus will not be able to do anything to us as long as Sheikh Hasina is there” and Awami League (AL) Presidium Member Mohammed Nasim expressed the same (Daily Star, 2020, March 21c). When the leader is in a ruling position, party officials may praise their leader and represent him/her as someone godly (Wang, 2015). Accompanying war metaphors encourage citizens to accept sweeping and possibly authoritarian powers. We found this approach in the coronavirus period in Hungary, when the Justice Minister Judit Varga submitted a bill to the parliament that would allow the government to question anyone said to be hindering measures taken to prevent the spread of the virus; the government would be able to send those who spread false information to jail for up to five years (CIVICUS, 2020). The Bangladesh government had also closed the press, particularly the online media, so as to stop the spread of negativity and rumors. On March 21, a Swedish online news site, published a report titled “Covid19: Without government action, over 500,000 may die in Bangladesh” based on a research paper published jointly by BRAC University, North South University and Johns Hopkins University (Netra News, 2020). On the other hand, by using fawning language such as “competent”, “as long as Sheikh Hasina is with us” and “country is still better than many countries”, leaders attempted to downplay any possible flaws in the strategy taken by the government and instead attempted to create an image of a fearless personality in charge who is capable of defeating any visible or invisible enemy.

Many problems lie in these metaphors. They do not focus on health education but exacerbate autocracy and state violence. The false pride and entrenched political culture in Bangladesh are evident in the metaphorical representation of speeches given by political leaders about coronavirus. In addition, these speeches tell us that there is an “unaware public” in a developing country such as Bangladesh, allowing leaders to deliver false information regarding COVID-19 during the crisis period. In the latter part of the 20th century, social scientists examined the vital role that discourse plays in constituting “social formation and discipline, economic exploitation and power” (Luke

2002, p. 97). Here, we find that through this metaphoric representation, leaders deliberately divert public attention away from the pandemic's actual situation. Professor Muzaherul Huq, founder of the country's public health foundation, expressed skepticism about the "ability to implement the plan." He told *The Daily Star* on March 6, "the government's boast of preparedness is a fraud" (Perera, 2020).

Discursive Practices

Discourse is, after all, context-dependent (Phillips, 2006). Representations of reality, which news items actually are, are always social constructs (Joye, 2010). The "discursive practice" dimension of CDA, like "interaction" in the "text-and-interaction" view of discourse, specifies the nature of the processes of text production and interpretation, including which types of discourse (or "discourses" in the more social-theoretical sense) are drawn upon and how they are combined (Fairclough, 1992). CDA sees the relationship between language and society as dialectical. This means that the relationship between language and society is two-way: on the one hand, language is influenced by society; on the other hand, society is shaped by language.

On March 15, 2020, Foreign Minister AK Abdul Momen said, "our main goal is to protect our people" (Daily Star, 2020, March 15). Following this, another statement came from the Prime Minister, "the government will do whatever is required to address the pandemic. To fulfil emergency requirements, I propose to allocate Tk 10,000 crore as a lump sum" (Daily Star, June 11, 2020). This hope of protection was restated again by the Health Minister at the National Mourning Day - "Whether the vaccine comes or not, coronavirus will leave the country" (Daily Star, 2020, August 15a). All these comments of the political leaders are influenced by a groundless belief in the government's ability to combat the pandemic, and confirms the culture of confrontation, competition, and monopolization of state institutions and resources by the party in power (Osman, 2010). This culture of confrontation was also displayed in the comment of Prime Minister Sheikh Hasina on October 3, 2020, "it's only the Awami League for which people get cooperation. Had there been any other party (in power), numerous people would have died, people would have undergone indescribable suffering" (Dhaka Tribune, 2020, October 3). And, when the Information Minister Hasan Mahmud said on March 21 that the opposition Bangladesh Nationalist Party (BNP) was creating confusion by capitalizing on the coronavirus situation to misguide the people of the country (Newagebd.net, 2020), this represented the tradition of "enemy discourse" in Bangladesh's political culture. It underscores the confrontational political culture of Bangladesh, where there is no census among political parties on issues of national interest, rather everything is subservient to political interest. The war metaphors complement the "enemy discourse" (Osman, 2010), and political leaders oppose each other simply for the sake of opposition in any situation. The metaphoric representation of these speeches demonstrates a culture of impunity, cynicism, and arrogance where, ironically, the ability to circumvent the laws is claimed as a hallmark of status and power (Ahmad, 2010). Kochanek (2000), who has followed Bangladesh's politics for decades, describes that the problems of governance in the country are "deeply rooted in the country's historical experience and the behaviour and values of the Bangladeshi elite" (p. 530). These political values affect the response of the government to the epidemic.

Social Practice

This dimension of Fairclough's model essentially refers to ideological effects and hegemonic processes (Blommaert and Bulcaen, 2000). Also, van Dijk (2009, p. 199) states that a polarization between the in-group ("us", a positive self-image of a social group) and the out-group ("them", assessed and represented in a negative way) is characteristic of many such ideological structures. In terms of the presented research, our textual analysis found several indications of such socio-cultural polarization in the mediation of the coronavirus outbreak in Bangladesh.

The same day that the Information Minister blamed BNP for creating confusion regarding the coronavirus situation, the Road, Transport and Bridge Minister said, "We're stronger than coronavirus." The joint use of enemy discourse and war metaphors allow political leaders to practice a culture of sycophancy and accuse the "other" (opposition) for any failings. This has already been described in the fearless leadership metaphor alluded to in the above section. All these speeches polarized the actual situation in Bangladesh, and in March 2020 the World Health Organization (WHO) suggested urgent action in Bangladesh (Daily Star, 2020, March 21b).

Conclusion

There are various constraints to stopping the spread of the coronavirus in a Third World country such as Bangladesh. For the government to be able to stop the spread, people would have to cooperate. “The first step is to have the people ready to carry out the strategy. Campaigns should be started right away. We have yet to witness such an initiative” (Daily Star, 2020, March 21). The key to dealing with this health issue was planning. However, during the planning phase, leaders in Bangladesh did not take the problem seriously enough to take strong efforts to stem the spread. Instead, they used widespread metaphors used by other states at this time to delude an unaware public. The state attempted to create a false sense of relief by employing established metaphors such as “war” to identify the virus as an enemy to the leadership; “fearless leadership” to represent the government’s effectiveness in combating the pandemic; “harmless virus” in rendering the virus as innocuous; and finally, “new nationalist” attitudes to create a false patriotism among the public. The Prime Minister said the purchase of safety materials was “nothing other than madness,” adding that “it’s not that this is an imminently fatal virus.” However, she advised people to keep their “hands clean at all times” (Perera, 2020). Along with her, all the other leaders repeated the same message, saying that the “coronavirus is not a deadly disease; it is like the flu and fever” and “we’re stronger than coronavirus”.

Here, these metaphors were used for unifying and motivating people under the umbrella of the ruling party. These political leaders’ responses to the coronavirus highlight their sycophancy and their inclination to ingratiate the leadership. Such a response reeks of (elected) authoritarianism, stifles the freedom of press, and creates a distance between leaders and their people. The result is that Bangladesh is now in the top 20 countries in the world with the largest number of coronavirus cases (Dhaka Tribune, 2020, June 5), and ranks third in the number of cases in South Asia, behind India and Pakistan. According to Sontag (1978), the metaphorical packaging of AIDS worsened the misery of those who are infected, while causing unnecessary fear in the general society. So too the metaphorical packaging of political speeches regarding the current problem obscured the reality of the crisis and led the audience to believe that the government was prepared to safeguard the country. Finally, figurative language such as metaphors can enable emotional exposure and foster a sense of closeness between speaker and listener that literal language is less able to achieve. Metaphors can indeed dramatically affect people’s attitudes toward numerous political and social matters (Gibbs et al., 2002). The representation of the COVID-19 emergency as a war affects the manner in which people conceptualize the pandemic and react to it, leading citizens to endorse authoritarianism and limitations to civil liberties (Panzeri et al, 2021). As in the case of S. Korea, the government outspokenly declared a “war” against COVID-19, mobilized nursing officers and doctors in their obligatory service as first responders, and deployed soldiers in quarantine work and set up a Central Disaster and Safety Countermeasure Headquarters to defeat COVID-19 (Kim et al., 2020).

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“I have to live for myself”: Exploring Isolation Experiences of Former COVID-19 Patients in Bangladesh

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Abstract

COVID-19 patients risk their psychological well-being during the period of their morbidity. In Bangladesh, few studies have investigated the psychological state of COVID-19 patients during their isolation period. This study intends to understand the isolation experiences of former COVID-19 patients in Bangladesh. In-depth interviews were conducted among former COVID-19 patients residing in rural and urban areas in Bangladesh. The respondents felt fearful, distraught, and traumatized during their early stages of isolation. Their emotional distress was concerned with not only themselves, but also with their family members. They upheld an optimistic attitude in hope of surviving against COVID-19. Their attitude led them to adopt different coping strategies that included communicating with others, entertaining themselves, praying, and becoming busy with daily chores. Their approaches, aggregated with support from their family members and acquaintances, nurtured their psychological well-being during the isolation period. Therefore, alongside providing familial and social support, the patients should be introduced to various coping mechanisms to avert psychological problems during COVID-19.

Keywords: COVID-19, Isolation, Coping mechanism

Introduction

COVID-19 is a highly infectious disease that spreads through close contact and droplets (Bedford et al., 2020; He et al., 2020; Heymann and Shindo, 2020) and has become a global threat since December 2019. Its clinical features range from asymptomatic to severe respiratory complications and organ failure (Singhal, 2020). As of February 14, 2021, globally there were 108,153,741 active COVID-19 cases and 2,381,295 COVID-19 related deaths (World Health Organization, 2021).

As some lower and middle-income countries struggle to confront the epidemic through social distancing and isolation (Bedford et al., 2020), Bangladesh finds itself among one of these countries with 540,592 confirmed cases and 8,274 deaths from March 8, 2020, to February 14, 2021 (World Health Organization, 2021).

Bangladesh has been trying to make it possible for its citizens to maintain social distancing and other precautions for the safety of their physical health (Anwar et al., 2020). But alongside protecting physical health, quarantine and isolation can have adverse effects on psychological health (Gunnell et al., 2020; Khan et al., 2020). The global population is facing stress, fear, anxiety, depressive symptoms, and psychological negativities due to the pandemic (Gunnell et al., 2020; Khan et al., 2020; Torales et al., 2020; Xiong et al., 2020). COVID-19 patients struggle with psychological distress and discrimination is merely a corollary to this scenario (Torales et al., 2020).

Review articles and systematic reviews have pointed out that the majority of COVID-19 patients heavily suffer from anxiety, depression, and other psychological morbidities (Deng et al., 2020; Krishnamoorthy et al., 2020; Talevi et al., 2020). This is an alarming finding, as a deteriorating psychological state risks a lower quality of life for these patients (Talevi et al., 2020). Exploratory studies from different countries on isolation experiences attest and elaborate various personal reasons for deteriorating psychological conditions (Dehkordi et al., 2020; Dishman and Schroeder, 2020; Moradi et al., 2020; Sahoo et al., 2020; Sun et al., 2021).

Moreover, social negativities are responsible for escalating psychological trauma (Dehkordi et al., 2020; Moradi et al., 2020). Social negativities stemming from stigma are a product of society's fear that escalates psychological distress among patients (Karim et al., 2007; Mahmud and Islam, 2020; Paul et al., 2015). In the case of the Bangladeshi society, stigma has shown to be important in creating further psychological and social difficulties for patients suffering from a contagious lethal disease such as tuberculosis (Karim et al., 2007; Paul et al., 2015). Currently, due to a lack of adequate health care facilities, many patients with mild symptoms of COVID-19 often remain isolated at home (Anwar et al., 2020).

Given the intensity of the situation and a dearth of relevant literature in Bangladesh, this study explores the isolation experiences of former COVID-19 patients. The study focuses on the psychological turmoil that patients face during isolation. Furthermore, it details coping mechanisms adopted by patients, and the success of these strategies.

Methodology

Study design

Data was collected through in-depth interviews (IDI). These contained semi-structured questionnaires, and a descriptive qualitative approach was undertaken.

Study sample & settings

The study population was any Bangladeshi citizen who suffered from the COVID-19 virus and had been certified as recovered post ailment. Following the methodology mentioned in Anieting and Mosugu (2017), this study used exponential non-discriminative snowball sampling to reach 19 participants residing in different urban and rural areas of Bangladesh. This technique was quite useful, given the researchers had difficulties contacting these respondents.

The second and third authors of this article had approached their networks of family, friends, and acquaintances, requesting introduction to any known former COVID-19 patients. The first two respondents were introduced through the second author's friends who worked in the health sector. The third respondent was an acquaintance of the third author. The first two respondents gave names of others who also responded. This process was continued until the rest of the respondents were reached. The respondents were each other's isolation mates, co-workers, subordinates, or neighbors. In this manner, the researchers interviewed 19 respondents from different socio-economic backgrounds.

Given the pandemic situation, the team carried out interviews on mobile phones. Thus, during the interviews, the respondents were residing at their residence in different regions of Bangladesh.

Data collection

The interviews were conducted from May to August 2020, using semi-structured in-depth interview guidelines. The interview process was developed by using references from Novick (2008). The mobile phone interviews allowed all respondents to be reached over a short period of time with limited resources. The first three authors had conducted interviews both individually and in groups of two. This gave the researchers a scope for investigator triangulation, which can help avoid biases (Thurmond, 2001).

All interviews were conducted in Bangla (Bengali). The interviews started with basic demographic questions and were followed by questions regarding the respondents' experiences regarding isolation and their coping mechanisms during that period. This was followed by further probing and asking for examples to construct a comprehensive understanding. The interviews ranged from 35 to 60 minutes.

Data analysis

The interviews were transcribed verbatim followed by data familiarization. A codebook was developed based on interview guidelines. During the analysis, newly emerged codes were added to the codebook. All these codes were clustered into themes. Data was analyzed using the *Atlas.ti* software. Inter-coder reliability was ensured as the researchers proceeded with the analysis.

Ethical approval

Ethical approval was obtained from James P. Grant School of Public Health, BRAC University. As the interviews were conducted via mobile phone, the researchers had no other option but to take verbal consent. After an introduction, the researchers explained the research objective to each interviewee. They then promised to maintain confidentiality and anonymity by not disclosing the interviewee's anthropometric information such as name, place of residence, and workplace. At the behest of the majority of the respondents, the researchers did not disclose the specific titles of their profession. The interviews were recorded only after gaining permission from the respondents.

Findings

Profile of Participants

The table below provides socio-demographic data of 19 participants based on their age, educational status, marital status, occupation, isolation areas, and other factors.

| Characteristics | Frequency | Characteristics | Frequency | Characteristics | Frequency |
|------------------------|------------------|------------------------|------------------|----------------------------------|------------------|
| Age | | Isolation Areas | | Educational Qualification | |
| 25-34 years | 8 | Isolation Centre | 2 | Primary | 4 |
| 35-44 years | 7 | Hospital | 7 | Secondary | 2 |
| 45-55 years | 4 | Home | 10 | Bachelors | 2 |
| Gender | | Symptom Type | | Masters | 5 |
| Male | 14 | Asymptomatic | 5 | Diploma | 6 |
| Female | 5 | Only Cold | 5 | Occupation | |
| Marital Status | | Fever with Cold | 7 | Health Worker | 9 |
| Married | 16 | | | Nurse | 5 |
| Unmarried | 3 | | | Lab Technician | 1 |
| Religion | | | | Health Facility Cleaner | 1 |
| Muslim | 13 | | | Accountant | 1 |
| Hindu | 6 | | | IT Officer | 1 |
| | | | | Former Garments Worker | 1 |

Encountering a positive diagnosis of coronavirus

Fear of death

All respondents became frightened and distressed upon learning about being positively diagnosed with COVID-19. Fear of sudden death shattered them to the extent that the majority broke down crying. Psychologically disturbed, every respondent had a sleepless night.

“They just ruined my sleep that night. If they had called me the following morning, I could have slept that night... I worried what if something happens accidentally, it’s all up to God, then again I may survive, by the blessings of my parents... there are no specific medications for this ailment, but then people survive as well.”

— 52-year-old male health worker

Concern for family members

Respondents became equally concerned about their families as soon as they learned that they had the virus. Few became apprehensive about possible financial difficulties that their children may face from their death. Many others who were living with family suffered angst regarding the possibility that their family may get infected by them.

“I was worried about my family. Before I received my COVID-19 test result, I was in close contact with my parents, wife, and kid. After receiving the result, I was overwhelmed by tension... my child has some lung problems, my aged parents... what if they get affected? My whole neighborhood got frantic just because I came out positive. What will happen when the whole family becomes affected?”

— 37-year-old male accountant

Few who did not reside with their families intended to protect their family members from psychological distress by concealing the news.

“I didn’t share about my COVID-19 positive status with my family. I am my parents’ only child. They will just pass out from tension! That’s why I shared this news after I recovered.”

— 27-year-old female nurse

Others’ reactions to learning about the COVID-19 patients

Distress among family members

The respondents who shared their COVID-19 positive news with family members reported that their families were psychologically distressed upon hearing the information. Some patients were admonished by apprehensive family members who believed that working in the health sector had caused them to contract the coronavirus.

“My brother berated me for testing for COVID-19. He thought it would have been better if I hadn’t tested because I was in good health. Panic struck the whole neighborhood that time, the whole village was locked down because of me; my brother became so frightened by this event that he started behaving like this.”

— 30-year-old male health worker

Enduring social pressure

News of the patients’ positive status with respect to COVID-19 spread rapidly on social media among the local people, particularly in villages and small towns, unlike in the urban areas. This resulted in forms of societal aggravation from which many patients and their family members suffered. Some were berated via mobile phone by people in their locality for contracting the disease. Mostly, however, anxious locals tried to prevent the spread of disease by not allowing any family member or acquaintance of the patients to cross the boundary of the patients’ home. To ensure

this, members of the locality even tried to block the roads leading to the houses of the COVID-19 patients. Thus, patients and their families struggled to access their daily necessities until local governmental authorities intervened.

“At first, the locals were unaware of my condition but then they posted my name and picture on Facebook! Then everyone knew about me and some tried to prevent my family members from coming out of the home... There was this woman who worked at our house, people locked her inside her house as well!!! Then a member of the local administration had to intervene to control the situation...”

— 37-year-old male health worker

Non-local residents who had to rely entirely on institutionalized isolation were exempted from these sorts of societal pressure.

“I live in this area for work purposes, my family lives in another village. So, I stayed in the Center and didn't tell my family, in case they rushed to see me and got infected... I thought about my daughter, she may get socially berated because of my condition. They may have locked down my house and won't allow anyone to get near to them. So, thinking about all these, I didn't go home, didn't tell my family, and stayed at the center...”

— 40-year-old male health worker

Isolation phase

Psychological effects of isolation

The majority of the patients were either isolated in hospitals in COVID-19 wards, or in isolation centers. Those who could manage a separate room in their homes went for home isolation. Being at home in isolation allowed the respondents to have direct interaction with their family members while maintaining distance. Yet, irrespective of their isolation sites, respondents felt depressed and desolated during isolation.

“Just thinking about the first three days of isolation makes me distraught, especially the pain of being confined in a room... that's it, the loneliness... you even get to meet two to four people in jail but I couldn't meet anybody over here... I was all alone in my cabin.”

— 37-year-old male health worker

This particular respondent could not psychologically bear with living in the isolation ward and opted for home isolation.

“For the first week, I remained isolated at the hospital cabin by myself but then it became unbearable. My cabin is at the corner of the hospital. People didn't frequent there due to restrictions. At night when it got darker, the whole place would become quiet... even the slightest sound of anything is creepy enough to scare someone. So, I convinced the hospital authority that I can maintain isolation at home and moved over there.”

— 26-year-old female nurse

Regaining self-composure

Although the respondents became despondent after learning about their disease status, they mustered their composure after some time. Their attempts to regain self-control were driven by their firm belief that their physical wellness strongly depended upon their mental wellbeing. Hence, to survive COVID-19, they tried to maintain a positive attitude during the isolation period.

“If you get depressed, you will become debilitated and your immunity will weaken. You will enfeeble your resistance power against the disease. To avoid getting dejected we must keep ourselves cheerful... it can be in anyways, laughter or talking with others.”

— 52-year-old male health worker

Personal coping strategies

Facing towards faith

Respondents turned towards their religious beliefs and practice in the hope of getting divine sanction for recovery. Many asked for blessings from families and peers believing God would heed these prayers and cure them.

“I calmed myself by praying to Allah and asking for salvation. I called everyone and asked for their blessings. My family, my whole neighborhood prayed for me... I believe in blessings, that is why I survived COVID-19... Surely Allah heeds to prayers and grants them. I used to spend my time praying to Allah asking for recovery and to look after my family.”

— 40-year-old male health facility cleaner

Engaging in entertainment and communicating with others

To create a more positive environment for themselves, respondents busied themselves with electronic devices such as smartphones, laptops, and televisions. Through these devices, they regularly enjoyed videos, played games, and communicated with people via social media. Having access to the internet and electronic media was advantageous, as it breached the patients’ detachment from the outside world keeping them occupied.

“I used to watch YouTube videos using the internet... videos on religious doctrines, information on COVID-19, songs, entertainment just to cheer myself up. Confinement in a room is itself desolating, I often recalled my wife and kid... just for a bit of entertainment I used to do internet browsing, chatted with friends over Facebook, IMO, WhatsApp, after all, I needed to pass that period.”

— 29-year-old male nurse

Not all had access and affordability to smartphones and the internet. These few respondents had struggled to adjust to their isolation period.

“I don't have a smartphone. I merely have this simple button phone... when the doctors used to visit me, they used to advise me not to stress and to remain in a good mood. I used to ask them how I can be in a good mood in that lonely place. My room didn't even have a television!”

— 40-year-old male health facility cleaner

Remaining healthy

To maintain their health, respondents focused on their diet and tried to ensure that they received sufficient protein, vegetables, and fruit items. Irrespective of their financial conditions, respondents spent additional money to maintain these dietary recommendations.

“I used to rotationally have fish or meat for lunch. For breakfast, they would provide me with pieces of bread, an egg, an apple, and a banana. But the fruits were not suitable for eating. Not of good quality. So, these additional foods... I had managed on my own. I spent twenty-three to four thousand takas for this food.”

— 52-year-old male health worker

Along with having an appropriate diet, prescribed medications, and performing exercise, respondents undertook certain home remedies to alleviate the effect of COVID-19. These remedies included inhaling hot water vapor, having citrus, and drinking an herbal tea made from locally available spices. Known as *Aada Cha* (ginger tea) this herbal tea mostly consists of ginger, cardamom, cinnamon, black pepper, and clove boiled in hot water. We learned from varied sources that these simple home remedies not only relaxed the patients, but also eased some of their anorexia and breathing problems. Therefore, many respondents argued that regular consumption of hot water, citrus, and the particular herbal tea can be a potential cure for the coronavirus.

“People told me to frequently consume warm water with ginger and lemon in it. So, I followed that, and whenever I felt cold I used to have lots of lemon juice and citrus. It always relieved me and I found it quite beneficial. And there was this ginger tea which I made from ginger, cardamom, clove, and simmering water. Having it, I never had to deal with cough, cold, or sore throat! I never stopped having it as long as I was in isolation. I am still maintaining this habit.”

— 25-year-old male former garments worker

Performing daily chores

While in isolation, these COVID-19 patients were obliged to perform regular chores such as cleaning clothes, utensils, and the room. Respondents briskly performed these chores believing that regular cleaning habits appease the ailment.

“I always used hot water for bathing, washing clothes, etc. As recovery from COVID-19 depends on your habit of cleanliness. You must clean the room, where you are isolating, 2-3 times a day. Regularly clean your bathroom, wash the bedsheet every alternative day and often spray disinfectants. I used to do all these things by myself.”

— 29-year-old male nurse

Support during isolation: experiences and expectations

Emotional support

Receiving positive attitudes and words from family, friends, and colleagues augmented the mental strength of the patients during isolation.

“My husband was there for me all along. He was concerned that I might get alarmed. Honestly, without his support, I may not even have survived. He would always encourage me to be strong... Then he would always ensure that I was having lemons and made my lemon juice whenever I got tired.”

— 28-year-old female nurse

Respondents who did not tell their family about their ailment relied on these support networks of friends and colleagues during isolation.

“One of my senior colleagues used to encourage me a lot. I mean he almost called eight-ten times a day. And then there was another colleague who also supported me a lot. I am grateful to two of them. They would ask whether I was eating properly and having adequate rest. They would say that soon I would be fine... After one week, one of them told me that I have come out of the danger period and nothing will happen to me... Their encouraging words constantly uplifted my spirit, reducing my anxieties.”

— 40-year-old male health worker

Tangible and Intangible support

Extra food, medicine, and money for other necessities such as phone and internet bills were regularly provided to the patients by their families, friends, and colleagues. These forms of kindness strengthened the camaraderie between the patients and others.

“I have some family members who live in the town. I called them and shared how the villagers are preventing us from purchasing groceries. Upon hearing this, they came with groceries and put those at our doorstep before heading back.”

— 30-year-old male health worker

Apart from these networks, the local government also helped some respondents by occasionally providing them with groceries. Also, in some cases, the local government pacified enraged locals from harassing the patient and family members.

“They blocked the front road of my house, because of my COVID-19 status. They were not allowing anyone to pass over there. Then the chairman intervened and took care of the matter. That led to the neighborhood being appeased.”

— 55-year-old male health worker

Expectations from society

According to these former patients we interviewed, different forms of emotional and tangible support are crucial for the COVID-19 victims and their family members. They strongly suggested that society's negative attitude severely affects the self-esteem of patients and makes them even more vulnerable to the virus.

“Of course, people should console and support the COVID-19 patients. They should assure them that they will provide these patients with daily necessities if needed. That will psychologically bolster the patients. And if someone is in home isolation then neither he nor his family members can go out to purchase the groceries. Some families have 5-6 members and they struggle in this situation. People should help them either with cash or groceries or in other ways they can.”

— 55-year-old male health worker

Expectations from the government

Respondents' expectations from the government varied by their economic status. Low-income people had struggled with managing additional money for nutritious food and other necessities, unlike their higher-income counterparts. They, unlike those who were well-off, believed that the government should financially help COVID-19 patients and their families.

“I believe that a COVID-19 patient gets befuddled during this time. The government must fully support that person during that period. The suffering I had endured that time cannot be compared with anything else... by support I mean receiving financial support, that would have been favorable for us.”

— 37-year-old male accountant

Discussion

To our knowledge, this qualitative investigation is the first one in Bangladesh that extensively focuses on the experiences of former COVID-19 patients. The survivors experienced a range of psychological adversities during the early stage of their ailment. Using an optimistic attitude, the survivors fought their mental distress by adopting different coping strategies. These strategies included praying, engaging in entertainment, attending to their health through exercise and diet, and performing daily chores. Alongside this, psychological and other support from familial and non-familial networks bolstered their mental health during the isolation phase.

Like other COVID-19 patients around the world, these respondents feared death and were despondent (Dehkordi et al., 2020; Dishman and Schroeder, 2020; Sahoo et al., 2020; Sun et al., 2021). The fear for their families' risk of catching the virus, the risk to their families of facing social stigma, and their worry about the wellbeing of their family exacerbated the patients' psychological distress (Dishman and Schroeder, 2020; Sahoo et al., 2020; Sun et al., 2021). This kind of stress is not uncommon among people with contagious lethal diseases. Studies on TB patients have shown similar concerns for family members among the TB patients (Juniarti and Evans, 2011; Karim et al., 2007). But unlike TB patients, the COVID-19 patients stressed about their families' possible financial difficulties in case of their sudden demise. This was because unlike TB, the outcome of COVID-19 is quite uncertain and could result in sudden death. The literature has seldom focused on this point, and we urge future researchers to examine this topic.

This study found that COVID-19 patients in Bangladesh had been ostracized by society, just as Dehkordi et al., (2020) found the same in Iran. Similar to the findings of Mahmud and Islam (2020), this study also found that this ostracization resulted from the society's fear and anxiety around the unknown course of the pandemic. Social attempts to protect themselves from COVID-19 pushed many COVID-19 victims we spoke to into a situation of alienation. These attempts led to difficulties in receiving technical support among these COVID-19 patients and their families. These forms of stigmatization were often fueled by an abuse of social media, breaching the confidentiality of COVID-19 patients, and putting them and their families at risk at an early stage of the ailment. The Information and Communication Technology Division of the government, along with the Ministry of Health, should monitor these issues and develop advocacy measures to prevent the harassment faced by COVID-19 victims.

Isolation can cause severe psychological distress for individuals, and they become particularly forlorn during the early stages of isolation (Dishman and Schroeder, 2020; Sahoo et al., 2020; Sun et al., 2021). However, we found our respondents to have overcome their adversities by adopting optimistic attitudes. As pointed out in Scheier et al., (2001), optimistic attitudes can lead to the embracing of strategies for the betterment of health. Our coronavirus survivors adopted various coping strategies that elevated their physical and psychological health.

Similar to the finding of Carver et al., (1989), this study found that the coping strategies survivors undertook included both emotional and problem-focused approaches. Religion, the most common form of emotional coping among survivors, engendered positive outcomes. Similar outcomes were noticed among cancer patients (Holt et al., 2009), chronic kidney disease patients (Chatrunga et al., 2015), and Ebola survivors (Rabelo et al., 2016).

As in the case of other cohorts elsewhere (Dishman and Schroeder, 2020; Sahoo et al., 2020; Sun et al., 2021), the patients we spoke with also provided themselves psychological support through entertainment and communication. This form of active coping was possible due to the patients' access to the internet and electronic gadgets (Azam, 2007). Access to technology had mediated their psychological distance from their families and friends without additional worries of infecting them. In the context of the pandemic, this simple coping strategy can ease mental health conditions among the COVID-19 patients and other health care professionals dealing with the pandemic.

Scientists have emphasized to the world the importance of a strong immune system (Iddir et al., 2020) and hygiene habits (World Health Organization, 2020) to assist in tackling COVID-19. Technology has facilitated outreaching this information over the world (Budd et al., 2020). Having access to information via technology (Azam, 2007) eased survivor initiatives with respect to self-care and managing the situation of COVID-19. As seen in other studies on COVID-19 patients (Dishman and Schroeder, 2020; Sun et al., 2021), our study respondents engaged in self-care activities that included nutritious diet and exercises. The unique and most beneficial among these initiatives was the consumption of herbal tea, found to have alleviated their symptoms. One finding of this study is that herbal tea is not only beneficial (also found by Poswal et al., 2019), but that there has been increased consumption of herbal products among Bangladeshi people during COVID-19 (also found by Ahmed et al., 2020). Further research on the benefits of herbal tea on COVID-19 is strongly recommended. In recent years, researchers have advocated for self-management activities that can alleviate disease conditions and improve quality of life (Holman and Lorig, 2004), and we recommend promoting these activities during COVID-19.

The study confirms the positive contribution of social support to psychological outcomes of patients suffering from morbidities (also found by Mak et al., 2009). Echoing the experiences of other COVID-19 patients (Sahoo et al., 2020; Sun et al., 2021), this study suggests that future researchers explore this matter among individuals, especially health workers quarantined during COVID-19 in Bangladesh.

Unlike psychological support, financial support was not a necessity for all the survivors. The respondents did not express worry about their jobs as did some patients in Iran (Dehkordi et al., 2020); but those who had a modest income struggled and were constantly stressed about their finances during the period of their illness. Few had received financial help from the local government. But this was neither sufficient, nor widespread. The Bangladesh government has taken different initiatives to financially support COVID-19 patients from low-income groups; this program can be more promising if attached to a monitoring system (Islam et al., 2020).

Conclusion

This study is one of the first in Bangladesh to explore the isolation experiences of former COVID-19 patients. COVID-19 patients interviewed in our study had overcome their psychological distress by adopting a variety of coping mechanisms. To our knowledge, this is also the first study to highlight the benefits of the particular herbal tea found to be beneficial for coronavirus survivors.

Electronic devices and internet had proved to be useful during this time, as was any social support that patients had. Program implementers can learn from this and use digital platforms to reach patients and help them to alleviate their fear and stress during the morbidity period.

Given the snowball sampling method and sample size, there are limitations as to how well the sample represents the entire country. In addition, these patients were affected during the first wave of COVID-19 in Bangladesh. It will be interesting to understand the experiences of patients, who were affected during the subsequent waves of the coronavirus in Bangladesh.

Declarations

This was a self-funded study. The authors declare no conflict of interest with respect to the research, authorship, and/or publication of this article. Transcripts used and analyzed during the current study are available from the corresponding author on reasonable request.

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Coping Strategies of Low-Income Households in Bangladesh During the COVID-19 Pandemic

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Abstract

Given the mounting livelihood challenges during the COVID-19 pandemic, low-income households in Bangladesh had to put forward various coping strategies to provide for themselves. This study assesses these efforts. Based on a quantitative survey, supplemented by qualitative tools, it studies how garment workers, urban informal workers, and returnee migrants coped with the first wave of the pandemic. A set of indicators, namely access to social safety net programs, access to emergency relief, community support, food and nutrition intake pattern, usage of savings, indebtedness, and alternative livelihood, were used to measure the coping mechanisms used by these low-income households. In addition to professional and other characteristics, the “gendered behavior” of households’ coping strategies were assessed. To what extent the formal and informal institutions have played roles to mitigate the financial and other needs of the households during the pandemic were discussed. The study also captured households’ perception of the potential hardships they could face if the pandemic were to be prolonged. Findings show that while all professional groups suffered during the pandemic, urban informal workers and returnee migrants struggled the most to cope with the pandemic. The study reveals mixed results showing how male and female respondents used coping strategies. The role of formal institutions has been limited to mitigate financial and other shocks, as households relied heavily on informal channels. Based on the findings, the study offers policy recommendations that could help mitigate the economic difficulties of the low-income groups.

Keywords: COVID-19, coping measures, low-income groups

Introduction

The COVID-19 pandemic (henceforth, the pandemic) has adversely affected the socio-economic wellbeing of millions of low-income people in Bangladesh. Several studies have captured the extent of job loss and income decline, and the emergence of a “new poor”, among others (CPJ, 2020; SANEM, 2021; PPRC-BIGD, 2020). For instance, of the 5,577 households covered by a nationwide survey conducted by the South Asian Network on Economic Modeling (SANEM), 42% were found to be below the poverty line (SANEM, 2021). Besides, there have been disproportionate impacts of the pandemic on rural and urban areas, with the latter hard hit by the pandemic-induced shock (PPRC-BIGD, 2021). A survey by the Centre for Peace and Justice (CPJ) shows that urban and semi-urban households’ average (mean) monthly income declined by 34% during the pandemic. In contrast, their expenditure fell by only 14% (CPJ, 2020). This is in line with a stylized fact (empirical regularity) of consumer behavior, known as the “ratchet effect”, implying that when incomes of individuals fall, their consumption expenditure does not fall as much.

The large gap between income and expenditure behavior of households amid the pandemic indicates that there are other strategies, in addition to reduced expenses, that households adopted to cope with the negative shocks of the pandemic. However, how the low-income groups in Bangladesh have been absorbing the shock offer limited insights. A handful of studies discuss the coping mechanisms of poor households during the pandemic in the country. For instance, PPRC-BIGD (2020) shows that households’ average food expenditure contracted by 22%. Another study reveals that around four-fifths of the households across the groups spent savings to cope with the pandemic (UNDP-HDRC, 2020).

Nevertheless, these aggregate pictures could mask marked heterogeneities in terms of coping measures by sectors (formal and informal), profession, age, gender, and education level, among others. Figure 1 shows the heterogeneous impacts of the COVID-19 pandemic on income and expenditure based on the respondents’ profession and gender. The labor market in Bangladesh is composed of both informal and formal workers with an overwhelming dominance of the former group. The preponderance of the informal sector has an impact on employees’ job security and employers’ capacity to absorb the pandemic-induced adverse shocks. A deeper understanding of potential differences in coping strategies in terms of household characteristics and labor market classification can help policymakers take the right policies reaching out to the most disadvantaged groups during crisis periods.

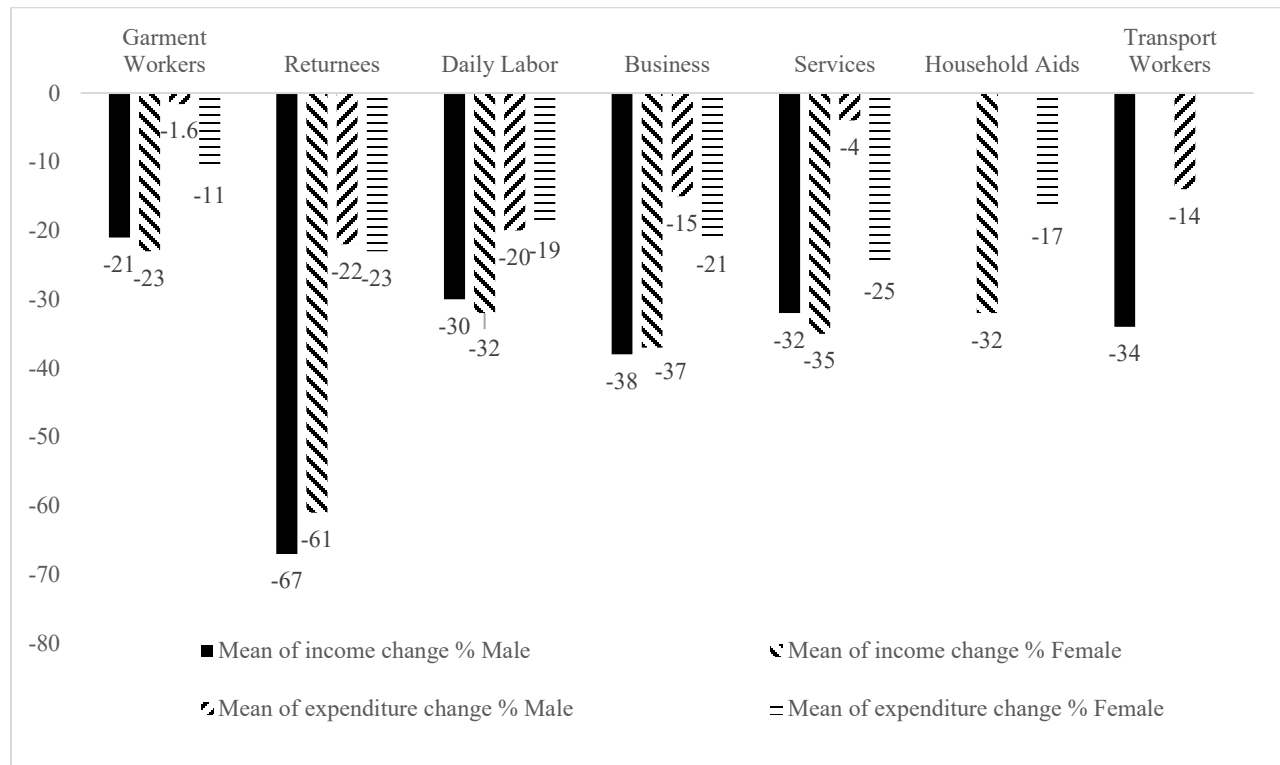


Figure 1: Households monthly income and expenditure before and during the COVID-19 pandemic
 Source: CPJ (2020). *Note: There is no female respondent among transport workers and no male respondent among household aids in the sample.*

To cope with the economic crisis, households adopted multiple coping measures using both formal and informal channels. As the pandemic has affected almost all countries, there is significant evidence on coping mechanisms from other low-income countries. Previous epidemics and pandemics are a useful guide to understand coping strategies of low-income groups. As discussed in the following section, in addition to reduced expenditure for food consumption and other necessary expenses, several studies reported a host of coping options. They include taking loans, accessing government and non-government aid, using savings, selling assets, purchasing subsidized food from Open Market Sales, reducing food consumption, moving to housing that has lower rent, and getting support from community-based organizations (UNDP-HDRC, 2020; Koos et al., 2020; PPRC-BIGD, 2020).

Moreover, there remain significant uncertainties as to how long the pandemic will continue. Bangladesh recorded the first case of COVID-19 on March 8, 2020. Since then, the infection curve has shown marked volatilities with little sign of flattening. If the pandemic continues, the low-income households may run out of options to cope with the crisis. As such, what should be the policy options to protect these groups from further vulnerabilities? There is not much evidence available to answer these questions. The knowledge gap in the areas mentioned above motivates us to undertake this study.

This study has three objectives. First, applying a host of indicators, it assesses the coping mechanism of three distinct groups - ready made garment (RMG) workers, non-RMG workers, and returnee migrants, workers who were working in other countries and have come back to Bangladesh. These groups are vital for the Bangladesh economy, and they represent both the formal and informal workforce. More than 4,600 RMG factories constitute the largest industrial sector in the country and contribute 11.2% to the gross domestic product (GDP) and 36% of employment in the manufacturing sector engaging 4.1 million workers (ADB, 2020). Over 10 million Bangladeshi migrants remitted about \$18 billion in 2019, and the sector represents around 7% of the country's GDP (WEF, 2020). Finally, 87% of the labor force is employed in the informal economy, according to the 2010 Labor Force Survey (BBS, 2010). Given that female workers have a greater participation in the RMG sector, and male workers are more represented in the migrant sector, our study employs a gendered lens in examining coping strategies. Second, it assesses the role of formal and informal institutions/channels to meet the household's financial and other needs during the pandemic. Third, it captures households' perception of the potential hardships they could face if the pandemic is prolonged. Based on the findings, the study offers recommendations to help mitigate the economic difficulties of the low-income groups.

The rest of the paper is organized as follows. The next section reviews the literature on coping measures and mechanisms. The section that follows discusses the data and method of the study, followed by a next section that analyses the data. The final section concludes with a discussion and policy recommendations.

Coping strategies of the pandemic-affected low-income groups: Cross-country experience

The COVID-19 pandemic is a once in a century event. Thus, there is limited literature on households' experiences in coping with pandemics. Nevertheless, we draw insights from available studies on the COVID-19 pandemic as well as other epidemics such as Ebola, AIDS, Yellow Fever, among others, to assess low-income households' coping measures amidst economic hardships induced by these types of health crises. The authors first reviewed selected studies to assess how people dealt with job loss, reductions in income, and other economic losses due to the pandemic, both in Bangladesh and selected low-income countries. A summary table is given on the indicators and measures capturing low-income groups' coping strategies during the pandemic.

Based on the in-person survey of 2,135 randomly selected households, the National Urban Poverty Reduction Programme (NUPRP) in Bangladesh found that most households (85%) were forced to decrease food consumption (UNDP-HDRC, 2020). Half of the households reduced other necessary expenses to meet the increased food prices. Around one-fifth of the households took out loans, while a similar portion (19%) accessed government aid, and 17% used their savings. It was also found that 11% of the beneficiary households received support from the NUPRP to cope with the crisis.

Both the Power and Participation Research Center (PPRC) and Brac Institute of Governance and Development (BIGD) studied livelihoods, coping, and recovery during the COVID-19 crisis, reaching out to 5,741 households in Bangladesh. It was found that urban households experienced a 26% reduction in food expenditure and as high as 86% of the urban slum households reported not having consumed milk and meat in the week before the survey (PPRC-BIGD, 2021). These studies also noted that savings and debt were widely used as personal coping measures. Social support was provided by friends and relatives, who were the most important source. Community/neighbor support had been somewhat more prominent for the urban sample. Only 13% of the urban households received support from the government.

Based on high-frequency phone surveys of World Bank in Ethiopia, Malawi, Mali, Nigeria, and Uganda, and the Reduced Coping Strategy Index (rCSI) of World Food Programme (WFP) in Malawi, Mali, Mozambique, Nigeria, Niger, and DRC, Koos et al. (2020) studied households' wellbeing and coping strategies in Africa during the COVID-19 pandemic. The rCSI measures the severity of the type of coping strategies and the frequency with which they are used. Each of these coping strategies has a weight reflecting its potential effect on the future welfare of the household.

Based on rCSI, WFP reports the proportions of households that used crisis level coping strategies (i.e., coping strategies with severe welfare implications). On the other hand, World Bank indicators are based on the percentage of people reporting the use of different coping strategies. Koos et al., (2020) showed that in the absence of adequate social protection or social insurance, most households having faced income shocks adopted different coping strategies, including reduction of certain types of consumption, selling productive assets, or borrowing at high interest rates.

Adesina-Uthman and Obaka (2020) assessed the effect of the pandemic-induced lockdown on the financial resources of Nigerian households. Their study showed that none of the households received any help from the government, employers, or lawmakers, and 62% of the respondents found no support from anywhere. However, 25% received supplies from friends and families and another 13% from neighbors. In addition, 11% had planned to borrow from friends and family to cope with the strain on their income, while 71% of respondents had no contingency savings for an emergency of this nature.

Different parts of the world have experienced numerous episodes of pandemics in the past few decades. African countries, in particular, had disproportionately absorbed the burden of Ebola, AIDS, Rift Valley fever, Crimean-Congo fever and yellow fever. A study on Malawi found that the cholera outbreak there impacted over half (52%) of households' livelihoods indirectly. To cope with the situation, people borrowed money (52%), sold household livestock (6%), crops (2%) or assets (2%) (Ilboudo et al., 2017). Chipare (2010) showed how Zimbabweans managed their finances to fulfil their basic needs and medical bills. Chipare's study showed that 46% of respondents borrowed money for daily cash needs and treatment. People mostly asked for help from relatives (63%) and friends (27%). Many low-income households became indebted and failed to pay back their loans. To cope with the cholera epidemic, the government invited humanitarian agencies to assist in specialized areas after realizing that the epidemic was overwhelming (Chipare, 2010).

The HIV outbreak in Ghana was examined using a sample of 1,745 respondents, which showed that households coped with that situation by skipping an entire day's meal (13%), reducing portion sizes (61%), harvesting immature crops (8%), and begging (6%) (Laar et al., 2015). Table A1 in the appendix summarizes the numerous coping indicators found in studies discussed above.

Data and Method

Similar to the approach adopted in Johnson et al., (2007), this study applied a quantitative research method complemented by qualitative ones. While a survey was conducted to collect quantitative data, key informant interviews (KIIs), focused group discussion (FGD), and semi-structured interviews were done to gather qualitative data and information.

The Survey

The CPJ survey (henceforth, the survey) was conducted in person between November 2020 to December 2020. The survey population includes i. garment workers (RMG), ii. returnee migrant workers (returnees), and iii. a non-RMG group of workers, comprised of household aids (domestic household workers), day laborers, transport workers, micro-entrepreneurs (business), and low-salaried persons working in the private sector. The survey team collected data from Dhaka North City Corporation, Dhaka South City Corporation, and Savar on RMG and non-RMG workers. The study reached out to the returnees from Nawabjang, Manikganj, and Madaripur.

Sample Size Estimation

Considering a 5% margin of error or 95% confidence interval for the true proportion, a minimum of 384 respondents was required for each group to have estimates with reasonable precision. Given the restriction imposed to comply with the COVID-19 health protocol and resource constraints, the team could not reach 384 respondents from the category "returnees", as they are dispersed all over Bangladesh. Thus, a sample size (196) for the returnees was used, giving a margin of error of 7%. The total sample size stood at 964 (384+384+196). Taking non-response and potential outliers into account, an additional 10% of respondents in each group were considered, totaling a sample size of 1,064

(422+422+216). In designing the survey, gender representation such as the female workforce's participation rate in RMG, non-RMG and migrant workers were also considered.

Composition of the Respondents

The survey reached out to 1,064 respondents, and after excluding the outliers, and the final number stood at 1,056, including 425 RMG workers (40%), 206 returnees (20%), and 425 non-RMG workers (40%) (Figure 2).

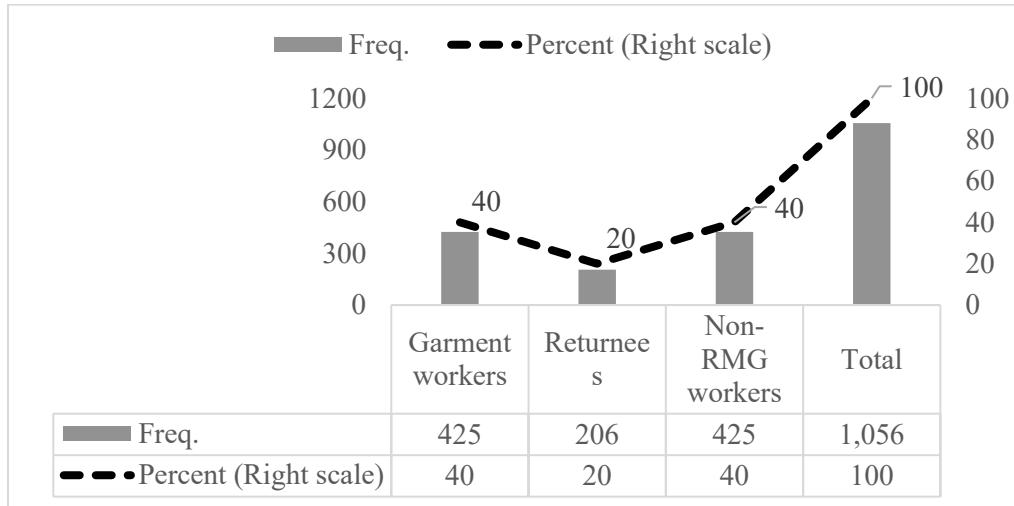


Figure 2: Distribution of respondents by profession

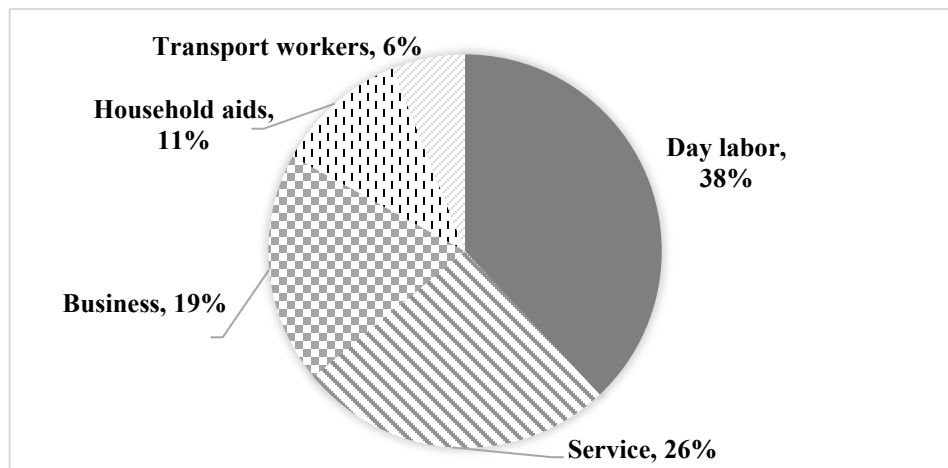


Figure 3: Classification of non-RMG workers

As shown in Figure 3, among the non-RMG respondents, 10% are household aids, 38% daily laborers, 26% low-paid salaried persons working in various services sectors (here under “service”), 6% transport workers (rickshaw puller, three-wheeler driver, etc.), and 19% micro-entrepreneurs (here under “business”).

Table 1 reports the summary statistics of the respondents. The average size of households is 4.3, the mean age of respondents is 34 years, the average educational attainment is primary level, and 81% of respondents are employed. The share of male and female respondents are 52% and 48%, respectively. The percentage of female respondents is highest among RMG workers, followed by the non-RMG workers and returnees.

Table 1: Summary statistics of survey respondents

| | Observation | Mean | Std. Dev. | Min | Max |
|----------------|-------------|------|-----------|-----|-----|
| Gender | 1,051 | 0.52 | 0.50 | 0 | 1 |
| Household size | 1,049 | 4.3 | 1.61 | 1 | 10 |
| Age | 1,051 | 34.4 | 9.72 | 18 | 65 |
| Education | 1,051 | 5.0 | 3.65 | 0 | 16 |
| Employment | 1,051 | 0.81 | 0.40 | 0 | 1 |

Note: Education is a discrete variable: 1-10= class 1-10, 11= SSC, 12-13=HSC, 14-15= BA/BSC, 16= MA/MSc, and 0 otherwise. Gender is a dummy variable taking on two values, 1 indicating male.

The survey data was analyzed using the statistical software STATA. In addition to outlining descriptive statistics, analyzing crosstabs, and showing the key trends in graphs and tables, the authors conducted a two-sample t-test, also known as the independent samples t-test. The method (t-test) was applied to test whether the unknown population means of two groups are equal or not, capturing the differences between groups (Cressie and Whitford, 1986).

Analysis of Results

To cope with the pandemic, households required both cash and in-kind assistance, as well as the ability to defer rental payments. Figure 4 shows that cash borrowing (57%) was the primary source of needs, followed by in-kind support (24%), and delay in house rent payment (18%). A disaggregated analysis by gender, profession, and status of employment revealed a somewhat similar pattern. Female workers generally sought more in-kind than cash support, and they requested a delay in the payment of house rent (Figure A1 in appendix). Figure 4 clearly shows that households required multiple types of support during the pandemic.

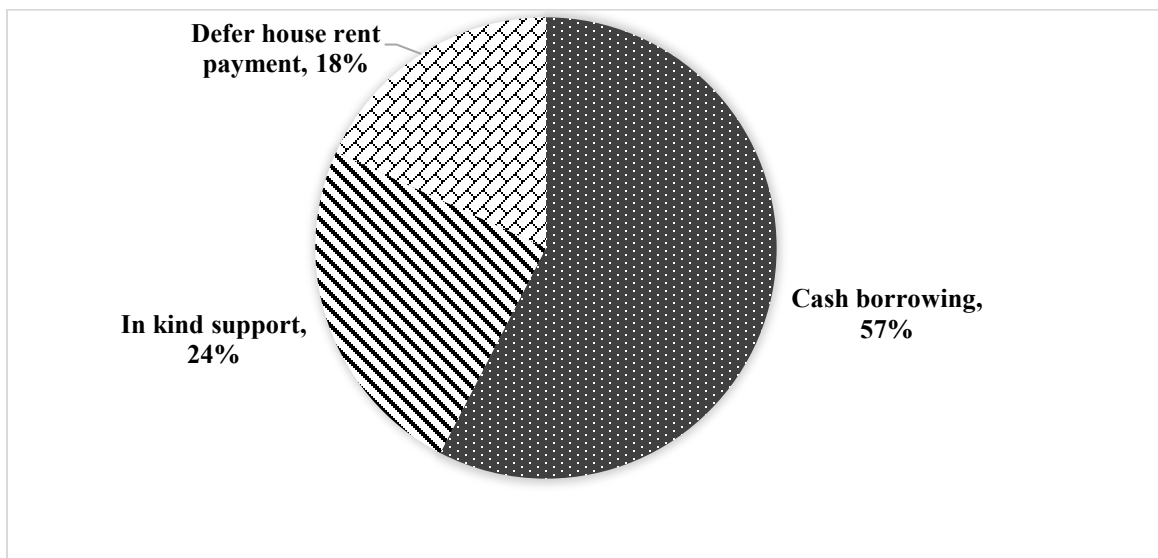


Figure 4: Types of support respondents sought during the pandemic

We will now discuss the various institutional and personal means used by households to cope with the pandemic.

Institutional and personal coping measures of low-income households amid the pandemic

Access to Social Safety Net

The survey explored the extent to which the study population was protected from extreme vulnerability through recurrent social safety net programs. It was found that only 22% of the respondents or their families had access to social safety net programs, namely food for work, cash for work, widow allowance, elderly allowance, and VGF (Vulnerable Group Feeding) (Table 2).

Table 2: Households' access to public social safety net

| | Food for work | Cash for work | Widow allowance | Elderly allowance | VGF | Total | Any types of safety net |
|-----|---------------|---------------|-----------------|-------------------|-----|-------|-------------------------|
| | Frequency | | | | | | Percent |
| Yes | 29 | 175 | 8 | 19 | 4 | 235 | 22 |
| No | 299 | 223 | 99 | 171 | 33 | 825 | 78 |
| N | 328 | 398 | 107 | 190 | 37 | 1060 | 100 |

Differentiated figures by professions in Figure 5 shows that the household aids topped the list (50%) in accessing the safety net benefits, followed by transport workers (38%), day laborers (25%), RMG workers (16%), service holders (15%), and business (micro-entrepreneurs) (15%). In addition, women who had been abandoned (39%) and respondents with no education (36%) had relatively higher-level access to numerous safety net programs. A gender-differentiated analysis suggests that 20% male and 18% female respondents benefitted from any public safety net programs.

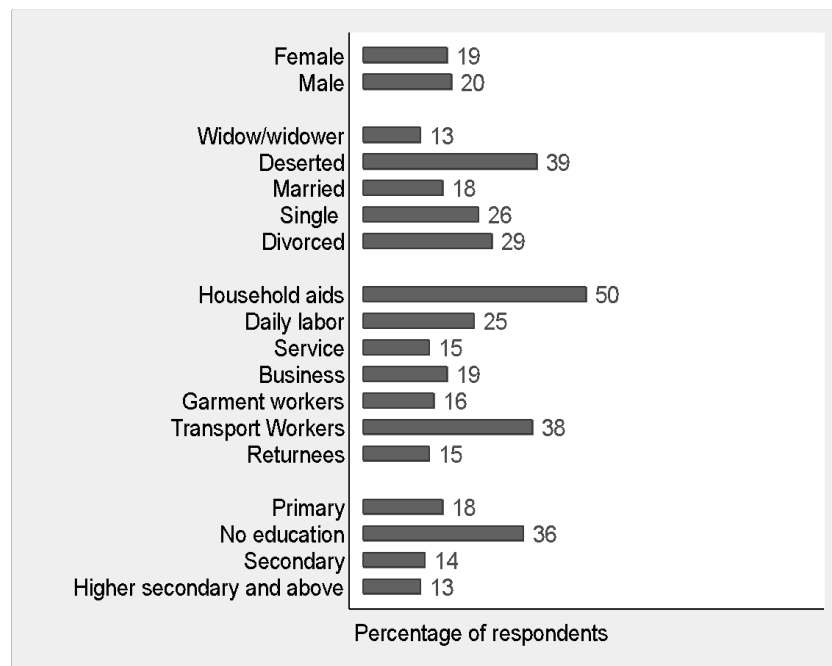


Figure 5: Households' access to public social safety net

Table 3 reports the results of the two-sample t-test for selected indicators based on the respondents' gender. There was no difference between male and female workers' access to social safety net programs, reflected by an insignificant p-value (last column of Table 3).

Table 3: Two-sample t-test results for selected indicators by gender

| | Male | Female | Mean Male | Mean Female | dif | St Err | t value | p value |
|---------------------------------------|------|--------|-----------|-------------|-------|--------|---------|---------|
| Access to social safety net | 551 | 500 | 1.80 | 1.82 | -.016 | .025 | -.65 | .521 |
| Access to emergency relief | 551 | 500 | 1.77 | 1.68 | .097 | .028 | 3.55 | .001 |
| Member of a community network | 551 | 500 | 1.81 | 1.81 | -.006 | .025 | -.25 | .799 |
| Received help from community network | 107 | 94 | 2.85 | 2.79 | .063 | .061 | 1.05 | .303 |
| Help sought from community at large | 551 | 500 | 1.61 | 1.53 | .084 | .03 | 2.75 | .006 |
| Received help from community at large | 551 | 500 | 1.74 | 1.71 | .029 | .028 | 1.05 | .303 |
| Change in having 3-meal a day | 455 | 436 | 2.46 | 2.47 | -.009 | .042 | -.2 | .835 |
| Adequate quantity of food | 453 | 436 | 2.19 | 2.21 | -.021 | .034 | -.6 | .533 |
| Protein intake | 455 | 436 | 1.99 | 2.03 | -.039 | .025 | -1.6 | .115 |
| Used savings | 551 | 500 | 1.12 | 1.23 | -.105 | .023 | -4.55 | 0 |
| Need financial support | 555 | 501 | 1.29 | 1.21 | .079 | .026 | 2.95 | .003 |
| Received financial support | 392 | 393 | 1.22 | 1.28 | -.063 | .03 | -2.05 | .04 |
| Alternative way of earnings | 551 | 500 | 1.77 | 1.90 | -.13 | .023 | -5.65 | 0 |
| Able to cope with Covid-19 | 555 | 501 | 1.82 | 1.87 | -.05 | .022 | -2.2 | .028 |

Access to Emergency Relief

Emergency assistance (relief) is provided by the government and other non-government and community organizations to help low-income groups. The survey found that 27% of the respondents (n=289) received *ad hoc* emergency assistance. Table 4 shows that survey respondents cited the community as the highest source of support (64%), followed by the government (39%), and non-government organizations (NGOs) (29%).

Table 4: Major sources of emergency relief during the COVID-19 pandemic

| | Frequency | Percent |
|------------|-----------|---------|
| Government | | |
| Yes | 114 | 39 |
| No | 175 | 61 |
| Community | | |
| Yes | 184 | 64 |
| No | 105 | 36 |
| NGO | | |
| Yes | 83 | 29 |
| No | 206 | 71 |

Disaggregated findings in Figure 6 by professions shows that household aids topped the list (43%) in accessing emergency relief, followed by day laborers (41%), service (34%), micro-entrepreneurs (28%), RMG workers (27%), transport workers (27%), and returnees (10%). A gender-disaggregated analysis suggests that about one-third of females and nearly a quarter of males received emergency relief. The two-sample t-test results in Table 3 also confirmed a significant difference in accessing emergency relief in terms of respondents' gender status.

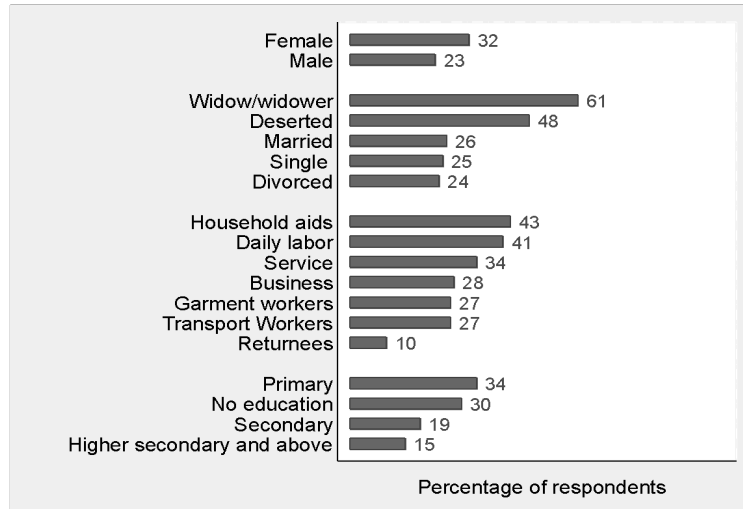


Figure 6: Respondents’ access to emergency relief

In terms of sources of emergency assistance, as Table A2 in the appendix shows, 74% of household aids received emergency relief from the community, followed by RMG workers (68%), micro-entrepreneurs (65%), returnees (65%), service (61%), daily laborers (58%), and transport workers (29%).

Access to Community Networks and Support

Survey enumerators gathered data on households’ affiliation with any community groups, networks, or organizations that may be considered to be social capital. Social capital is particularly important during a crisis period as the government has limitations addressing multi-dimensional problems faced by vulnerable sections. The survey results showed that only about one-fifth (19%) of the households were affiliated with community networks (Figure A2 in Appendix).

People involved in business (32%) and service (32%) professions had a higher affiliation with community networks, whereas household aids (11%) and returnees (12%) had the least association. Figure 7 indicates that only 16% of households received help from the community network with which they were associated. For certain groups such as household aids and transport workers, there was no help received. The two-sample t-test shown in Table 3 indicated no gender difference in terms of respondents’ community membership and help from their affiliated network during the pandemic.

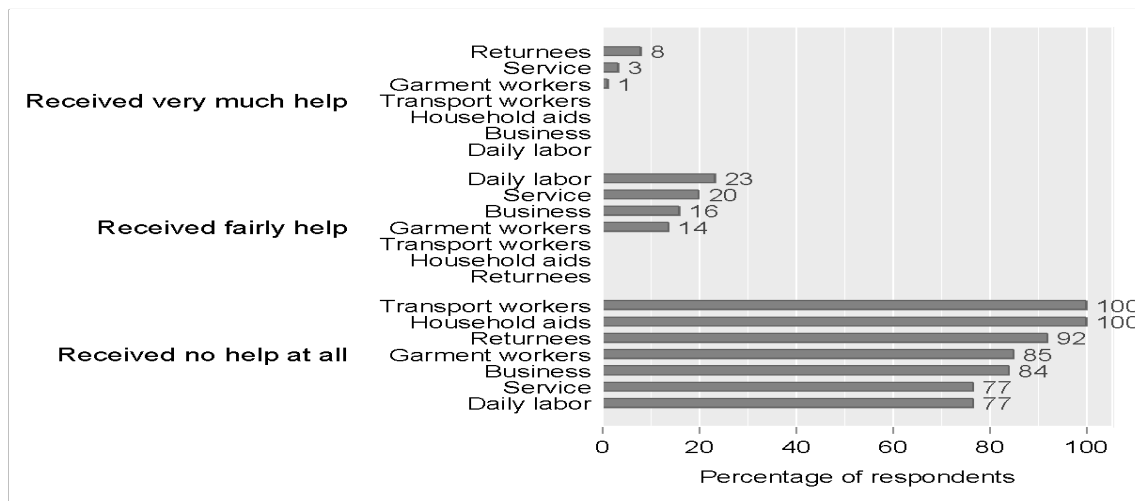


Figure 7: Received help from community networks

The survey explored whether respondents sought and received help from the community at large beyond their network. About 43% of respondents sought community support, but only 27% of them received the help they sought. A disaggregated analysis in Figure 8, based on professions, revealed that over two-thirds (68%) of the household aids sought community support, followed by service holders (55%), transport workers (54%), day laborers (52%), micro-entrepreneurs (40%), RMG workers (39%), and returnees (32%).

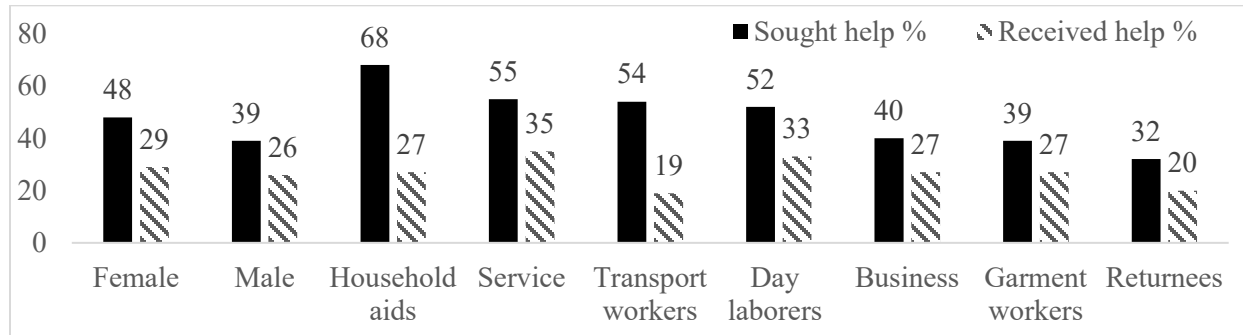


Figure 8: Percentage of respondents who sought community support by profession

A gender-wise differentiation of the findings revealed that 48% of females and 39% of male respondents sought help, while 29% of females and 26% of males received help. Among the recipients of community support, 35% of service holders received assistance, followed by daily laborers (33%), household aids (27%), micro-entrepreneurs (27%), RMG workers (27%), returnees (20%), and transport workers (19%). The two-sample t-test in Table 3 suggested a significant gender gap in seeking community help. However, there is no difference in this regard in receiving the support.

Unstructured interviews and the FGDs revealed a mixed view of support from the community or NGOs. A section of them received the help they sought, while some reported that while their names were listed by the concerns, they did not eventually receive the support due to them. Some household aids received support from their employers. One NGO executive said that they helped the people with whom they had institutional relations, but they did not follow a community-based approach in reaching out to the needy. Another senior NGO executive mentioned that NGOs usually implement donor-designed projects, and they had lost the innovative capacity and desire to establish the kind of volunteerism needed to support the vulnerable people in a situation such as COVID-19.

Cut-down in Food and Nutrition Intake

Figure 9 shows that the food intake and nutritional behavior of households had changed amid the pandemic. About 93% of household aids, 92% of day laborers, 85% of micro-entrepreneurs, 92% of transport workers, 89% of private service holders, 81% of RMG workers, and 78% of returnees experienced the change in food intake behavior (Figure A3 in appendix). About 40% of households were found to have reduced the number of their meals to less than three meals a day, 70% consumed less quantity of food, 87% reduced protein consumption, and 69% nursing mothers and children received reduced nutritional care. Figure A4 in the appendix further shows that the incidence of decrease in protein intake among the occupational groups was between 83% to 93%, with household aids topping the list (93%), followed by day laborers (92%), private service holders (88%), RMG workers (86%), micro-entrepreneurs (84%), transport workers (83%), and returnees (83%).

The two-sample t-test in Table 3 indicated no difference between male and female workers in terms of food and nutrition intake - both groups were equally affected adversely in terms of having less meals a day, an inadequate quantity of food, and a lower protein intake. Changes in the food and nutritional intake behavior depicted here was also echoed by the respondents of FGDs and unstructured interviews.

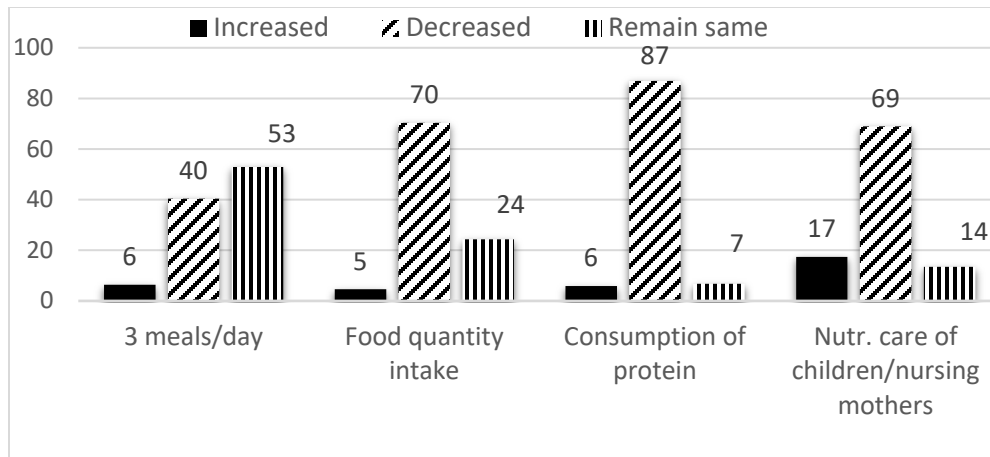


Figure 9: Changes in the food and nutritional intake (% of respondents)

Usage of Savings

Figure 10 shows that households’ income declined markedly, while their expenses did not drop in line with income fall during the pandemic. Given the limited scale of the social safety net and emergency relief and community-based support, they depended on their savings to cope with the shock. This became obvious when 83% of the respondents reported that their savings were adversely affected. Among different professions, returnees (100%) were the most affected groups, followed by household aids (89%), transport workers (85%), day laborers (82%), and service (80%). More male workers (88%) witnessed their savings depleted than female workers (77%).

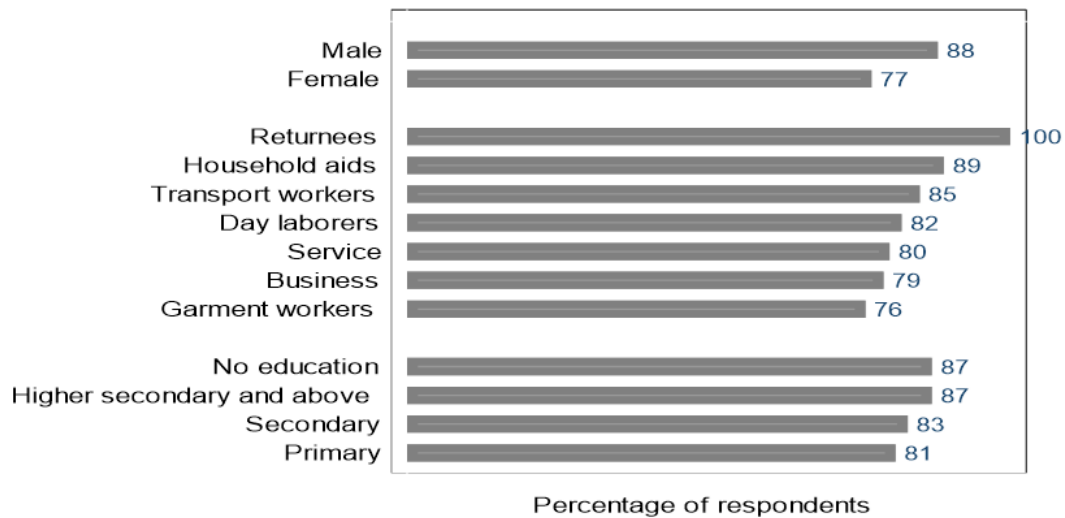


Figure 10: Percentage of households' savings affected during the pandemic

In Table 3, the two-sample t-test confirmed a significant gender gap in terms of households’ depletion of savings amid the pandemic, with male workers more affected than female workers. Unstructured interviews and an FGD showed that most households used up their savings during the pandemic. NGOs discouraged their clients’ use of savings for consumption purposes. Some respondents used ornaments as collateral or sold them to get a loan to finance daily necessities.

Borrowing from Formal and Informal Sources

The savings and/or assets of respondents were not sufficient to meet their financial and other needs. About three quarters of the households felt the need for financial support, with more females (80%) than male workers (71%) feeling this pressure. However, more male workers (79%) received financial support than female workers (72%). A disaggregated analysis by occupation in Figure 11 revealed that 93% of the household aids, 81% service holders, 79% of the day laborers, 77% of transport workers, and 74% of micro-entrepreneurs felt the need for financial support during the pandemic.

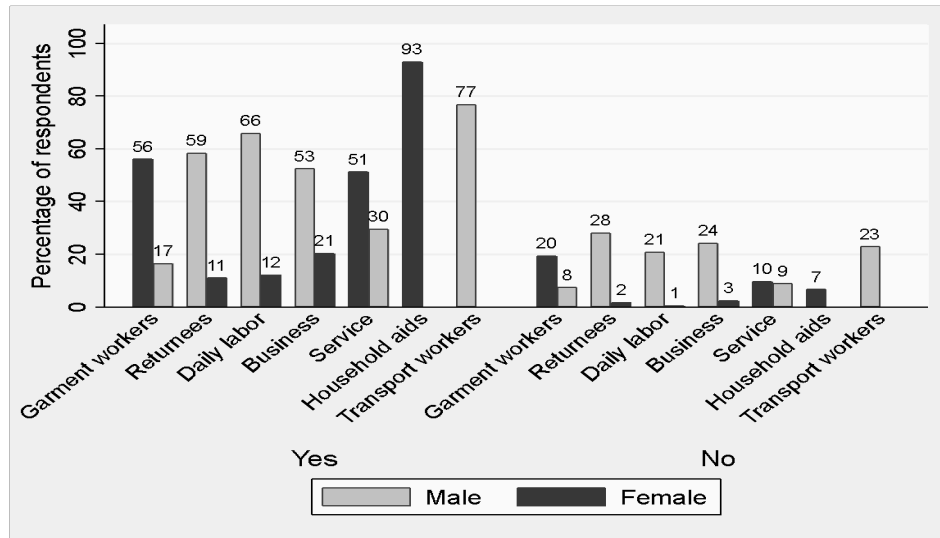


Figure 11: Gender and profession wise financial needs of households

Figure 12 shows that informal channels or institutions, namely relatives, neighbors, grocery store owners, friends, and moneylenders, were the key sources of borrowing, with a minimal role of banks and other formal institutions in meeting the financial needs of households. Disaggregated findings in Table A3 in the appendix indicate that male respondents generally approached relatives more than female respondents did, whereas the women cohort preferred their neighbors as a primary source of financial help. The returnees approached relatives for financial support (76%); the corresponding figures for both the non-RMG group and RMG workers were 60%. Irrespective of gender and profession, banks, NGOs, and other institutions together accounted for only 12% of the sources of funds.



Figure 12: Respondents' sources of financial support during the pandemic (multiple responses)

There is a significant gender gap in terms of demand and supply of finance, as indicated by the results of the two-sample t-test in Table 3, given the fact that more female workers than male workers felt the need for financial support. In contrast, more male workers received support compared to female workers.

Search for an Alternative Livelihood

A number of respondents tried to find other sources of income when they could not perform their regular occupations. For example, Figure 13 shows that about 27% of transport workers opted for an alternative way of earning.

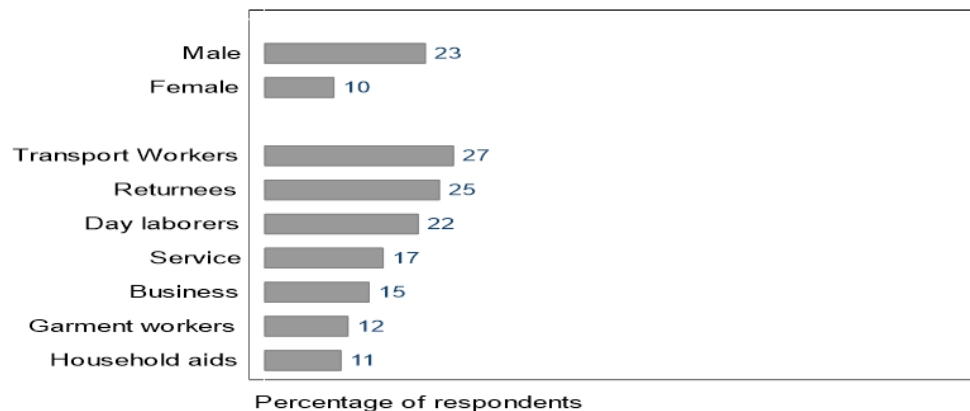


Figure 13: Alternative sources of income by gender and profession

Having lost their source of income abroad, 25% of returnees explored alternative livelihood (25%), followed by day laborers (17%), service holders (17%), and micro-entrepreneurs (15%). More male workers (23%) opted for an alternative livelihood compared to female workers (10%), the two-sample t-test suggesting a significant gender difference in terms of the respondents' attempts to find an alternative livelihood.

An alternative livelihood as a coping strategy was essential for migrant workers, given the uncertainties of returning to host countries. Just under two-thirds of the returnees said they would like to return to host countries. Less than 10% of them were involved with alternative livelihood, and a quarter opted for it (Figure 14).

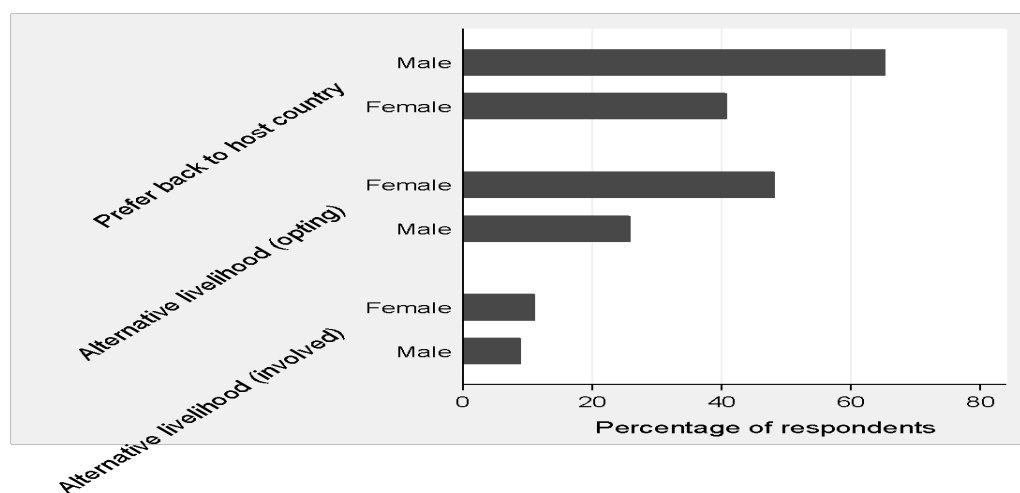


Figure 14: Future livelihood plan of returnee migrants by gender

There was a marked difference between male and female returnees in terms of their preference for alternative livelihood. Nearly half of the female returnees had explored alternative livelihood opportunities in Bangladesh, and that share was much higher than their male counterparts.

Households’ Worry and Ability to Cope with the Pandemic-induced Protracted Crisis

Given the protracted nature of the pandemic, low-income households expressed their concerns about being able to cope with the further shocks emanating from the pandemic. Figure 15 shows that only 5% of respondents were not worried about their future economic loss, while nearly 55% were apprehensive, and 40% were reasonably worried. Returnee migrants (73%) were, in particular, concerned about their future economic losses.

The study explored whether the respondents would be able to bear the cost burden of the pandemic any further, beyond the year 2020. Only 16% of respondents felt that they were in a position to cope with the pandemic with a significant gender gap whereby nearly a-fifth of male workers (19%), compared to 13% of female workers, would be able to bear the burden.



Figure 15: Households concerns about future economic loss

A disaggregated analysis by profession in Figure 16 shows that the household aids (7%) are least prepared to absorb the further burden of the pandemic, followed by service holders (11%), transport workers (12%), and daily laborers (15%) and micro-entrepreneurs (24%). Households could face multidimensional problems if the pandemic is prolonged. Figure 17 shows that they mentioned a potential shortage of food (81%), reduction of income and savings (72%), increased healthcare costs (52%), disruption of education of children (43%), potential family conflict (38%), and deterioration of law and order (14%) are some of the problems they could face.

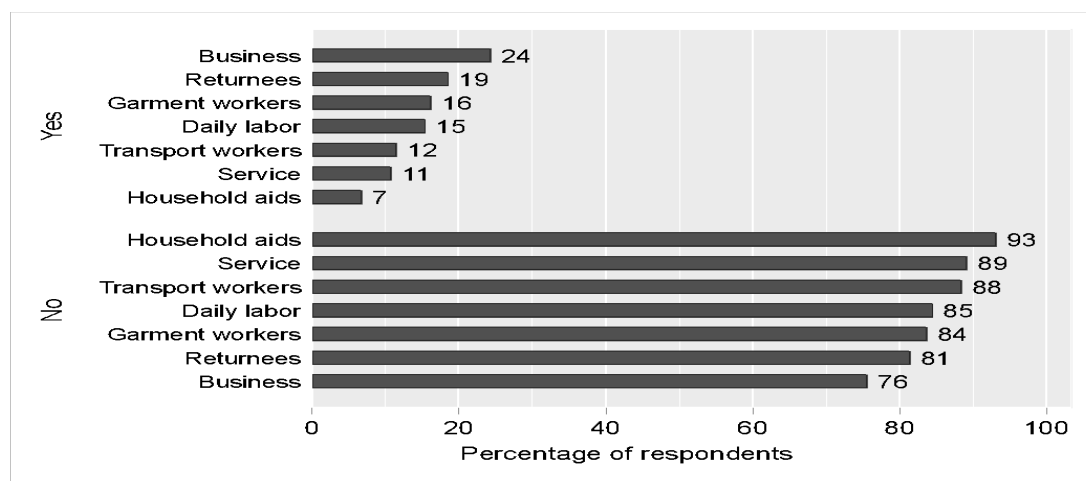


Figure 16: Households’ ability to cope with the outbreak in the near future

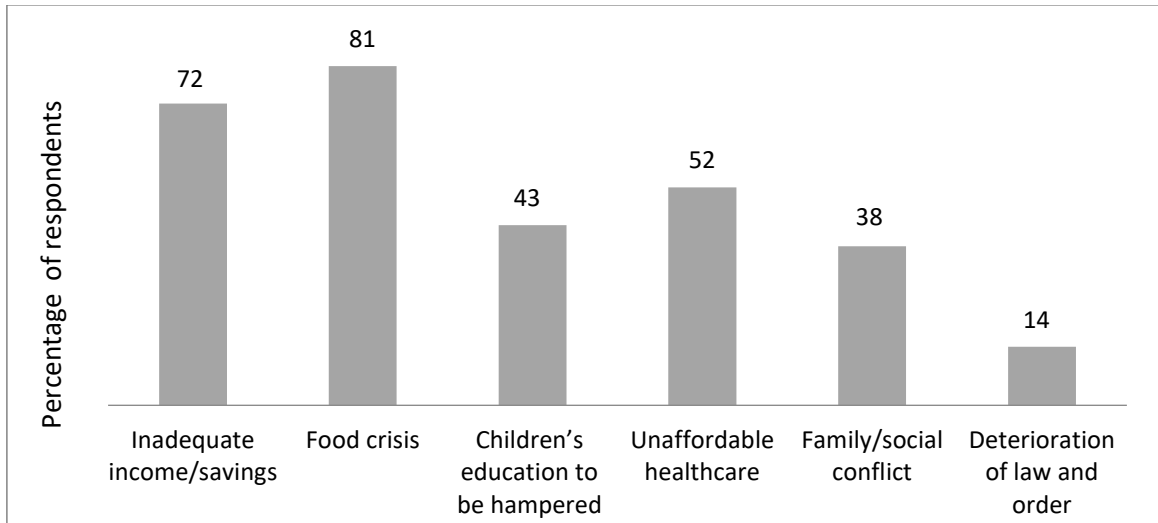


Figure 17: Types of problems households may face (multiple responses)

Addressing the Problems of Low-income Groups

The analysis above indicates that low-income households in Bangladesh struggled to cope with the pandemic. The survey attempted to understand the potential solutions to address the problems of low-income people. In doing so, it captured the households' perception about the much-debated life-livelihood trade-off during the pandemic. Epidemiologists recommended that economic activities be limited, if not shut down, until the virus is controlled. On the question of whether the government's decision to open up the economy before controlling the virus was appropriate, almost 99% of the returnees, 98% of RMG workers, and 98% of the non-RMG workers justified the decision, as shown in Figure 18. The survey found that about 8% of respondents (or their families) were affected by the COVID-19 infection. This indicated that for low-income groups, the preference for livelihood opportunities was more important than the risk of exposure to the COVID-19 virus.

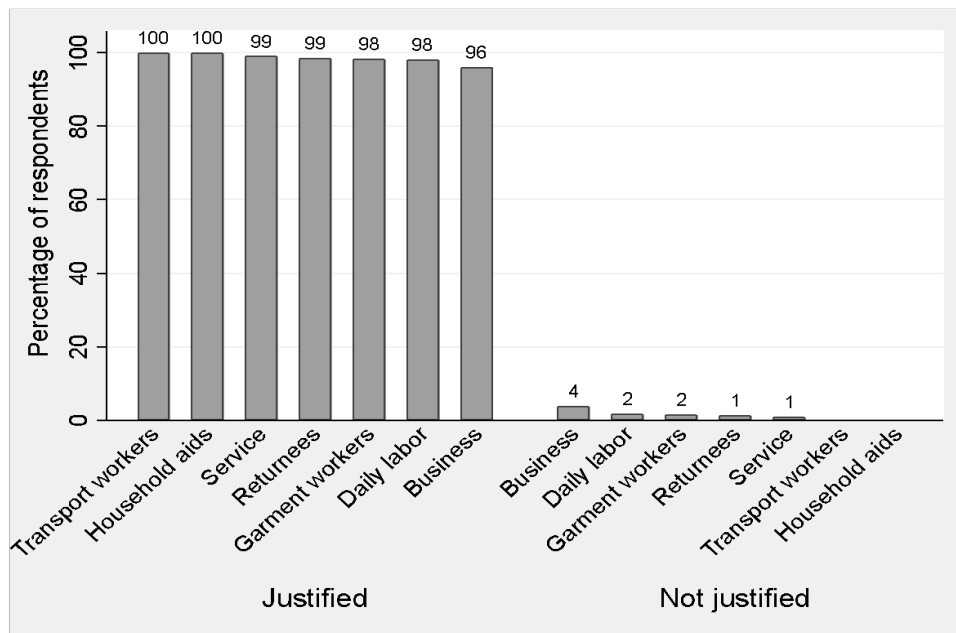


Figure 18: Respondents' perception of the government's decision to open up the economy before controlling the virus

However, opening up the economy to help absorb the economic shock of the pandemic does not diminish the further role of the government to provide support to people in economic hardship during this time. Nearly 70% of households expected the government to come to their rescue to cope with the crisis. More male (75%) than female workers (67%) had higher expectations in this regard. In terms of professions, day laborers (89%) were either highly or reasonably hopeful that the government would help them to overcome their losses, followed by transport worker (83%), service holders (71%), returnees (67%), RMG worker (65%), household aids (61%), and business (60%) (Figure 19).

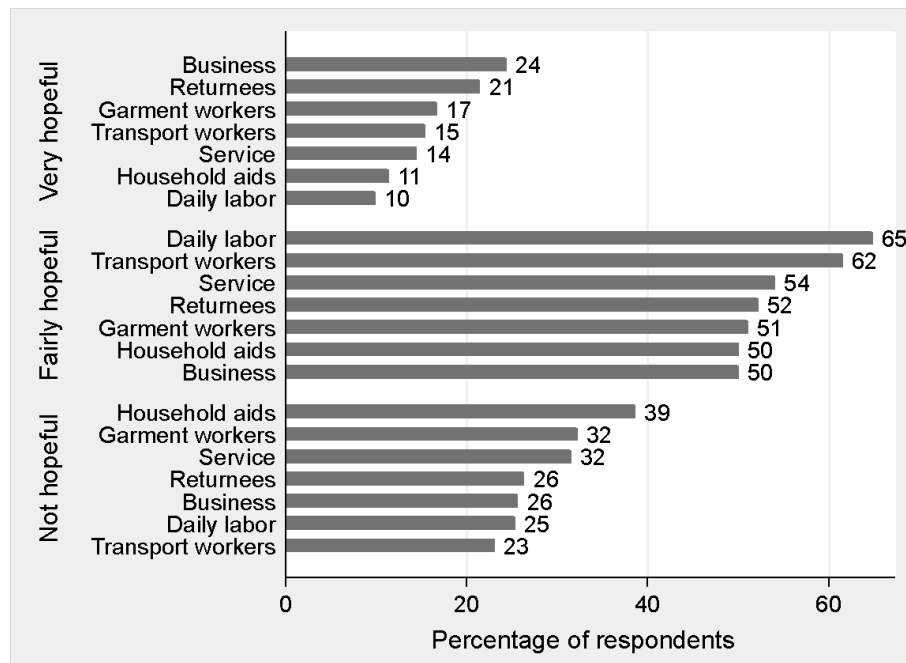


Figure 19: Expectation of getting support from the government to regain economic losses

Conclusions and Policy Recommendations

This study has three specific objectives. The first objective is to assess the numerous measures low-income households used as well as institutional and community support that were available to cope with the pandemic-induced economic crisis. The second objective is to assess any gender difference in these coping strategies. The final objective is to explore the roles that the formal and informal institutions have played to mitigate the financial and other needs.

The findings show that all low-income groups from every occupation surveyed suffered significantly while coping with the pandemic. However, there were marked heterogeneities in terms of occupation and gender, among others. The non-RMG group, particularly informal workers such as household aids, transport workers, and day laborers struggled the most to cope with the pandemic. Micro-entrepreneurs and low-earning service holders had a similar experience. Together, they seldom form an organized group with any effective representation at the national level to lobby for public support such as stimulus packages or other forms of assistance. Returnee migrants suffered in terms of job and income loss, among other things, and lacked representation to voice their demand effectively.

The majority of low-income people coped with the pandemic by cutting down their food and nutrition intake. Several studies reviewed in this paper confirm that reduced consumption across low-income groups was one of the critical ways to cope with the crisis. The long-term consequences of a lack of nutrition are enormous (Kraemer et al., 2016). Targeted programs should be developed, involving international organizations and donors, to limit the impacts of growing food and nutrition poverty.

The study found a variety of results while assessing gendered perspectives in how respondents coped with the pandemic. Female workers, in particular, were in a disadvantageous situation in meeting financial needs during this time. Also, more female returnees felt the need for alternative employment than male workers. These gender-specific concerns should be addressed when designing policies to help people withstand the shock of the pandemic.

Institutional support such as social safety net programs and *ad hoc* emergency assistance were inadequate to help low-income groups. When it came to emergency relief, not even one-third of them received assistance during the pandemic. During lockdowns or similar emergencies, the poor section of the society should be provided with enough cash and food assistance given the lack of adequate contingency savings. A World Bank study also showed that the coverage of safety nets in urban areas (18%) in Bangladesh is comparatively low compared to rural areas (36%) (Daily Star, 2019). Because poverty is changing and becoming more prevalent in urban areas, new solutions may be required. Globally, the COVID-19 pandemic underscores the need for the state to put in place policies, strategies, and institutionalized means of ensuring social protection for all, especially the very poor and vulnerable (UN/DESA, 2020). It is recommended that the coverage of safety net programs be extended in urban and semi-urban areas of Bangladesh.

Formal financial institutions were of little help in meeting households' financial needs. Low-income groups had minimal access to banks and other formal institutions' loan and credit facilities. They overwhelmingly borrowed from informal channels, notably from relatives, neighbors, grocery shop owners, and friends. Given the lack of collateral, low-income people are not bankable in formal institutions. While the Bangladesh Bank introduced a scheme to refinance NGOs' needs for an emergency loan, they have been risk-averse during the pandemic. Innovation is needed to make the formal financial system and NGOs responsive so that they can be mobilized to provide credit swiftly during emergencies.

The role of communities during the pandemic or similar emergency settings is very critical. The study found that communities have a mixed function. Respondents received more emergency assistance (i.e., emergency relief) from communities than the government and NGOs. However, they received little assistance from the community organizations they were involved with. Policy options could include promoting communities that develop this form of social capital, so that this could complement the state's operations during an emergency.

Given the displacement of a large number of migrant workers and lockdown-induced restrictions, returnees and transport workers, in particular, opted for alternative livelihoods. Institutional support in the form of cheap credit and skill development, among others, could facilitate low-income workers' capacity for an alternative livelihood.

While the study is designed to assess the impact of the first wave of the pandemic, the authors have drawn several lessons that could be useful to help low-income households cope with a second wave of the pandemic. An overwhelming majority of low-income households placed a higher priority on their livelihood than risking exposure to the COVID-19 virus. This is hardly surprising given the myriad challenges they faced. From policy perspectives, the choices that these households made should be considered when recommendations are provided by epidemiologists and other health sector experts.

As the pandemic continues, the fear that households had and was reflected in the survey becomes a reality. Low-income groups anticipated several problems they might face, including food shortage, further pressure on their savings and assets, educational losses for their children, unaffordable healthcare, and family (social) tensions. The survey also underscored that low-income people relied heavily on the state to cope with the crisis. This reinforces the fact that the government remains the insurer of last resort.

Given the myriad of problems faced by the low-income groups and the potential further vulnerabilities amidst the third wave of the pandemic, the government, development partners, and international agencies may want to consider the policies recommended in this study to mitigate the impact of the COVID-19 pandemic on these vulnerable groups.

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Conflict of Interest: The authors have no conflicts of interest to declare.

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Appendix

Table A1: Indicators of coping measures applied in selected studies

| Coping mechanisms indicators | Country focus | Reference study |
|---|---|---|
| <ul style="list-style-type: none"> ▪ Decreased food consumption ▪ Reduced other necessary expenses ▪ Took loan ▪ Received government aid ▪ Received Non-government aid ▪ Used savings ▪ Received support from community-based organization ▪ Sold assets ▪ Received individual grant ▪ Accessed ration card (food subsidy) ▪ Purchased goods from open market sales ▪ Moved to lower rented place ▪ Migrated out (household member) ▪ Shared household rent | Bangladesh | UNDP-HDRC (2020) |
| <ul style="list-style-type: none"> ▪ <i>Personal coping:</i> ▪ Used household income and savings ▪ Took loans, shop credit ▪ Reduced consumption ▪ Sold asset ▪ Received remittance ▪ <i>Social and Institutional coping:</i> ▪ Received support from friends/relatives, neighbors, and local community ▪ Received support from employers ▪ Received government relief ▪ Received help from NGOs | Bangladesh | PPRC-BIGD (2020) & PPRC-BIGD (2021) |
| <ul style="list-style-type: none"> ▪ Used contingency savings ▪ Borrowed essential supplies from friends and relatives ▪ Received government support ▪ Borrowed from banks | Nigeria | Adesina-Uthman and Obaka (2020) |
| <ul style="list-style-type: none"> ▪ Reduced certain types of consumption ▪ Sold productive assets ▪ Borrowed at high-interest rates ▪ Received social assistance. ▪ The reduced coping strategy index (rCSI) of World Food Programme. Constructed from a battery of questions - whether a household had to rely on selling assets, informal borrowing, reducing meals, and how frequent they did that over a specified period, normally 7 days. | Ethiopia, Malawi, Mali, Nigeria, Uganda, Mozambique, Niger, and DRC (Congo) | Koos et al. (2020) |
| <ul style="list-style-type: none"> ▪ Borrowed money ▪ Sold household livestock | Malawi | Ilboudo et al. (2017) |
| <ul style="list-style-type: none"> ▪ Skipped meals ▪ Reduced protein consumption ▪ Harvested immature crops | Ghana | Laar et al. (2015) |

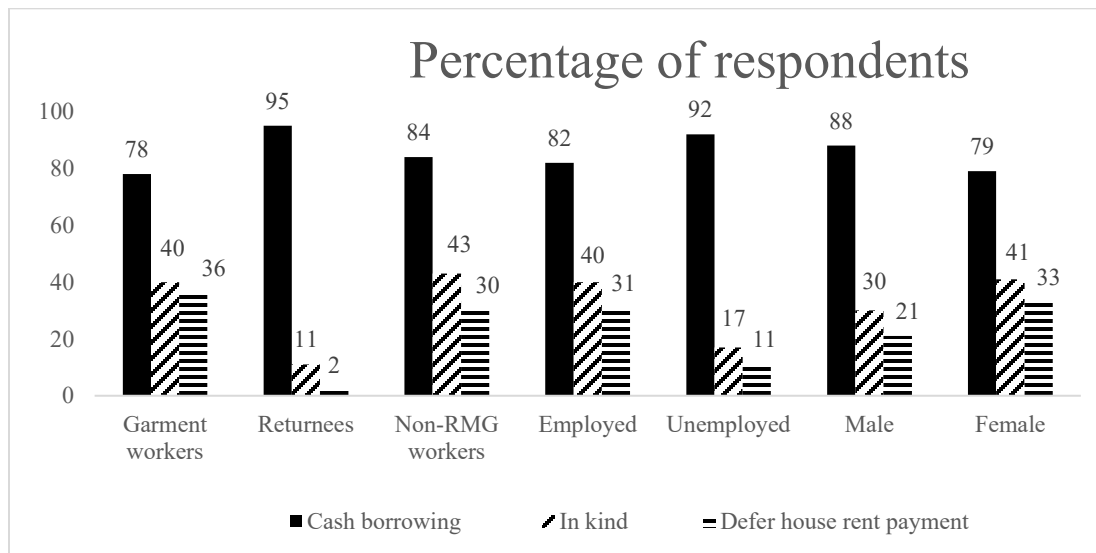


Figure A1: Types of support sought by respondents during the pandemic (multiple responses)

Table A2: Sources of emergency relief by professions (n=289)

| Source of relief | RMG workers | Returnees | Daily labor | Business | Service | Household aids | Transport workers |
|------------------|-------------|-----------|-------------|----------|---------|----------------|-------------------|
| Government | | | | | | | |
| Yes | 35.65 | 55 | 46.27 | 34.78 | 31.58 | 42.11 | 42.86 |
| No | 64.35 | 45 | 53.73 | 65.22 | 68.42 | 57.89 | 57.14 |
| Community | | | | | | | |
| Yes | 67.83 | 65 | 58.21 | 65.22 | 60.53 | 73.68 | 28.57 |
| No | 32.17 | 35 | 41.79 | 34.78 | 39.47 | 26.32 | 71.43 |
| NGO | | | | | | | |
| Yes | 30.43 | 5 | 26.87 | 39.13 | 34.21 | 21.05 | 42.86 |
| No | 69.57 | 95 | 73.13 | 60.87 | 65.79 | 78.95 | 57.14 |

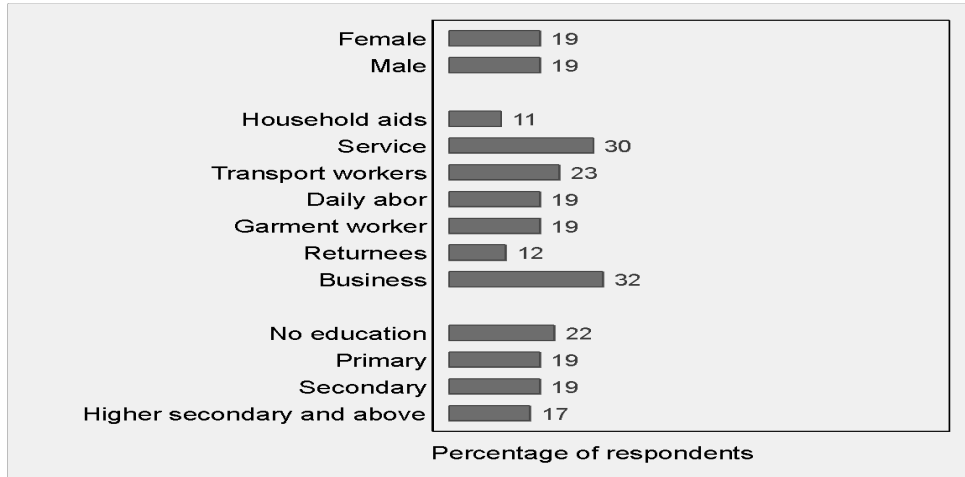


Figure A2: Households affiliation with community network

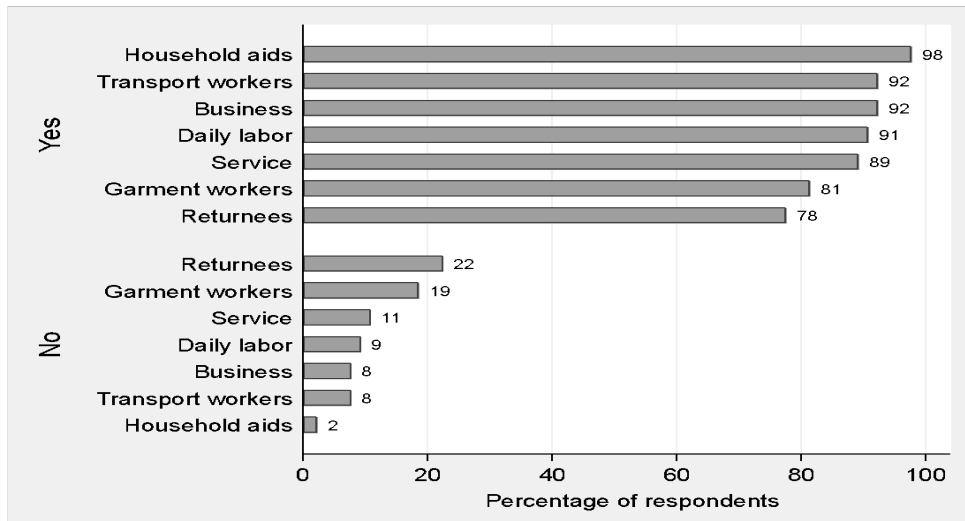


Figure A3: Profession-wise incidence of changes in food behavior

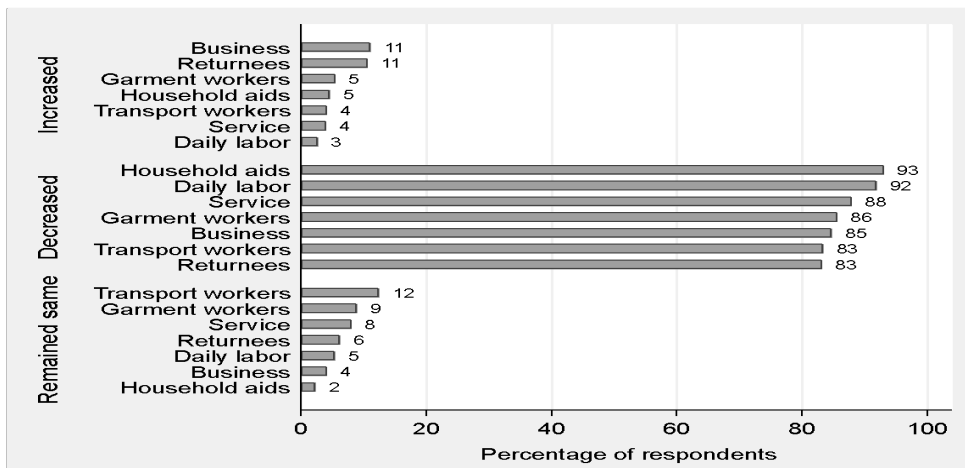


Figure A4: Profession-wise incidence of change in protein intake

Table A3: Financial support sought from different sources by profession and gender

| | | Relatives | Friends | Neighbors | Money lender | Grocery shop owners | Bank | Other institutions | Total |
|-----------|----------------------|-----------|---------|-----------|--------------|---------------------|-------|--------------------|--------|
| RMG | Frequency | 185 | 28 | 173 | 12 | 93 | 14 | 38 | 543 |
| | Percent of responses | 34.07 | 5.16 | 31.86 | 2.21 | 17.13 | 2.58 | 7 | 100 |
| | Percent of cases | 60.26 | 9.12 | 56.35 | 3.91 | 30.29 | 4.56 | 12.38 | 176.87 |
| Returnees | Frequency | 106 | 22 | 14 | 0 | 6 | 17 | 22 | 187 |
| | Percent of responses | 56.68 | 11.76 | 7.49 | 0 | 3.21 | 9.09 | 11.76 | 100 |
| | Percent of cases | 75.71 | 15.71 | 10 | 0 | 4.29 | 12.14 | 15.71 | 133.57 |
| Non-RMG | Frequency | 201 | 24 | 186 | 18 | 96 | 16 | 57 | 598 |
| | Percent of responses | 33.61 | 4.01 | 31.1 | 3.01 | 16.05 | 2.68 | 9.53 | 100 |
| | Percent of cases | 60.18 | 7.19 | 55.69 | 5.39 | 28.74 | 4.79 | 17.07 | 179.04 |
| Male | Frequency | 261 | 46 | 144 | 15 | 72 | 31 | 64 | 633 |
| | Percent of responses | 41.23 | 7.27 | 22.75 | 2.37 | 11.37 | 4.9 | 10.11 | 100 |
| | Percent of cases | 67.1 | 11.83 | 37.02 | 3.86 | 18.51 | 7.97 | 16.45 | 162.72 |
| Female | Frequency | 231 | 28 | 229 | 15 | 123 | 16 | 53 | 695 |
| | Percent of responses | 33.24 | 4.03 | 32.95 | 2.16 | 17.7 | 2.3 | 7.63 | 100 |
| | Percent of cases | 58.93 | 7.14 | 58.42 | 3.83 | 31.38 | 4.08 | 13.52 | 177.3 |

Inequality in Access to COVID-19 Vaccines: Evidence from the Household Heads and Household Help from Dhaka City

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Abstract

Inequality in vaccination has been perceived as a research problem in the recent COVID-19 pandemic. This type of inequality has been investigated in the particular context of race, ethnicity, gender, regions in different parts of the world, with no study conducted so far in Bangladesh, an important South Asian country. We have conducted an online purposive random sampling of 311 household heads in April 2021 from Dhaka, Bangladesh, and their respective domestic or household help to examine the vaccination status across the socio-economic background, age, income, access to communication technology, and having a national identity card. Using univariate descriptive statistics, bivariate contingency table analysis, and multivariate logistic regression estimation, we find that in Dhaka, domestic or household workers above 40 years of age have mostly not taken COVID-19 vaccination at a 5% significance level. At the same time, their associated household heads are mostly vaccinated with two doses when they are above 40. Being a household head and having access to reliable communication technology are significant determinants of online registration and COVID-19 vaccination. The results have posed a question regarding the efficacy of the ongoing vaccination drive and the observed inequality or vaccine gap, primarily driven by class differences, whereas the government policy towards vaccination was intended to be universal across classes.

JEL Classification: I1 (Health); I18 (Government Policy, Regulation, and Public Health)

Keywords: Vaccine Gap; Vaccine Inequality; Vaccine Disparity; COVID-19

Introduction

Bangladesh's Vaccination Policy: Serum Institute

In a recent speech, the WHO Secretary-General expressed his distress regarding the vaccine gap between the rich and developing countries. He stated that nations such as Israel, UAE, and Saudi Arabia are globally considered to be the benchmark for universal vaccination, and hence their vaccination policies are being adopted by numerous countries. However, even after adopting these guidelines, several nations have failed to reap the benefit of a first-mover advantage. On the contrary, countries with effective administrative structures such as New Zealand, South Korea, and Jordan have used sensible strategies and achieved praiseworthy success against the virus.

The South Asian nation Bangladesh, with approximately 166 million people, is considered to be a lower-middle-income country. Unfortunately, the COVID-19 pandemic has severely affected its economy and sustainable development agendas. The government of Bangladesh was prudent enough to allow the private sector to negotiate with the Serum Institute of India to purchase Oxford vaccines, known as the Covishield¹, with advanced payment

(Kamruzzaman, 2021). On November 5, 2020, the Bangladesh government ordered 30 million doses for \$4 per shot through Beximco Pharmaceuticals, and the effective mass vaccination started on February 7, 2021 (Kamruzzaman, 2021). It is to be noted that Bangladesh's health expenditure as a percent of GDP is the lowest in South Asia. As of 2018, the corresponding figures for the South Asian countries in descending order are Maldives (9.41%), Afghanistan (9.40%), Nepal (5.84%), Sri Lanka (3.76%), India (3.54%), Pakistan (3.20%), Bhutan (3.06%), and Bangladesh (2.34%) (World Bank, 2021).

Chronological History

According to the World Health Organization (WHO), as of May 31, 2021, the total cases of COVID-19 in Bangladesh was 798,830, of which 12,583 (1.56%) patients have died. The government followed limited testing facilities for the mass population. Nonetheless, the government was cautious enough to launch a freely available vaccination *en masse*, following the Extended Program of Immunization (EPI) success history. The government reserved 30 million doses from the Serum Institute, with advanced payment for 15 million doses. These were made freely available to all people via an online registration system, with limited rationing of age limit starting from 60, 50, and finally 40 years. The regulatory body also integrated foreign nationals residing in Bangladesh into the mass vaccination program from March 17, 2021. As of May 31, 2021, more than 9.90 million vaccines have been used in Bangladesh. Out of the total population of around 166 million people, only 4.17 million people are fully vaccinated, and an estimated 1.65 million have taken their first shot.

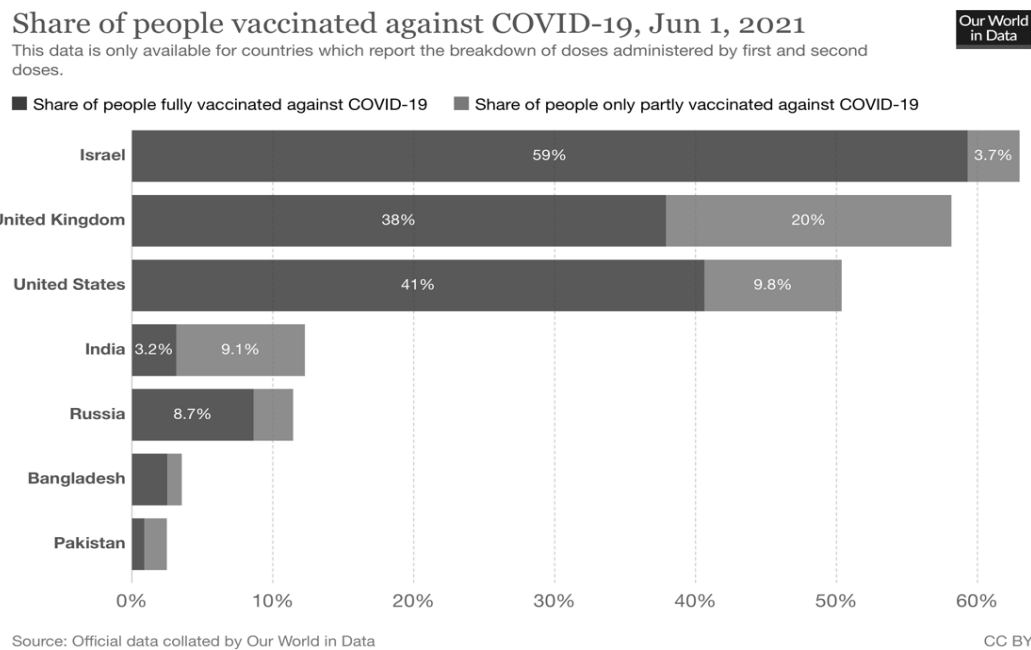


Figure 1: Share of People Vaccinated against COVID-19 at a glance

Source: Our World in Data (2021)

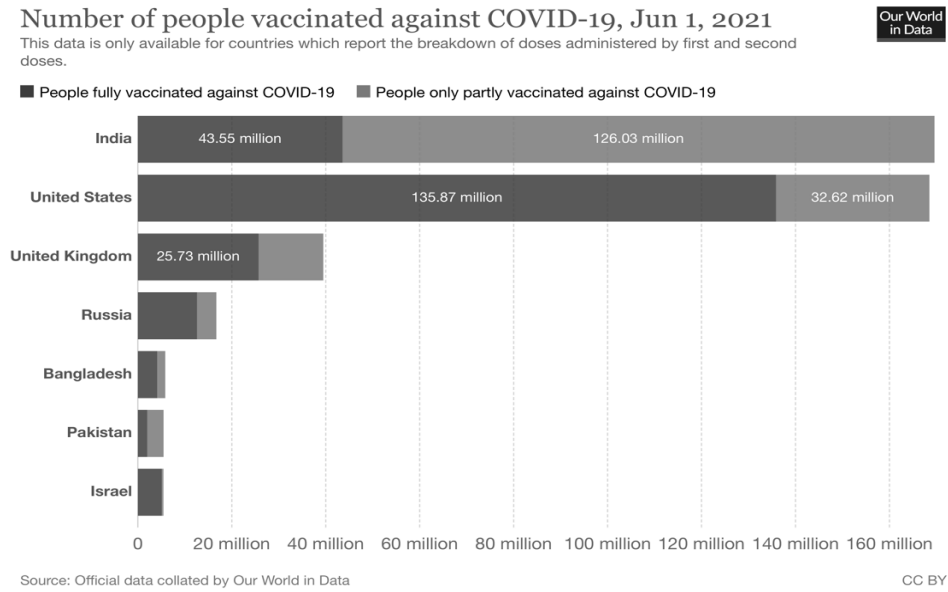


Figure 2: Number of People Vaccinated against COVID-19 at a glance
Source: Our World in Data (2021)

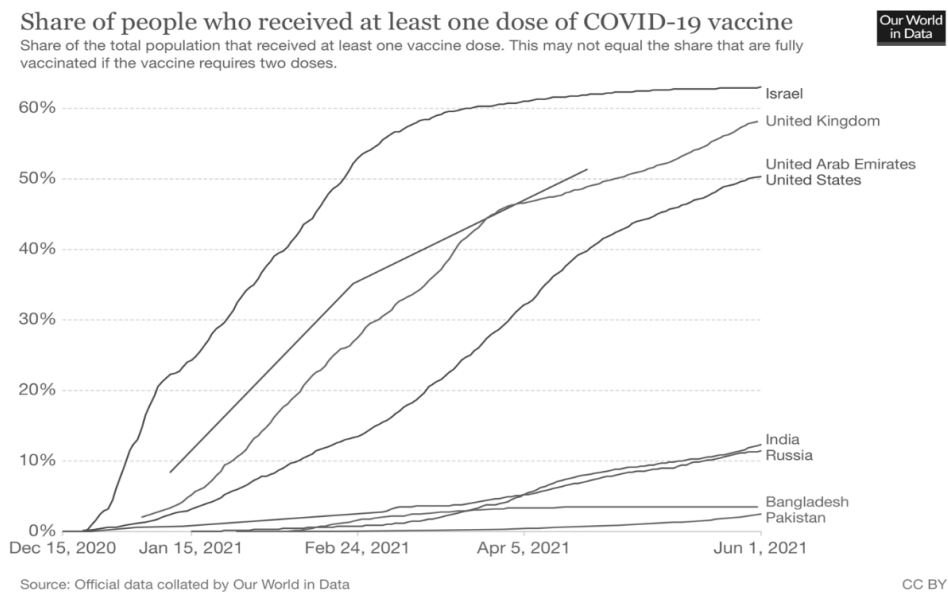


Figure 3: The dynamics of the share of people who received at least one dose
Source: Our World in Data (2021)

From the figures above, it can be seen that Israel has effectively vaccinated 59% of its entire population by May 31, 2021. The United Kingdom and the United States of America have fully immunized around 40% of their population (Our World in Data, 2021). It can also be seen that 43.56 million Indians are fully immunized, and 126.03 million are partially protected against COVID-19 (Our World in Data, 2021). On the other hand, Bangladesh and Pakistan are lagging behind their neighbor India in these numbers. Only 2.25% of 166 million people are fully vaccinated in Bangladesh, which is somewhat alarming.

The puzzles of the rich-poor divide for mass vaccination

Agence France-Presse (AFP) has reported that the vaccine gap between underprivileged and privileged countries is snowballing, and there is no general solution available to mitigate this disparity. Many developed countries have started providing vaccination to their youth, while several developing countries have started their first dose of immunization for people above 40 years old. According to the World Health Organization, vaccination has been provided to more than 600 million people worldwide. Nevertheless, many underdeveloped countries in Africa have not received their first supply of COVID-19 vaccines. The WHO Director-General, Tedros Adhamon Ghebreyesus, has said that the COVID-19 vaccination is a blessing for affluent countries; however, it is a curse for emerging countries. It introduces another means of increasing inequality between rich and developing countries (UN News, 2021).

Nonetheless, the global community has not considered the internal vaccine gap within countries, manifested by unequal access to the so-called mass vaccination available to the general public. We have seen that even in countries like the UK and the US, racial minorities, including African Americans have a higher death rate than most of the population, even though most countries provide the vaccines freely. Why is this happening?

Research Objective

In Bangladesh, the affluent can easily afford more than one household help to support household chores. These workers are hired on a part-time or full-time basis. Dhaka city, the sixth largest megacity in the world, has undergone massive urbanization, and the migration of the young population from the countryside to Dhaka has led to many of them being hired as domestic help. Those who employ these migrants are mostly vaccinated, while the employees who prepare meals and provide cleaning, cooking, and other services are outside the fold of those who are vaccinated. The irony is that these domestic workers regularly contact their employers, putting them at risk. Is there any reason for this vaccine gap within the city? Income, wealth, education, class, or consciousness level disparity probably put this household help in a disadvantageous position to get proper access to digital facilities, thereby preventing them from registering for the vaccine.

The main objective of this study is to examine the reasons for this vaccine gap by conducting a sample survey of people living across different parts of the city. With this end in view, the second section of this paper presents a brief literature review of the vaccine gap, the third section includes an outline of the methodology used in this paper, the fourth section provides a broad overview about data, and the following three sections present estimated results followed by a concluding section that has policy suggestions.

Literature Review

The literature on non-medical COVID-19 research can be broadly classified into three groups: causes of transmission, causes of death or mortality, and the socio-economic impact of COVID-19. In the first group, several potential reasons for transmission were identified. The determinants include testing, environmental or ecological factors, the effectiveness of the government, cultural factors such as wearing a mask or keeping physical distance, and handwashing (Goswami, Ali, and Islam, 2020; Ehlert, 2021). The factors seen as contributing to a higher death rate are: preconditions of asthma, cancer, liver or other non-communicable diseases, lack of vaccination, age, gender, and racial minority status (Gebhard, Regitz-Zagrosek, Neuhauser, Morgan, and Klein, 2020; Kang and Jung 2020; Perone, 2021).

India, a highly populated country, is dealing with an inadequate rural healthcare system (Kumar, Nayar, and Koya, 2020). Similarly, it is difficult for Bangladesh to distribute vaccination equitably among low- and high-income households due to its limited rural healthcare system. The COVID-19 pandemic has also disrupted production and transportation throughout the world. Consequently, the food chain system of many countries has been highly affected, and lower-income citizens have been exposed to job lay-offs (Singh, Kumar, Panchal, and Tiwari, 2021). Unemployment often leads to the consumption of less nutritious foods, which may deteriorate the immune system, increasing the probability of getting infected by COVID-19. A vaccine produced by a US federal program is being proposed to be delivered at Dollar General, a retail outlet targeted to low-income groups so that they may have easier accessibility. This might reduce the gap of vaccination between high and low low-income households. (Chevalier, Schwartz, Su, and Williams, 2021)

Research on immunization of children from various diseases in Bangladesh discusses numerous factors creating a disparity among households of different income levels. Generally, 86% of children in Bangladesh are wholly vaccinated for different flu viruses. However, urban children can access facilities with more medical advancements than children from rural areas. As a result, many unimmunized children are being seen in less-educated and low-income households in underdeveloped regions in Senegal (Sarker, Akram, Ali, Chowdhury, and Sultana, 2019). In addition, these groups lack knowledge regarding health issues and therefore do not make the best decisions related to their wellbeing.

In the US, the concept of accepting vaccination varies among regions due to differences in culture, religion, and political beliefs. Cynical political beliefs among African Americans make them less willing to take vaccinations (Woko, Siegel, and Hornik, 2020). Some surveys on COVID-19 vaccinations have found that most respondents are willing to receive vaccinations if the government verifies the reliability of the vaccines (Lazarus et al., 2021). However, a prevalent issue in the US across different states is that racial minorities are not receiving vaccinations at rates that are in keeping with their representation in the population (Thoumi, Tewarson, and Johnson 2021).

A health survey shows that Bangladesh has successfully distributed remedies for tetanus to different rural areas through building clinics, arranging roadshows, and educating low-income households. The Bangladesh government has effectively immunized the youth by covering BCG, DPT 1, DPT 2, DPT 3, Polio 1, Polio 2, and Polio 3 vaccinations (Jamil, Bhuiya, Streatfeild, and Chakrabarty, 1999). Several active small firms in Bangladesh are developing income smoothing behaviors to minimize this gap (Habib, 2005). However, the income gap between rich and poor hinders the Bangladesh government's sustainability (Boulton, Carlson, Power, and Wagner, 2018). Consequently, Bangladesh needs improvement in socio-economic factors to reduce the vaccine disparity among different classes of people.

A large body of the vaccine gap literature deals with other epidemics, the rich-poor divide, the digital divide, and the developed vs. developing country divide. The literature discusses income disparity among different races, cultures, ethnic groups, and economies. Evidence of income disparity has been found by numerous studies that have conducted cross-country analysis. However, research is lacking on intra-country vaccine disparity. This paper fills this gap by examining the vaccine disparity among different classes of people using primary data from Dhaka, Bangladesh.

Methodology

This study examines the magnitude and the determinants of the COVID-19 vaccine gap in Dhaka, Bangladesh. A purposive random sample of 311 household heads and their corresponding household help was conducted in April 2021. Respondents were asked 41 questions about possible factors that may have contributed to vaccine disparity. The nature of the questions is primarily categorical, and some are purely ordered responses. In addition, information about household heads and their family members was collected, and such information was also gathered from the domestic workers. The data was collected mainly from the households of undergraduate and graduate students at North South University (NSU), Dhaka, in Spring 2021.

NSU is the second-largest university in Bangladesh and the leading private university among 107 private universities. The advantage of selecting NSU is that it has a representative student population from all parts of Bangladesh living in Dhaka. Currently, NSU has 20,000 students from different parts of Bangladesh, and the majority of them reside in Dhaka, having come here for their education. It is to be noted that NSU is successfully conducting online classes for all programs during the COVID-19 pandemic. All students participate in classwork remotely, and teachers connect with students via Google Classroom.

The survey respondents are classified according to their profession, residential area, income level, age, awareness level, and the number of electronic devices owned; the household workers are also classified in another cluster based on their income level, education, cell phone ownership, accessibility to electronic devices and internet, and awareness level. This study examines the determinants of vaccine disparity by using a Logit model because the dependent variable is the probability of being vaccinated or not.

Survey Population

The survey population consists of residents of Dhaka city who had part-time or full-time household help during the survey period. Household heads or household workers aged below 40 years were excluded from the final estimation, as based on the directives of the Bangladesh government, this age group did not qualify to receive vaccinations till April 30, 2021.

Sampling Method

A purposive random sampling method has been used, allowing the researchers to select samples for an online survey. Dhaka is the largest megacity of Bangladesh, and it is the sixth most densely populated city globally, with 8.9 million residents. Dhaka has been selected for this study, as this cosmopolitan city is home to migrants from all parts of the country, and hence the number of COVID-19 cases and death rates are the highest here of any region in the country.

Considering the widespread infection, transmission, and mutation of the new variants of COVID-19, face-to-face interviews with the respondents were avoided. Instead, an online platform from NSU was used. The online survey was conducted using Google Forms, and the link to the form was circulated among teachers and students of NSU. Given the standard of living of most NSU students, it was assumed that their households could afford to hire one or more domestic workers, either full-time or part-time.

Part-time household help generally lives close to the residence where they work, preferably within walking distance. They primarily work in the residence of their household head for a couple of hours a day, making it difficult for researchers to collect data from these part-time workers personally. An online questionnaire was circulated to students via Google Classroom, and they were asked to fill out the form by collecting responses from part-time and full-time workers in their households. The students were asked to submit the answers via the online platform, and the data was stored for 15 days, from April 16 to April 30, 2021. Students who relocated their residence from Dhaka to other parts of the country during the pandemic were excluded from the sample. Families that did not use any household help service during the data collection period were also excluded.

Survey Constraints

Many respondents hesitated to share their residential address and cell number with the researchers. Also, this study does not have any external financial support, and hence no financial incentives could be provided to the respondents to fill out the form. The authors had to request the respondents repeatedly to participate in the survey. Moreover, many domestic workers were below 40 years of age, and hence they do not qualify for vaccination. The data collection process was solely based on online responses from household heads/students, while direct responses from household help were not available due to the nature of the survey. Some students were busy during the spring semester's final stage and did not have sufficient time to fill out the questionnaire. The authors had to rely heavily on course teachers to encourage their students to participate in the survey. The prolonged absence of some students from Dhaka implied that they were taking online classes from rural areas and could not participate in the study due to location constraints. Some families were not comfortable using household help services during COVID-19, so these families were excluded from the survey.

Data

Sample Size

The survey respondents were mainly from 26 areas of Dhaka city. The sample consists of 311 households who have used household help during the period. The family information of the household head is captured, but that of the domestic workers' family is not fully captured; information about only the household help was captured.

Area Covered and Time Frame

The data was collected from the Dhaka North and the Dhaka South City Corporation Area and surrounding areas. During the data collection period in April 2021, many respondents had just received the first dose of the vaccine, and a few were fully vaccinated. Since then, the government had temporarily discontinued administering the first dose due to an apparent supply shortage from the Serum Institute, India (Kamruzzaman, 2021).

Univariate and Bivariate Results

Table 1: Vaccinated vs. Not Vaccinated

| Individuals | Vaccinated | Not Vaccinated | Total |
|----------------------------|--------------|----------------|-------|
| Household members above 40 | 360 (67.54%) | 173 (32.46%) | 533 |
| Household members below 40 | 52 (6.15%) | 794 (93.85%) | 846 |
| Household help above 40 | 5 (9.80%) | 46 (90.20%) | 51 |
| Total | 417 | 1,013 | 1,430 |

Source: Calculated from the survey.

Note: Figures in the parentheses represent the percentage of respondents in that respondent type.

The survey yielded data for 311 households and their domestic help. The aggregate number of household members is 1,379, out of which 533 individuals are above 40 years old. Among the 311 household workers, 51 were above 40 years old. Table 1 shows that 67.54% of the household members above 40 years of age were vaccinated. However, only five household workers² above 40 years of age received the COVID-19 vaccination, showing a significant class disparity. It should be noted that the age eligibility criterion for vaccination (above 40) does not apply to frontline workers, health officials, bankers, funeral service workers, and other categories. Also, some households used their connections to get their younger members vaccinated, which explains the 6.15% vaccination rate for household members who are younger than 40.

A Chi-Square Test for Vaccinated vs. Not Vaccinated (above 40 years of age) was conducted. The test result suggested that the null hypothesis of no class discrepancy can be rejected at the 1% significance level, suggesting a significant discrepancy exists because of class difference. As can be seen from Table 2, there are significant differences between the actual frequencies of household members and household help vs. their expected frequencies if the rows and columns were independent (i.e., there was no discrepancy due to class difference). The highly significant test statistic suggests that the row and column independence can be firmly rejected.

Table 2: Chi-Square Test for Vaccinated vs. Not Vaccinated (Above 40 Years of Age)

| | Vaccinated | Not Vaccinated |
|--|--|----------------|
| Household Members | 360 (333.13) | 173 (199.88) |
| Household Help | 5 (31.88) | 46 (19.13) |
| Total | 365 | 219 |
| H ₀ : Vaccination status and respondents' type are not associated | | |
| H _a : Vaccination status and respondents' type are associated | | |
| Test Statistic: 66.207 *** | | |
| Decision: | Reject the null hypothesis at the 1% significance level. | |

Source: Calculated from the survey. *** Significant at 1% level.

Note: Figures outside the parentheses represent the actual frequencies, and figures in the parentheses represent the expected frequencies if the rows and columns were independent.

In Bangladesh, individuals have to undergo an online registration process to get enlisted for the COVID-19 vaccination. Access to the online registration service requires a device, such as a mobile phone, computer, and internet. Therefore, our model uses access to a mobile phone or internet as a vital independent variable.

From Table 3, we can see that 100% of the household heads (above 40 years old) have access to mobile phones or the internet. On the other hand, 64.71% of the household help (above 40 years old) have access to mobile phones or the internet. A Chi-Square Test for "Have access to mobile phone or internet" vs. "Do not have access to mobile phone or internet" was conducted. The test result suggested that the null hypothesis of no class discrepancy can be rejected at the 1% significance level. As shown in Table 4, there are significant differences between the actual frequencies vs. the expected frequencies if the rows and columns were independent. The highly significant test statistic suggests that the row and column independence (which would establish no discrepancy due to class difference) can be firmly rejected.

Table 3: Access to Mobile Phone or Internet

| Individuals | Access to the mobile phone, laptop, computer, or internet | No access to the mobile phone, laptop, computer, or internet | Total |
|-------------------------|---|--|-------|
| Household head above 40 | 294 (100%) | 0 (0%) | 294 |
| Household help above 40 | 33 (64.71%) | 18 (35.29%) | 51 |
| Total | 327 | 18 | 345 |

Source: Calculated from the survey.

Note: Figures in the parentheses represent the percentage of respondents in that respondent type.

Table 4: Chi-Square Test for "Have access to mobile phone or internet" vs. "Do not have access to mobile phone or internet" (Above 40 Years of Age)

| | Have access | Do not have access |
|----------------|--------------|--------------------|
| Household Head | 294 (278.66) | 0 (15.34) |
| Household Help | 33 (48.34) | 18 (2.66) |
| Total | 327 | 18 |

H₀: Access to mobile phone or internet and respondents' type is not associated
 H_a: Access to mobile phone or internet and respondents' type are associated

Test Statistic: 109.477 ***

Decision: Reject the null hypothesis at the 1% significance level.

Source: Calculated from the survey. *** Significant at 1% level.

Note: Figures outside the parentheses represent the actual frequencies, and figures in the parentheses represent the expected frequencies if the rows and columns were independent.

The online registration process in Bangladesh requires a NID card for identity verification and authentication. NID is one of the most important documents needed to register for the COVID-19 vaccination; therefore, NID is a key independent variable in our model.

From Table 5, we can see that 100% of the household heads (above 40 years old) have a NID card. On the other hand, 70.59% of the household help (above 40 years old) have a NID card. A Chi-Square Test for "Have NID" vs. "Do not have NID" was conducted. The test result suggested that the null hypothesis of no class discrepancy can be rejected at the 1% significance level. As can be seen from Table 6, there are significant differences between the actual frequencies vs. the expected frequencies if the rows and columns were independent. The highly significant test statistic suggests that the row and column independence (which would establish no discrepancy due to class difference) can be firmly rejected.

Table 5: Access to National Identity Card (NID)

| Individuals | Have NID | Do not have NID | Total |
|-------------------------|-------------|-----------------|-------|
| Household head above 40 | 294 (100%) | 0 (0%) | 294 |
| Household help above 40 | 36 (70.59%) | 15 (29.41%) | 51 |
| Total | 330 | 15 | 345 |

Source: Calculated from the survey.

Note: Figures in the parentheses represent the percentage of respondents in that respondent type.

Table 6: Chi-Square Test for "Have NID" vs. "Do not have NID" (Above 40 Years of Age)

| | Have NID | Do not have NID |
|---|--|-----------------|
| Household Head | 294 (281.22) | 0 (12.78) |
| Household Help | 36 (48.78) | 15 (2.22) |
| Total | 330 | 15 |
| H ₀ : Access to NID and respondents' type are not associated | | |
| H _a : Access to NID and respondents' type are associated | | |
| | Test Statistic: 90.40*** | |
| Decision | Reject the null hypothesis at the 1% significance level. | |

Source: Calculated from the survey. *** Significant at 1% level.

Note: Figures outside the parentheses represent the actual frequencies, and figures in the parentheses represent the expected frequencies if the rows and columns were independent.

The household heads and the household help were asked to suggest how Bangladesh could successfully address this pandemic. As shown in Table 7, because the household help lack knowledge on health issues and policies, many of them responded emotionally rather than logically. Also, even though the household help is aware of the virus's deadlines and is trying to take adequate preventive measures based on their limited knowledge, they are not affluent enough to sit at home. These respondents were more concerned about dying from hunger than they were about the pandemic. The household heads appeared to be conscientious citizens, suggesting the equitable and inclusive distribution of the vaccination, and affirming that they are affluent enough to survive without earning for a few months.

A Chi-Square Test for the level of awareness was conducted. The test result suggested that the null hypothesis of no class discrepancy can be rejected at the 1% significance level. As can be seen from Table 8, the highly significant test statistic suggests that the row and column independence (which would establish that there is no discrepancy due to class difference) can be firmly rejected.

Table 7: Level of Awareness Across Classes

| Level of Awareness | Household head | Household help |
|---|----------------|----------------|
| Reduce age limit for vaccine | 25 (8.04%) | |
| Make the registration process easier and available to everyone rather than to people only with internet and NID | 38 (12.22%) | 2 (0.64%) |
| Raise awareness, encourage, and promote vaccination by the government and other organizations | 97 (31.19%) | 26 (8.36%) |
| More availability/accessibility of vaccines, making more inclusive vaccination programs | 40 (12.86%) | 31 (9.975%) |
| Door to door or area-based vaccination service | 13 (4.18%) | 1 (0.32%) |
| Bangladesh should produce their vaccine | 1 (0.32%) | |
| Provide free vaccines to people | 3 (0.96%) | |
| A more reliable vaccine should be given to people, which will have no side effects | 12 (3.86%) | 1 (0.32%) |
| Make vaccination mandatory for all | 5 (1.61%) | |
| Ensure stimulus package for everyone | | 12 (3.86%) |
| Allah will take care of us | | 41 (13.18%) |
| Stay home and maintain all sorts of precautions | | 129 (41.50%) |
| Enforce strict rules during lockdown | | 4 (1.29%) |
| Eat healthy to make your immune system stronger | | 4 (1.29%) |
| Others | 77 (24.75%) | 60 (19.29%) |
| Total | 311 | 311 |

Source: Calculated from the survey.

Note: Figures in the parentheses represent the percentage of respondents in that respondent type.

Table 8: Chi-Square Test for Awareness Level

| | |
|---|--|
| H ₀ : Awareness level and respondents' type are not associated | Test Statistic: 320.23*** |
| H _a : Awareness level and respondents' type are associated | |
| Decision | Reject the null hypothesis at the 1% significance level. |

Source: Calculated from the survey. *** Significant at 1% level.

Multivariate Logistic Regression Analysis

For conducting a multivariate analysis, we used a logistic regression framework as follows:

$$L_i = \ln (P_i/1-P_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \varepsilon_i \dots [1]$$

Where P is the log-likelihood of the function to be maximized.

And,

$P_i = 1$ if the respondent is above 40 years old and vaccinated

$P_i = 0$ if the respondent is above 40 years old and not vaccinated

X_{1i} is a dummy variable that takes the value of 1 if the respondent is a household head, and it takes the value of 0 if the respondent is a household help

X_{2i} is a dummy variable that takes the value of 1 if the respondent has access to the mobile phone, computer, or laptop; and 0 otherwise

X_{3i} is a dummy variable that takes the value of 1 if the respondent has a National ID Card (NID) and 0 otherwise

$X_{4i} = LY_i$ is the log of the monthly income of household head or household help in terms of Bangladeshi Taka

The expected sign of $\beta_4 > 0$.

X_{5i} = Reasons for not getting vaccinated. It is an indicator variable that ranges from 0, 1, 2, ..., 12 where the meaning of codes is as follows:

0: Did not answer or was not vaccinated (reference category which was dropped from the final estimation)

1: No one is above 40 in the household; 2: Vaccine is less reliable, and we have trust issues; 3: Suffering from other health issues; 4: Waiting to get registered / Not registered; 5: Registered; 6: No reason; 7: Others; 8: Lower availability of vaccine; 9: Vaccination is for rich people; 10: I do not know the procedure to register for vaccination; 11: I did not know about the vaccine; 12: I do not believe in vaccination. God will help us!

Table 9: The Estimated Regression Result for Binary Logistic and Other Competing Methods (The dependent variable is whether the individual is vaccinated or not)

| Predictor | Logit | Normit (Probit) | Gompit |
|--|---------------------|--------------------|---------------------|
| Constant | -2.95 (2.39) | -1.38 (1.27) | -2.80* (1.52) |
| Individual Type HH or Hm (HH=1, Hm=0) | 2.58** (1.21) | 1.58** (0.68) | 1.58** (0.80) |
| Access to mobile phone and computer (YES=1, NO=0) | 2.51** (1.05) | 1.37** (0.59) | 2.10*** (0.72) |
| NID (YES=1, NO=0) | 0.33 (1.46) | -0.04 (0.80) | 0.47 (1.26) |
| LY (Log of Monthly Income) | -0.01 (0.24) | -0.01 (0.12) | -0.04 (0.11) |
| Reasons for not getting the Vaccine (Ref category $X_{5i}=0$) | | | |
| 1 | -3.84*** (0.61) | -2.25*** (0.34) | -2.47*** (0.51) |
| 2 | -4.44*** (0.62) | -2.57*** (0.32) | -3.10*** (0.55) |
| 3 | -23.65 (11236.4) | -7.58 (2596.25) | -21.79 (9230.96) |
| 4 | -23.66 (7575.71) | -7.58 (1750.46) | -21.81 (6223.71) |
| 5 | -23.65 (17766.2) | -7.58 (4105.01) | -21.79 (14595.4) |
| 6 | -4.00*** (1.13) | -2.35*** (0.62) | -2.62*** (1.01) |
| 7 | -3.62*** (0.70) | -2.13*** (0.40) | -2.32*** (0.59) |
| 8 | -23.65 (17764.0) | -7.57 (4104.03) | -21.78 (14592.7) |
| 9 | -0.56 (1.53) | -0.06 (0.87) | -0.56 (1.30) |
| 10 | -20.31 (8217.59) | -5.88 (1834.44) | -19.61 (6901.00) |
| 11 | -19.90 (13108.9) | -5.80 (2916.22) | -19.20 (11015.0) |
| 12 | -1.44 (1.39) | -0.84 (0.78) | -1.14 (1.21) |
| Maximized Log-likelihood | -99.61*** | -99.68*** | -99.23*** |
| Test that all slopes are zero | 269.26*** | 269.10*** | 270.04*** |

Source: Calculated from the survey. ***, **, and * represent significance at 1%, 5%, and 10% level, respectively. Standard errors are provided in the parenthesis.

The Odds ratio for the first three dummies is 13.25, 12.26, and 1.39, respectively, which indicates the ratio of probabilities between being vaccinated and not vaccinated is above 1. That means the significant difference between

household heads and household help in terms of class, mobile phone, laptop, computer, or internet accessibility, and NID all favors household heads in getting vaccinated because of their current position. However, monthly income was not found as a statistically significant determinant. The estimated β coefficients also take the correct sign and significance for the three dummies. Nevertheless, the desired sign of the estimated coefficient of β_4 is not found, and it is not statistically significant either. This could be because the dataset has an apparent size bias towards the household head for persons aged above 40, and most of them are vaccinated. In the case of β_5 , the indicators 1, 2, 6, and 7 are statistically significant. That means that "no one is above 40," "vaccines are not reliable and we have trust issues," "other reason," and "no reason" has been found as statistically significant determinants for not being vaccinated. This indicates that perception plays a role for both classes for not being vaccinated. To check the robustness of these results, we also ran Probit or Normit and Gompit estimation and found that the results do not vary much. We have also found some support for this in a separate question where we asked both groups about the solutions for COVID-19 and found that the two groups substantially differ in their perspectives on the pandemic (see Table 7).

Further Analysis

The authors have also conducted some qualitative analysis to further examine the vaccine gap determinants among the two classes of people in Dhaka city. The survey results show that government organizations and ward commissioners have also played a significant role in motivating people to get COVID-19 vaccination. A good number of household help (including those who were not vaccinated) stated that they were encouraged to get vaccinated by different organizations, such as government organizations, mosques, NGOs, and ward commissioners. However, health consciousness and knowledge about vaccination encourage people to get vaccinated more than the other factors, demonstrating the significance of the educational background of the vaccinated people.

Table 7 shows that around 42% of the household workers have stated that staying at home and maintaining all sorts of precautions will help them deal with the pandemic. However, most household help can barely read and write, and their low level of education generally constraints them from gaining factual knowledge about any disease; therefore, this group of people is prone to giving high authority to healthcare organizations and news reports regarding their physical wellbeing.

Table 7 also shows that 13.18% of the household help have solid religious beliefs regarding how the world can eradicate the pandemic; they responded, "Allah has given the pandemic, and He will take it away." Surprisingly, none of the household heads based their answers on religious faith when asked the same question. Instead, their responses were in the line of "Bangladesh should produce its vaccination." The household heads, who are generally highly educated, have made substantial comments about the pandemic and evaluated the validity of the vaccination. In contrast, the household help, most of whom are uneducated, seem to only keep faith in God without taking preventive actions to protect their health. The analysis shows that the education gap can also create a vaccine gap among different classes of people in Dhaka city, which can be an area of future research.

Conclusion and Policy Suggestions

The non-medical literature on COVID-19 can be classified into three broad groups: first, examining the determinants of the transmission of the virus, second, the determinants of the death rate or mortality, and third, the socio-economic impact of this pandemic. The third group gave rise to a subcategory where the researchers primarily focus on the vaccination gap across regions, countries, areas, ethnic groups, professions, gender, rural-urban divide, income status, and wealth disparity. Many developed countries have had a difficult time fighting against this pandemic. However, some developing countries can also be listed as a success story in vaccine management due to the active role of the state from the very inception of the disease, and Bangladesh can be enlisted as one of these types of countries in the world.

Even though Bangladesh has an acute shortage of capacity in producing enough vaccines locally, the government has rightly managed to buy from Serum Institute (India) and made it available to all classes of citizens freely through a first-come, first-serve basis with the age requirement of 40+ years. This policy has paid a dividend in the sense that the death rate and transmission did not cross the danger limit, and the country can be classified as a moderately good performer in COVID-19 management globally. The registration process is fully automated, and any

Bangladeshi citizen with National Identity Number (NID) can register for vaccination online. The network also covers remote areas of the country where people have cell phones and internet networks. As the government freely provides the vaccine, there is no apparent bar or restriction in getting two doses if the supply is available. However, a puzzle or contradiction remains in the process. Do people who have no access to cell phones, computers, laptops, or internet get access to the vaccine? This research question led us to conduct an online survey of more than 1,400 respondents belonging to 311 households in Dhaka city, Bangladesh, from April 16 to April 30, 2021. A cross-section of respondents, selected on a purposive sampling basis, were interviewed in two categories through a structured questionnaire with 41 questions about their status of vaccination, income, age, education, access to cell phone, laptop or computer, internet, awareness/consciousness level, and other relevant information on a confidential basis. Using simple descriptive statistics, bivariate Chi-Square measure of association, and multivariate binary logistic regression method, this study found new and exciting results that contribute to the existing literature on the vaccine gap, which is dominated mainly by developed vs. developing country disparity.

This study found that the probability of getting vaccinated is substantially lower for household workers than the head of the household in which they work. The disparity in access to vaccination does not stem directly from income or wealth disparity; instead, the main reasons are disparity in access to the internet, cell phone, laptop or computer, and national identity card. The most alarming reason for the disparity is the lack of awareness, religious perception, and education. A binary logistic regression model has rightly identified the channels of these relationships at a 5% level of significance. Even though income can be perceived as a significant determinant of access to vaccination, this study has not identified it as significant, whereas access to technology is identified as the prime driver both for the rich and the poor. Online registration is not enough to ensure equal access to vaccination in Bangladesh; a massive campaign by the government, NGOs, social media, electronic and print media encouraging people from all walks of life to register for vaccination can yield better results.

Moreover, an urgent decision to provide walk-in services for registration must be introduced to encourage people from the working class. Mosques, temples, churches, pagodas, and other religious institutions can promote vaccination awareness to the general people. At the same time, a smooth supply of vaccines must be ensured. The country should also invest more money and allow local companies to go for vaccine production. Using only foreign sources is not sufficient to vaccinate this massive population at such a high rate. The vaccination can be considered genuinely universal if people from all walks of life can access it without legal, economic, or cultural constraints.

Endnotes

¹ Covishield is the Indian made version of AstraZeneca's Vaxzevria jab.

² Four out of the five vaccinated household helpers were part-timers. Two of them were encouraged by NGOs and government bodies to take the shot, and the other two got the shot as they felt it is crucial to get vaccinated, which implies that the household heads do not play a significant role in encouraging the household workers to be immunized against COVID-19.

Ethical Declaration

All participants have voluntarily taken part in the survey. Personal information collected from the respondents is kept confidential, and the individuals' identities are kept anonymous. Data was compiled based on the ethical guidelines, and hence there is no conflict of interest.

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Cost-Effectiveness of COVID-19 Vaccination in Bangladesh

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Abstract

This study fills a knowledge gap regarding the COVID-19 vaccination by estimating the burden of disease and cost-effectiveness of the vaccination program in the context of Bangladesh. Although vaccination appears to be the only viable path towards normalcy, it has been initiated in most developing countries with lukewarm progress. The vaccination programs involve significant costs, and it is imperative to understand the cost burden of COVID-19 when analyzing the net benefits of vaccination. This study is based on data obtained from official government and international sources. It estimates the Disability Adjusted Life Years (DALY) due to COVID-19 in Bangladesh. The cost-effectiveness of the vaccination in the country is compared to the threshold of Incremental Cost-Effectiveness Ratio (ICER) recommended by the WHO. The study shows that people of ages 31-40 years contributed most to the total DALY implying that vaccination programs are most cost-effective for those above 30 years of age. The study also shows that the price of the vaccine should not exceed USD \$20 per dose to make the program sustainable, as the ICER is highly sensitive to the price. This evidence calls for government to prioritize the implementation of a vaccination program on a large scale, and the government should attempt to purchase the vaccine from low-cost sources.

Keywords: COVID-19, Disability Adjusted Life Years, Cost-effectiveness, Vaccination

Introduction

Ever since the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic in March 2020, the virus has claimed more than three million lives globally with upwards of 165 million cases confirmed by May 2021, among which more than 17% of cases (29 million) are from south-east Asia (WHO, 2021). Facing a disastrous first wave of this disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), many countries are now being rattled by a deadly second wave (Pandey and Nazmi, 2021; Salyer et al., 2021).

Bangladesh faced 780,159 confirmed cases with 12,149 deaths caused by COVID-19 from the date of the first confirmed case until May 16, 2021 (MoHFW, 2021). Shattered by the first wave, Bangladesh has been tackling the second wave from April 2021, with the highest number of weekly and daily confirmed cases occurring in the first week of April (WHO, 2020). A higher infection rate for the disease has increased the burden on the health care system, causing an increase in the fatality rate (WHO, 2020).

Like many other countries, in order to curb the transmission of the virus, Bangladesh has imposed restrictions on public gatherings and closures of schools and workplaces at several phases (Hale et al., 2021). The economic cost has been about \$39 million/day¹ (The Dhaka Tribune, 2020). In low and middle-income countries like Bangladesh, such measures are not sustainable and when these measures are withdrawn, the situation is worsened (Vassall et al., 2020). Therefore, in the developing world, vaccination has been one of the most cost-effective measures to prevent the disease burden and deaths (Greenwood, 2014). As of June 1, 2021, seven vaccines have completed phase III trials, and at least 23 other vaccine candidates were in phase III trials, whereas over 304 are in clinical trials (Shrotri, Swinnen, Kampmann, and Parker, 2021). To protect the community from the outbreak of this disease, about 70% of the population needs to vaccinate. This would assure an adequate level of herd immunity (Maragakis, 2021).

In Bangladesh, nationwide COVID-19 vaccination was launched on February 7, 2021, and since then 5.8 million people (3.6% of total population) have received the first dose of Oxford AstraZeneca (COVISHIELD) vaccine until May 16, 2021. From April 8, 2021, 3.6 million people have received a second dose of the vaccine, that is 2.2% people are fully immunized against coronavirus (MoHFW, 2021). The vaccination rate during that period is 38.6% and 32% for the US and UK, respectively (Mathieu et al., 2021). With the stock of AstraZeneca vaccines depleted, Bangladesh has received five million doses of Sinopharm vaccine from China (The Daily Star, 2021a) and a million doses of Pfizer vaccine was to take off on June 2, 2021 (The Daily Star, 2021b). Additionally, the authorities of Bangladesh and Russia are bargaining with the price of the Sputnik V vaccine (The Daily Jugantor, 2021).

While vaccination appears to be the only option left to get back to normalcy, vaccination interventions involve costs—both for the vaccine itself, as well as the distribution and administrative costs. Undoubtedly, these costs also involve some opportunity costs, as this money could be spent elsewhere—for instance, in strengthening capacity of health sector for non-communicable diseases, for urban health or for improving health facility for under-served or hard to reach areas. Therefore, to strengthen the platform for implementing the COVID-19 vaccination program nationwide, some cost-effectiveness analyses are required for policy makers. Although there are few studies focusing on the cost-effectiveness of the COVID-19 vaccination (Kohli, Maschio, Becker, and Weinstein, 2021; Hagens et al., 2021) and different infection prevention vaccines (Pecenka et al., 2017; Troege, Sack, and Chao, 2014), such an analysis using the Disability Adjusted Life Years (DALYs) has not been seen in the context of Bangladesh because of the limited knowledge of this disease. To address this knowledge gap, this study aims at estimating the burden of COVID-19 in Bangladesh using the DALYs, and then using these estimates to assess the cost-effectiveness of COVID-19 vaccination program.

The rest of the paper is organized as follows: the next section presents methodology to estimate the DALY and cost-effectiveness of COVID-19 vaccination program, followed by the section on estimated results, and finally the last section presents discussion and conclusion.

Methodology

The DALYs in Bangladesh due to COVID-19 are measured using an incidence-based approach (burden-eu, 2020). DALYs are calculated by adding the number of years of life lost due to premature mortality (YLLs) and the number of years lived with disability (YLDs) (burden-eu, 2020):

$$DALY = YLL + YLD$$

Calculated from an incidence perspective, YLD can be defined as the product of the number of incident cases (N), the average duration until recovery or death (D), and the disability weight (DW), which basically echoes the adverse effect on health on a scale from 0 (no impact on full health) to 1 (death) (burden-eu, 2020). This can be presented as follows:

$$YLD_{inc} = N \times D \times DW$$

For calculating the YLDs, the numbers of confirmed cases by sex and age group, as well as the duration of disease and disability weights (DWs) of each health state (mild/moderate, severe, and critical) are needed (burden-eu, 2020). The numbers of confirmed cases of COVID-19 by sex and age group were obtained from a press release of the Directorate General of Health Services division of Ministry of Health and Family Welfare (MoHFW) of Bangladesh (2021), and morbidity and mortality weekly update of Bangladesh reported by World Health Organization (WHO, 2020). For each health state, the age specific confirmed cases for both males and females are estimated from the

COVID-19 pandemic modelling developed by the COVID-19 International Modelling Consortium (CoMo consortium) of the University of Oxford (2020). The duration of disease for each health state was found in a research report jointly conducted by the Health Economics Unit of MoHFW and the University of Dhaka (The Prothom Alo, 2021). Disability weights of each health state caused by coronavirus infection were collected from a protocol for calculating burden of disease of COVID-19 developed by the European Burden of Disease Network (burden-eu, 2020). Table 1 shows the parameters used for calculating the YLDs and range of sensitivity analyses. We considered the number of severe cases, disability weight, and morbid duration as variables with uncertainties.

Table 1: Parameters used to calculate the years lived with disability and cost of vaccination program

| Parameters | Baseline | Sensitivity analysis | | Reference |
|--|----------|----------------------|-------------|---|
| | | Lower Limit | Upper Limit | |
| No of cases | | - | - | Estimation |
| Mild/Moderate | 678,659 | | | |
| Severe | 30,756 | | | |
| Critical | 3,076 | | | |
| No of deaths – Total | 10,182 | - | - | MoHFW (2021) |
| Disability weight | | | | burden-eu (2020) |
| Mild/Moderate | 0.051 | 0.032 | 0.074 | |
| Severe | 0.133 | 0.088 | 0.190 | |
| Critical | 0.655 | 0.579 | 0.727 | |
| Duration of Disease | | | | The Prothom Alo (2021), Rees et al. (2020) |
| Mild/Moderate | 14 | - | - | |
| Severe | 10 | 6 | 19 | |
| Critical | 08 | 5 | 13 | |
| Burden of isolation for 2 weeks after the discharge per person | 0.007 | - | - | Jo et al. (2020) |
| Cost of purchasing 2 (two) doses of vaccine (US\$) | | | | The Daily Star (2021c), The Daily Jugantor (2021) |
| AstraZeneca (COVISHIELD) | 8 | - | - | |
| Sputnik V | 20 | - | - | |
| Administrative cost of 2 (two) doses of vaccine (US\$) | | | | Assumption |
| AstraZeneca (COVISHIELD) | 4 | - | 8 | |
| Sputnik V | 4 | - | 8 | |

YLL can be calculated by multiplying the number of deaths (M) and the average remaining life expectancy (RLE) at the time of death (burden-eu, 2020):

$$YLL = M \times RLE$$

To calculate YLLs, the number of confirmed death cases were obtained from the press release of Directorate General of Health Services of the MoHFW in Bangladesh (2021), and sex and age specific confirmed death cases were estimated from morbidity and mortality weekly update of Bangladesh reported by the WHO (2020). The “ideal” life expectancy² at birth for both males and females are 86 years and was obtained from the new Global Burden of Disease (GBD) 2010 life table (WHO, 2017). To compare the results with other countries, we estimated the YLLs, YLDs and DALYs per 100,000 population by sex and age, using the data from the Bangladesh Demographic and Health Survey (NIPORT and ICF, 2020).

To analyze the cost-effectiveness of the vaccination program of COVID-19, incremental cost-effectiveness ratios (ICERs) are calculated. The ICER is defined as the ratio of the change in the costs of the COVID-19 vaccination program (compared to doing nothing) to the change in effects of the vaccination in terms of DALYs averted. Vaccine purchasing costs were obtained from different print media (The Daily Star, 2021c; The Daily Jugantor, 2021); while the administration cost of the vaccination program was assumed (Table 1).

The following equation is used for ICER:

$$\text{Incremental cost-effectiveness ratio (ICER)} = (C_1 - C_0) / (E_1 - E_0)$$

Where C_1 and E_1 are the cost and effect of the COVID-19 vaccination program while C_0 and E_0 are the cost and effect of the comparator respectively. For reporting the cost-effectiveness scenario, we used the common cost-effectiveness threshold level proposed by the World Health Organization: an intervention will be considered cost-effective if cost per DALY averted is less than *three* times the national annual per capita GDP, and an intervention will be considered highly cost-effective if cost per DALY averted is less than the national annual per capita GDP (Edejer et al., 2003).

Results

After more than one year of confirming the first case of COVID-19, that is from March 8, 2020, to April 16, 2021, a total of 711,779 confirmed cases of COVID-19 with 10,182 deaths were reported in Bangladesh.

During the study period, a total of 544,898.8 YLDs were attributed to COVID-19 in Bangladesh, translating to 334.2 YLDs per 100,000 population. Males had greater YLDs than females did. The numbers are 392,568.7 and 152,330 in total, and 476 and 189.1 per 100,000 population for males and females, respectively. The burden of YLDs was the highest for the age group of 31-40 years, 106,396.2 for males and 34,068 for females, and the 80+ year old age group had the lowest proportion of YLDs - 5,409.2 in males, and 2318.1 in females (Figure 1A). The highest proportion of YLDs per 100,000 population was observed in those aged 51-60 years (1,064.2 in males and 454.5 in females) and the lowest proportion was in the group of people aged 0-10 years (30.4 in males and 29.9 in females) (Figure 1B).

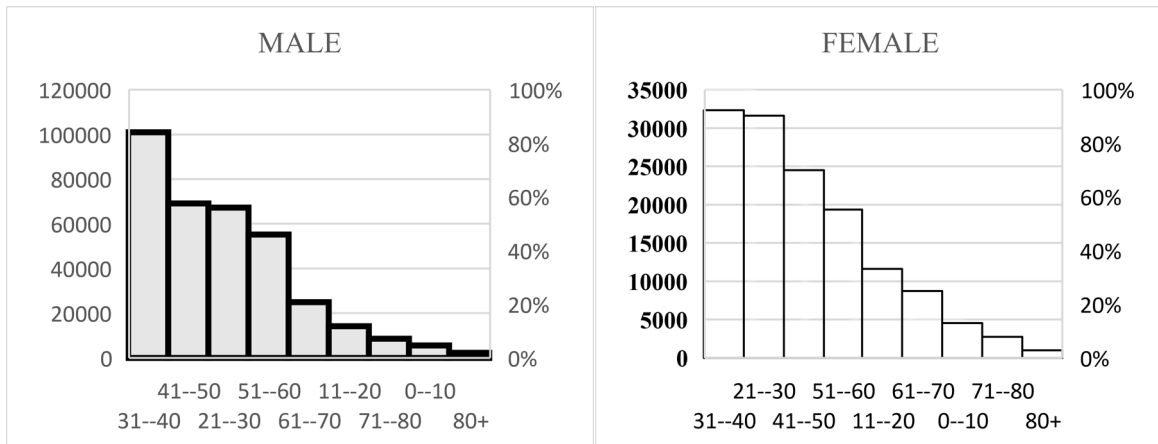


Figure 1A: YLDs for COVID-19 by sex and age group

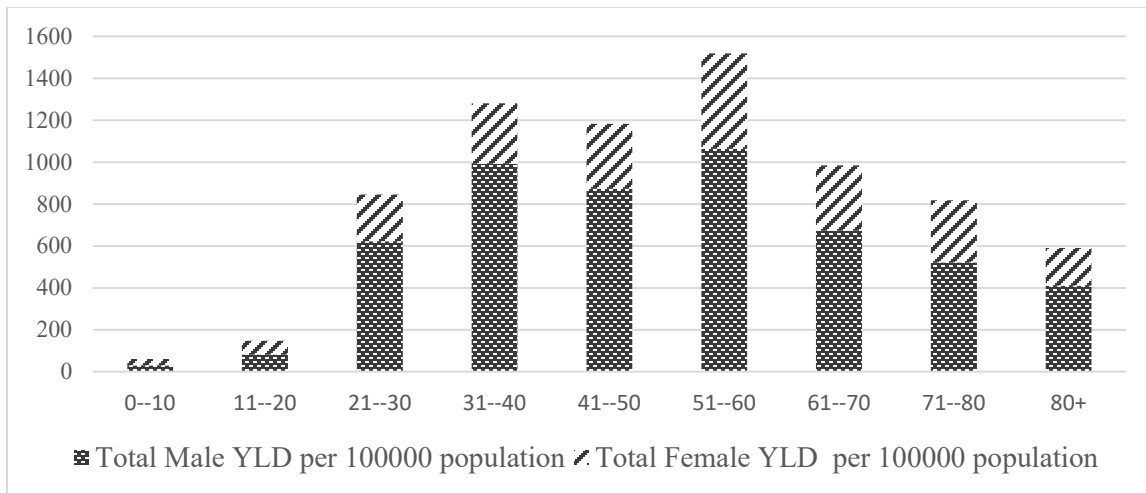


Figure 1B. YLDs for COVID-19 by sex and age group (per 100,000 population)

Table 2 presents the sensitivity analysis undertaken to investigate the effect of changes in the parameter estimates on the estimated YLDs. We considered the number of severe cases, disability weight, and the duration of morbidity as variables with uncertainties. From Table 2A, which can be found in the appendix, it was observed that increasing the severe (or those requiring hospitalization) cases by 10%, 20%, and 30% increased the YLDs by 0.7%, 1.4%, and 2% respectively for males, and 0.6%, 1.3%, and 1.9% respectively for females. When all possible lower limits on the disability weights were considered, the YLDs for both males and females declined by 36%. A consideration of all the upper limits increased the YLDs by more than 43% for both males and females. These can be found in Table 2B in the appendix, in which S1, S2, and S3 represent the scenario of YLDs with all the upper limits of DWs and the lower limits of DWs, respectively. Table 2C in the appendix also includes S4 and S5, which respectively denote upper and lower limits on the duration of morbidity and shows us that when the morbidity duration for severe and critical cases were increased to 19 and 13 days, respectively, YLDs for males and females increased by 8.8% and 8.1% respectively. On the other hand, reducing the duration to 6- and 5-days results in YLDs for males and females of 376,060.4 and 146,432.9, respectively. This is approximately 4% lower than the baseline for both males and females. When all the scenarios were combined in Figure 2, it was clear that the disability weight was the most sensitive parameter.

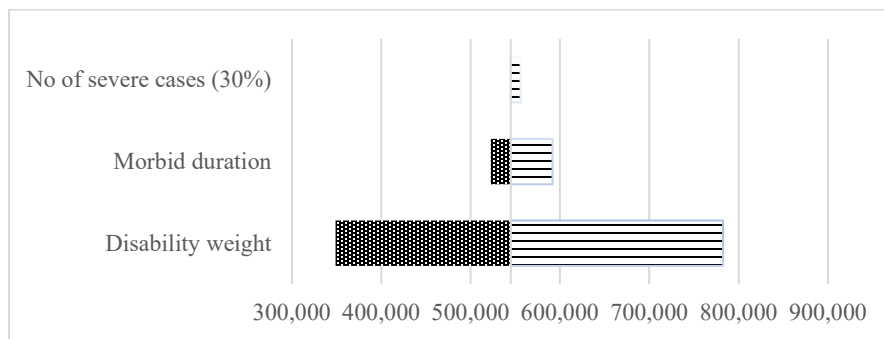


Figure 2: Sensitivity analyses of variables used in the calculation of YLDs.

(Note: The dark shade represents the lower limit of YLDs, and the light shade represents the upper limit of YLDs)

Until April 16, 2021, the total number of YLLs caused by COVID-19 was 242,502 and YLLs per 100,000 population was 148.9. As for the YLDs, YLLs were higher in males than in females, and were 181,826 and 60,676 for males and females, respectively. Males in the age group 51-60 years were 30% of total YLLs, and females in this age group were 25% of total YLLs (Figure 3). As shown in Figure 3, the YLLs were highest in 51-60 years age group for both male and female followed by 61-70 years age group, whereas YLDs were highest among 31-40 years age group for both males and females.

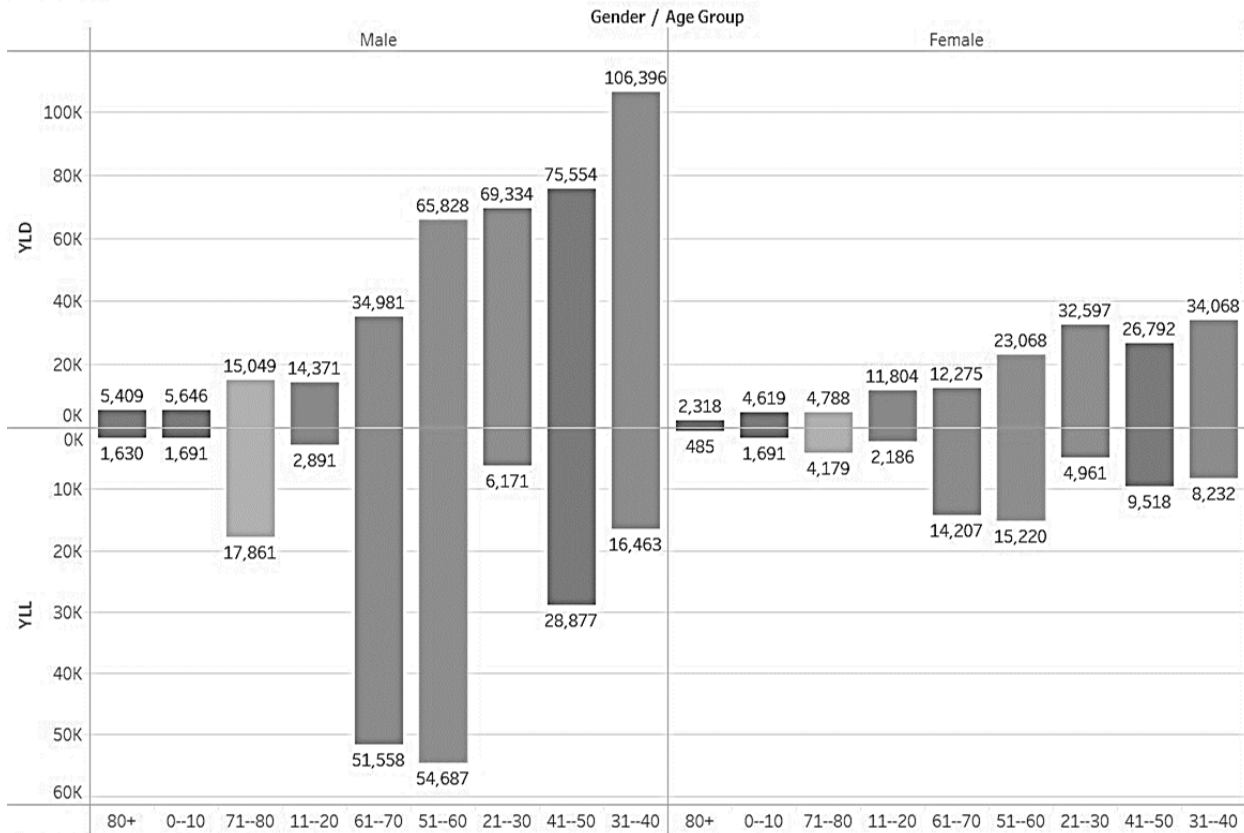


Figure 3: YLDs and YLLs for COVID-19 by sex and age group

The corresponding total DALYs for COVID-19 by gender during the study period was 787,400.8 and 483.4 DALYs per 100,000 population. YLDs and YLLs constituted 69.2% and 30.8% of the DALYs respectively. The relative contribution of YLDs and YLLs to DALYs varied by age – the highest proportion of YLDs was 90.2% for the age group 21-30 years, while the YLLs were 58.2% for the age group 61-70 years. The highest DALYs were observed in the 31-40 years age group for both males (122,859.2) and females (42,299.5), followed by the age groups 51-60 years and 41-50 years. The DALYs per 100,000 population were highest for 51-60 years age group for both males (1,948.3) and females (2,374.2).

Cost-effectiveness of COVID-19 vaccination program

By implementing the COVID-19 vaccination program, a total of 787,400.8 DALYs could have been averted during this period of more than one year. Figure 4 depicts the scenario of cost per DALY averted for different vaccines in Bangladesh, where C4 and C8 denote the deployment of the COVISHIELD vaccine with administrative cost of US \$4 and \$8, respectively. Similarly, S4 and S8 show a scenario where the Sputnik V vaccine is used with the same administrative costs of \$4 and \$8, respectively. This figure elaborates that when administrative costs are US \$4, if 70% population of Bangladesh are vaccinated by AstraZeneca (or COVISHIELD), the estimated cost per DALY averted would be US\$ 1,737.6. The cost figures would be doubled to US \$3,475.2 if the vaccine is changed to Sputnik V. On the other hand, if administrative costs are US \$8, or equal to 100% of the procurement cost of COVISHIELD vaccine, the aversion cost ranges from US\$ 2,316.8 to US \$4,054.4 for Sputnik V, a figure that is more than 1.5-fold higher than that with lower administrative costs. Additionally, if the cost of the vaccine surges to US \$20 per dose, the cost per DALY averted will increase to 71% (US \$6,950.5). This, combined with the maximum administration cost, is presented as S204 and S208 in Figure 4. For each case, the minimum cost per DALY averted would be lowest for the 51-60 years age group, followed by 61-70-, and 71-80-years age groups (Figure 4).

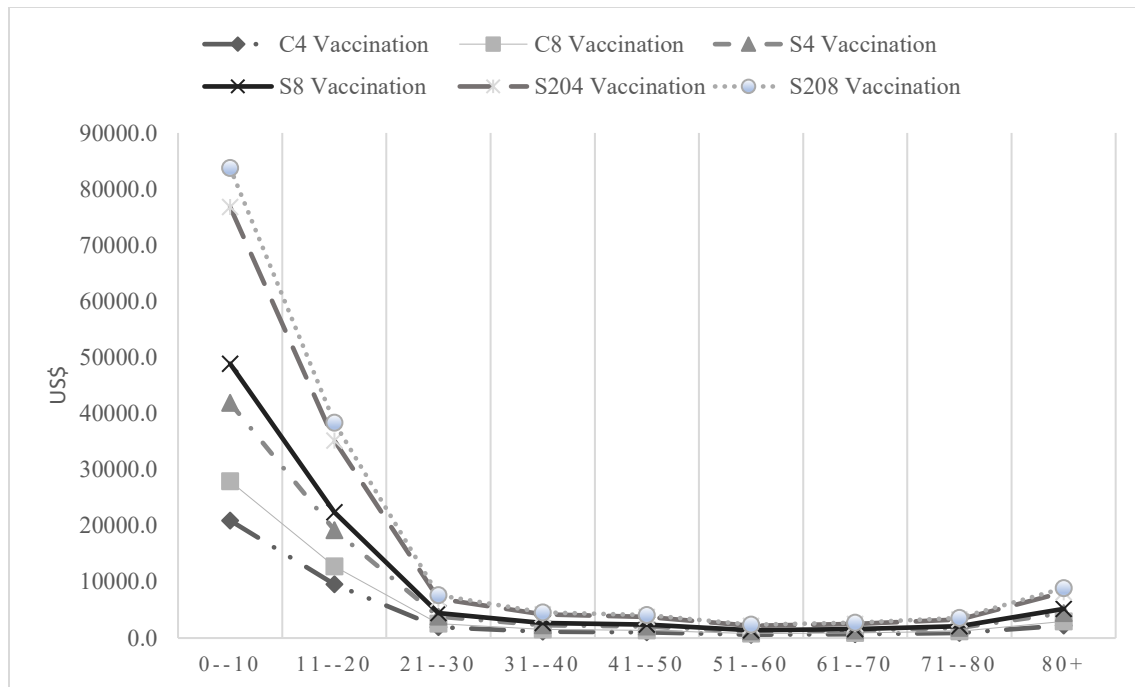


Figure 4: Cost per DALY averted of COVID-19 Vaccination

The above results demonstrate that the COVID-19 vaccination is a cost-effective investment, given that the incremental cost effectiveness ratios (ICERs) for both vaccines fall below three times of the national annual per capita GDP, which is US \$2,227 in Bangladesh in 2020-2021 (Dhaka Tribune, 2021). In addition, applying thresholds to determine the cost effectiveness of an intervention, the COVID-19 vaccination program with the COVISHIELD vaccine appears to be “very cost-effective” while the Sputnik V appears to be “cost-effective”. Therefore, according to the criteria laid out by the WHO, Bangladesh employed a “very cost-effective” to “cost-effective” approach when implementing the COVID-19 vaccination program.

Discussion and Conclusion

In this study, the burden of the COVID-19 pandemic for over one year in Bangladesh has been measured using the incidence-based DALYs. It was found that YLLs were higher in males than those in females, supporting similar findings from South Korea and Italy (Jo et al., 2020; Nurchis et al., 2020). YLDs were also higher in males compared to females across all age groups, which is also consistent with the findings from Italy (Nurchis et al., 2020), but inconsistent with the findings from S. Korea (Jo et al., 2020). This scenario can partly be explained by sex-based differences in genome sequences, which lead to differences due to immunity, pre-existing diseases, high-risk behaviors (such as smoking and alcohol consumption), and exposure to the virus (Sharma, Volgman, and Michos, 2020). Similar to the study of Jo et al. (2020) in S. Korea, YLDs in this study were found to be highly sensitive to disability weights.

In terms of age distribution, people aged 31-40 years contributed to the highest number of DALYs, accounting for around 21% of the total DALYs, incorporating the higher contribution of YLDs rather than YLLs. Previous studies (Jo et al., 2020; Nurchis et al., 2020) have demonstrated that DALYs were higher for the people aged more than 70 years which can be explained by the association between age and prevalence of co-morbidities and co-morbidity conditions (Wolff, Starfield, and Anderson, 2002). The context of our study can also be informed by findings from the previous studies where comparatively lower knowledge of the disease and lesser response in practicing social distancing have been identified as the reasons for a higher prevalence of COVID-19 among younger groups of people (Rahman et al., 2020). This finding can also be explained by another study where the association between prevalence of COVID-19 and obesity is noted (Zhang, Lewis, Moley, and Brestoff, 2021). Bangladesh is facing a growing prevalence of obesity among people aged 30-50 years (Banik and Rahman, 2018).

In this study the total DALYs per 100,000 population was maximum among the 51-60 years age group for both males and females, which is slightly different from the study of S. Korea (Jo et al., 2020). DALYs per 1,000 population for Bangladesh was around 5 which is similar to that found in Maharashtra, India (6.1), USA (4), and Italy (6); whereas for Germany and Sweden the corresponding number is 1 (Vasishtha, Mohanty, Mishra, Dubey, and Sahoo, 2021; Mohanty, Dubey, Mishra, and Sahoo, 2020).

Total burdens of COVID-19 in Bangladesh are expected to be greater than these estimates, as it is an ongoing outbreak. There could be more confirmed cases and undetected deaths in the study period. Moreover, Bangladesh is at high risk to witness the third wave of this pandemic, as restrictions on social gatherings have been relaxed (The Business Standard, 2021). Detecting the fast spreading and deadlier Indian variant of the coronavirus and black fungus among the COVID recovered patients have triggered a new concern about COVID-19 (The Dhaka Tribune, 2021; Molla, 2021).

As a response to the growing concern over COVID-19, vaccination should be implemented nationwide on a broader scale. This study showed that implementing the COVID-19 vaccine is “highly cost-effective” when the price of the vaccine is lower than US \$10; while the price less than US \$20 makes it “cost-effective”. However, if the price of the vaccine increases to US \$30, it is no longer cost-effective. Studies of different countries demonstrate that vaccination appears to be cost effective in Turkey even when the price varies from US \$10 to \$30 (Hagens et al., 2021), in the US even if the price is US \$35 (Kohli, Maschio, Becker, and Weinstein, 2021), and in Pakistan if it is below US \$3 (Pearson et al., 2021). If the death case doubles, given the 54% mortality rate of black fungus, vaccination programs prove to be effective in Bangladesh when the price is bounded by US \$20; otherwise, it is established as ineffective on a larger scale. When the age-wise break down is taken into account, vaccination is found to be the most cost-effective option for people above 50 years (Hagens et al., 2021).

The analysis presented in this paper is novel in that it estimates the burden of COVID-19 using a scientific method. The study is based on the epidemiological and socio-economic data retrieved from official and government sources of Bangladesh and from reputed international sources. In earlier studies of other countries that focused on this topic, disability weights were assumed for different health states. However, the disability weights used in this study were obtained from a protocol developed by burden-eu for COVID-19 DALY calculation (2020).

This study offers some policy recommendations, but it is important to note the restrictive assumptions on which the conclusions are made. For instance, projected cases and deaths are estimated using an epidemiological model with historical data. This trend may not remain the same in the future. In this study, the vaccines which provide full protection against the first generation of the coronavirus have been assessed. However, if the vaccines have a lower efficacy against any new variants of the pandemic, the entire scenario could be altered. For instance, if COVISHIELD is less effective in controlling any new variants, the confidence ratio will decline. Along with unpredictability regarding efficacies, other uncertainties such as a mutation of the virus, human responses to such mutation, invention of drugs, etc. can also alter the cost-effectiveness conclusions.

Based on the results presented in this study, it appears that vaccination is a cost-effective intervention. However, the costs of running vaccination campaign can be challenging if no further data of administration is available. Moreover, different vaccines have different supply chain requirements which may further complicate the administration of vaccines. With various sensitivity analysis, this study shows that vaccination program is not only cost-effective, but also is the only viable option for curbing infection.

Endnotes

¹ BDT 3,300 crore which is almost US \$39 million/day [US \$1 =BDT 84.84]

² In DALY calculation the “ideal” life expectancy (maximum life expectancy possible across the globe) is used instead of the country-specific actual life expectancy. The notion is that everyone deserves the highest level of life expectancy in the world, regardless of their actual country of residence.

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Appendix

Table 2A: Effect of increase in severe cases on YLDs

| Age Group | S1 Male | S10 Male | S20 Male | S30 Male | S1 Female | S10 Female | S20 Female | S30 Female |
|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| 0-10 | 5,645.9 | 5,651.4 | 5,656.9 | 5,662.5 | 4,619.1 | 4,623.6 | 4,628.1 | 4,632.7 |
| 11-20 | 14,370.7 | 14,384.8 | 14,398.8 | 14,412.9 | 11,804.4 | 11,816.0 | 11,827.6 | 11,839.1 |
| 21-30 | 69,334.1 | 69,457.5 | 69,581.0 | 69,704.4 | 32,597.5 | 32,655.5 | 32,713.5 | 32,771.5 |
| 31-40 | 106,396.2 | 106,719.1 | 107,042.1 | 107,365.1 | 34,068.0 | 34,171.5 | 34,274.9 | 34,378.3 |
| 41-50 | 75,553.9 | 75,943.5 | 76,333.1 | 76,722.7 | 26,792.2 | 26,930.3 | 27,068.5 | 27,206.6 |
| 51-60 | 65,828.4 | 66,465.2 | 67,102.0 | 67,738.8 | 23,068.2 | 23,291.3 | 23,514.5 | 23,737.6 |
| 61-70 | 34,981.4 | 35,582.8 | 36,184.1 | 36,785.5 | 12,274.7 | 12,485.7 | 12,696.7 | 12,907.7 |
| 71-80 | 15,049.0 | 15,435.8 | 15,822.7 | 16,209.5 | 4,787.9 | 4,911.0 | 5,034.1 | 5,157.2 |
| 80+ | 5,409.2 | 5,594.4 | 5,779.6 | 5,964.8 | 2,318.1 | 2,397.4 | 2,476.8 | 25,56.2 |
| Total YLD | 392,568.7 | 395,234.5 | 397,900.3 | 400,566.1 | 152,330.0 | 153,282.3 | 154,234.6 | 155,186.9 |

Table 2B: Effect of Disability Weight on YLDs

| Age Group | S1 Male | S2 Male | S3 Male | S1 Female | S2 Female | S3 Female |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0-10 | 5,645.9 | 3,552.9 | 8,180.0 | 4,619.1 | 2,906.7 | 6,692.3 |
| 11-20 | 14,370.7 | 9,043.2 | 20,820.8 | 11,804.4 | 7,428.3 | 17,102.8 |
| 21-30 | 69,334.1 | 43,734.6 | 100,332.7 | 32,597.5 | 20,561.9 | 47,171.4 |
| 31-40 | 106,396.2 | 67,362.5 | 153,672.9 | 34,068.0 | 21,569.5 | 49,206.0 |
| 41-50 | 75,553.9 | 48,135.2 | 108,775.6 | 26,792.2 | 17,069.2 | 38,572.9 |
| 51-60 | 65,828.4 | 42,495.3 | 94,123.9 | 23,068.2 | 14,891.6 | 32,983.7 |
| 61-70 | 34,981.4 | 23,074.1 | 49,442.9 | 12,274.7 | 8,096.5 | 17,349.1 |
| 71-80 | 15,049.0 | 10,166.2 | 20,990.2 | 4,787.9 | 3,234.4 | 6,678.2 |
| 80+ | 5,409.2 | 3,740.4 | 7,443.8 | 2,318.1 | 1,602.9 | 3,190.0 |
| Total YLD | 392,568.7 | 251,304.5 | 563,782.7 | 152,330.0 | 97,361.0 | 218,946.4 |

Table 2C: Effect of morbid duration on YLDs

| Age Group | S1 Male | S4 Male | S5 Male | S1 Female | S4 Female | S5 Female |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0-10 | 5,645.9 | 5,611.7 | 5,717.5 | 4,619.1 | 4,591.1 | 4,677.7 |
| 11-20 | 14,370.7 | 14,283.6 | 14,553.0 | 11,804.4 | 11,732.9 | 11,954.2 |
| 21-30 | 69,334.1 | 68,569.8 | 70,933.6 | 32,597.5 | 32,238.1 | 33,349.4 |
| 31-40 | 106,396.2 | 104,396.2 | 110,581.4 | 34,068.0 | 33,427.7 | 35,408.2 |
| 41-50 | 75,553.9 | 73,141.2 | 80,602.9 | 26,792.2 | 25,936.6 | 28,582.6 |
| 51-60 | 65,828.4 | 61,885.0 | 74,080.7 | 23,068.2 | 21,686.3 | 25,960.0 |
| 61-70 | 34,981.4 | 31,257.3 | 42,774.5 | 12,274.7 | 10,967.9 | 15,009.2 |
| 71-80 | 15,049.0 | 12,653.4 | 20,062.1 | 4,787.9 | 4,025.7 | 6,382.9 |
| 80+ | 5,409.2 | 4,262.3 | 7,809.2 | 2,318.1 | 1,826.6 | 3,346.6 |
| Sub total | 392,568.7 | 376,060.4 | 427,114.9 | 152,330 | 146,432.9 | 164,670.7 |

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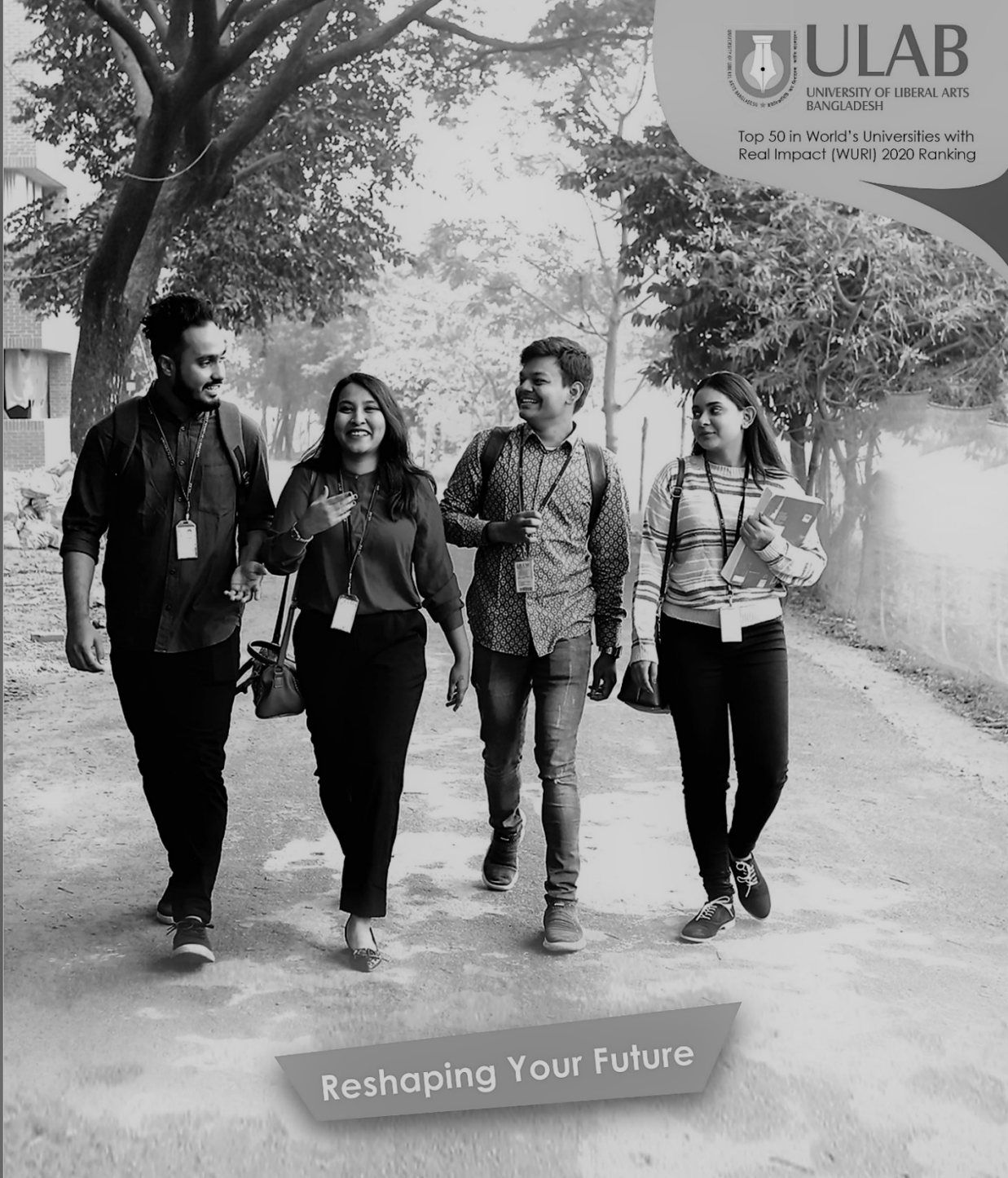
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